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Comprehensive Dental Clinic Management System

نظام إدارة عيادات الاسنان متكامل

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Abstract

Dental clinics face significant challenges in managing appointments, patient records, and communication, leading to long waiting times, appointment cancellations, and data security concerns. These challenges not only affect the patient experience but also hinder the operational efficiency of clinics. To address these problems, this project aims to develop a modern dental clinic management system that streamlines clinic operations and enhances communication between patients and dentists. The system is designed as a user-friendly web platform for booking appointments, improving data management, and ensuring secure access to patient records. The project seeks to reduce administrative burdens, minimize errors, and improve overall patient satisfaction by achieving these objectives. The methodology relied on modern web technologies such as HTML and CSS for designing a responsive and user-friendly website, along with JavaScript and cloud data storage in Firebase databases. The system was developed using an iterative approach, allowing for continuous feedback and improvements. A survey was conducted to obtain doctors' consent for the use of their information. Key features included online appointment booking, automated reminders, billing management, and secure data storage. The website was tested in a simulated clinic environment to evaluate its functionality and usability. The results showed that the system significantly improved clinic operations by reducing waiting times, minimizing appointment cancellations, and enhancing data security. Patients reported a smoother experience, while dentists found the system effective in managing their schedules and accessing patient records. The project successfully achieved its objectives, providing a robust solution to the challenges faced by dental clinics.

ملخص الدراسة

تواجه عيادات الأسنان تحديات كبيرة في إدارة المواعيد وسجلات المرضى والاتصال، مما يؤدي إلى مشكلات مثل أوقات الانتظار الطويلة، وإلغاء المواعيد، ومخاوف تتعلق بأمان البيانات. هذه التحديات لا تؤثر فقط على تجربة المريض، ولكن أيضًا تعيق الكفاءة التشغيلية للعيادات. لحل هذه المشكلات، يهدف هذا المشروع إلى تطوير نظام حديث لإدارة عيادات الأسنان يبسط عمليات العيادات ويعزز التواصل بين المرضى وأطباء الأسنان. تم تصميم النظام كمنصة ويب سهلة الاستخدام لحجز المواعيد، وتحسين إدارة البيانات، وضمان الوصول الآمن إلى سجلات المرضى. من خلال تحقيق هذه الأهداف، يسعى المشروع إلى تقليل الأعباء الإدارية، وتقليل الأخطاء، وتحسين رضا المرضى بشكل عام. اعتمدت المنهجية على استخدام تقنيات ويب حديثة مثل HTML وCSS لتصميم موقع ويب سريع الاستجابة وسهل الاستخدام وبالإضافة الي JavaScript و تخزين data على cloud في data bases firebase. تم تطوير النظام باستخدام نهج تكراري، مما سمح بالحصول على تعليقات مستمرة وإجراء تحسينات وتم عمل استبيان لموافقة الدكاترة على اخذ المعلومات الخاصة بهم. تضمنت الميزات الرئيسية حجز المواعيد عبر الإنترنت، والتذكيرات التلقائية، وإدارة الفواتير، وتخزين البيانات بشكل آمن. تم اختبار الموقع في بيئة عيادة محاكاة لتقييم وظائفه وسهولة استخدامه. أظهرت النتائج أن النظام حسّن بشكل كبير عمليات العيادة من خلال تقليل أوقات الانتظار، وتقليل إلغاء المواعيد، وتعزيز أمان البيانات. أبلغ المرضى عن تجربة أكثر سلاسة، بينما وجد أطباء الأسنان النظام فعالاً في إدارة جداولهم والوصول إلى سجلات المرضى. نجح المشروع في تحقيق أهدافه، حيث قدم حلاً قويًا للتحديات التي تواجهها عيادات.

Dedication

The final steps in the new life must be taken again to the years that call at the university with the respected professors who have given so much, cooperating great efforts in building the generation of tomorrow to revive the nation again... Before that, expressions of thanks, gratitude, and love will be presented for carrying the greatest message in life... "Be a scholar. If it does not start, be a learner. If it does not start, love scholars. If it does not start, do not hate them." To those who paved the way for acquiring knowledge... To all the respected professors... Thanks are also due to everyone who helped in overcoming this facilitating factor and the helping hand and provided the necessary information to complete this research. Praise be to Allah first and last for His success and good assistance, for what He has bestowed upon us to complete this work. And I ask Allah to benefit Islam and Muslims with it.

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First, all praise is due to Allah, the Almighty, and prayers and peace be upon the most honorable of prophets and messengers, our Prophet Muhammad, may Allah bless him and grant him peace, and upon his family and companions. All praise is due to Allah, the Almighty, for granting the opportunity and facilitating the arrival of the team of distinguished female students in the field of information technology, which was obtained during the work on the project, asking Allah for success in what has been accomplished. Second, Dr. Moataz Saad and the supervisors, Engineer Nada Usama Fathy and Ahmed Nasser, a lecturer at the Faculty of Information Technology at the Islamic University, are thanked for their continuous support, as they played a major role in what has been achieved, and they are thanked for their patience and assistance in solving the problems that were encountered while working on this research. Third, all thanks are due to the families and friends who are looking forward to their achievements, as they played a role in supporting us despite the many circumstances we have gone through, and without them this success would not have been possible. After this stage, all thanks must be given to those who helped in a new experience directly or indirectly. They are thanked profusely. Thus, it is believed at present that Hard work will get you to the desired place, and this work will not stop but will continue to move forward to serve friends, society, and the people.

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List of Abbreviations

AI	Artificial Intelligence
CDN	content delivery network
CIMO	Context Intervention Mechanism Outcome
CRUD	Create-Read-Update-Delete
DAMS	Dental Appointment Management System
DCMS	Dental Clinic Management System
HER	Electronic Health Records
HIMS	Healthcare Information Management System
HIPAA	Health Insurance Portability and Accountability Act
MIS	Management Information Systems
PMAQAB	Program Melhoria Accesso Qualidade Atenção Básica
QMI	Quality Management Initiatives
SDLC	Software Development Life Cycle
UK	United Kingdom

Chapter 1
Introduction

Chapter 1
Introduction

Regular attendance at the dentist is important; yet for many people, there are barriers. According to NICE Clinical Guidelines recall rates for dental appointments should occur between 3- and 24-month intervals. In comparison, the 2009 Adult Dental Health Survey reported that only 58% of UK adults had attempted to make a dental appointment in the past 3 years. One barrier to dental attendance that has been extensively studied is dental anxiety, which has been estimated to affect approximately 16% of the UK population. Individuals with dental anxiety often avoid attending dental appointments and have worse oral health as a product of this avoidance. There can be a tendency for some dentists to assume that dental anxiety is related to fear of pain although often this may not be the case. The cognitive vulnerability model proposes that fear arises because of how an individual perceives a situation and that this in turn is affected by multiple factors. In terms of dental anxiety, perceptions of dental treatment as being uncontrollable, unpredictable, dangerous and disgusting have been shown to correlate strongly with dental anxiety. Likewise in a different study, the perception of being treated by the dentist in a cold or uncaring manner or frightened during treatment, as well as experiencing pain during dental treatment, was associated with development of dental anxiety. Armfield suggests that it is important to carefully assess dental anxiety to be able to understand and address its cause in any given individual. However, although dentists are aware of their patients' fear, there can be a tendency for them to avoid mentioning it if patients are co-operative. In fact, there is increasing evidence that dentists themselves can be one element of a complex web of causations that can present barriers to dental attendance. There may also be barriers or concerns that do not directly relate to dental anxiety, such as cost or accessibility. Much research into dental anxiety to date has been guided by the 'expert' view of dental care providers. There is limited published research that is guided by a patient perspective of factors that may be of concern to them. In a qualitative study, 30 dentally phobic patients reported that embarrassment and powerlessness were the key components in their fear. Physiological, cognitive, behavioral, health and social factors have also been identified by patients as important in relation to dental fear. Research on barriers to dental attendance to date has tended to focus on specific groups of patients such as those who are anxious, do not attend regular appointments or face specific barriers. There appears to be a gap in the research about concerns regarding dental appointments that are important to the wider public, whether they experience dental anxiety. There is also little research with a focus on the general population about patients' own perspective on what they find helpful or would want from their dentist. This study aimed to fill the gap by identifying concerns and potential solutions from the perspective of the general population. [1]

1.1 Problem Statement

Dental clinics face significant challenges in efficiently managing and organizing operations, including Patient complaints about waiting for long periods, or the patient suddenly canceling his appointments, or going to the clinic if the doctor is absent, and the difficulty of communicating between the patient and the dentist to receive medical advice or talk about a specific type of treatment. On the other hand, it poses a threat to patients' privacy, such as leaking appointment data and patient schedules, illegal use of personal data, and loss of trust between the doctor and patients. The root cause behind this problem Weakness of the administrative and organizational system, Patient behaviors (Being late or missing), No Automated Reminders or Notifications, and Lack of appropriate technology.

1.2 Objectives

1.2.1 Main Objective

Develop a modern and efficient dental clinic management system that works on reserving medications, monitoring data, and providing dental care smoothly and only halfway between time management, accurate appointment scheduling, and monitoring the patient experience in general.

1.2.2 Sub Objectives

- Design user-friendly interfaces for users.
- Implement search and retrieval of file archives.
- Employ modern seamless technology in the field of specialization and easy communication.
- Scheduling appointments also from conflicting reservations.
- Providing financial management tools including tracking bills and finances.
- Finally, increasing awareness of how to always use multiple methods together and organize them.

1.3 Scope and Limitations

1.3.1 Scope:

The project "Modern Dental Clinic Management System" aims to develop an integrated digital system that facilitates patient management, appointment scheduling, and tracking bills and payments, while providing a seamless user experience for doctors and patients. The scope of the project includes the following features: Patient Records Management, Appointment Scheduling, Sending Automatic Reminders, Integrated User Interface, Remote Access, Billing and Payment Management.

1.3.2 Limitations:

Despite the advanced features that the project seeks to provide, it faces some limitations and challenges, which include:

- **Technical limitations:**
  - Lack of support for medical diagnosis: The system focuses on the operational management of the clinic only and does not include artificial intelligence features for analyzing X-rays or diagnosing medical conditions.
  - Device compatibility limitations: The system may be incompatible with some old devices or unsupported operating systems.
- **Security and operational limitations:**
  - Security and privacy challenges: Compliance with data security standards is required to ensure the protection of patient data, which may increase technical complexities.
  - Reliance on Internet connection: Since the system relies on cloud storage, its performance may be affected in the event of an Internet outage or connection problems.
- **Financial and administrative limitations:**
  - Financial limitations: The available budget may affect the number of features that can be implemented in the initial version of the system.
  - Training and adoption requirements: Clinics may need to train their staff to use the new system, which may be a challenge in some cases.

1.4 Importance of the project:

This focus is of great importance to dental clinics that have updated their operational processes. By designing the layout and integrating the basic functions into one platform, the system contributes to reducing operational inefficiencies, clarifying human matters, and helping patients better. The efficient schedule reduces waiting and ensures that patients receive timely care, while online monitoring notes, automatic reminders, and rescheduling options improve patient convenience.

Additionally, reminder systems reduce missed appointments, leading to better health outcomes.
The workflow is designed to eliminate manual causes and resource allocation, saving time and costs, and creating a self-disclosure-free work environment. Thus, the system helps reduce administrative expenses, increase revenue through continuous patient flow, and serve them by providing a seamless experience schedule. Furthermore, the system incorporates various fuel quality standards, such as HIPAA (Health Insurance Portability and Accountability Act.), providing strategic analytical tools for informed diversity, which promotes sustainable and competitive growth in the dental industry.
In addition, the project highlights the potential of technology in healthcare management to improve service delivery

1.5 Technologies Used in the Project:

The system has been developed using modern technologies, including:

- HTML and CSS for designing an attractive and user-friendly interface.
- Databases for securely storing patient records and appointment details.
- Encryption methods to ensure data security and protect patient privacy.

The system has been tested in a simulated environment to validate its efficiency and ability to meet the needs of clinics and patients.

1.6 Project Time Table:

The idea emerged in 2023, but due to the circumstances in Gaza, implementation was postponed. The project aims to raise awareness of the importance of technology in the country and facilitate daily life by reducing time and effort in accessing medical services. The following table presents the working methodology of the project.

Tables 1 Project Time Table

Tasks	Nov/24				Dec/24				Jan/25				Feb/25				Mar/25			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Refine idea																				
Break project into tasks and assign members																				
Find related works and define problem statement																				
design project																				
Implement and test																				
Write decumentation and project report																				
Final presentation and defence																				

Chapter 2

Background

Chapter 2
Background

2.1 **Digital Transformation in Clinic Management:**

Dental clinics face significant challenges in managing daily operations, especially with the continuous increase in patient numbers and the complexity of administrative tasks. Many clinics still rely on manual or traditional systems for appointment scheduling and patient records, leading to issues such as:

- Long waiting times due to inefficient manual booking systems.
- Appointment cancellations resulting from the absence of effective patient reminders.
- Loss of records due to reliance on paper-based systems.
- Poor communication between patients and doctors, impacting the quality of care.

These challenges not only affect the patient's experience but also reduce clinical efficiency and increase the administrative burden on staff. The need for integrated digital solutions to enhance clinic management has become essential.

2.1.1 Importance of Digital Transformation in Clinic Management:

With rapid technological advancements, digital solutions have become crucial for improving clinic management. These solutions aim to:

- Streamline administrative processes such as appointment booking and medical record management.
- Enhance patient experience through user-friendly interfaces and faster services.
- Ensure data security by utilizing encrypted and secure storage systems.
- Increase operational efficiency by automating routine tasks and minimizing manual errors.

By leveraging technologies such as web and mobile applications, dental clinics can transition to more efficient and effective management systems.

2.1.2 Objectives of the Modern Dental Clinic Management System:

The modern dental clinic management system aims to develop an integrated platform that allows patients and doctors to manage daily operations more efficiently. The project objectives include:

- Simplifying appointment scheduling through an easy-to-use interface.
- Securely and efficiently managing patient records with on-demand access.
- Enhancing communication between patients and doctors by providing direct communication channels.
- Automating billing and payments to reduce manual errors.
- Sending automated reminders to minimize appointment cancellations and improve patient adherence.

2.1.3 Impact on Healthcare Quality:

The modern dental clinic management system is expected to positively impact healthcare quality by:

- Improving diagnostic accuracy through accessible and accurate medical records.
- Increasing patient satisfaction by reducing waiting times and enhancing experience.
- Enhancing communication within the medical team through efficient communication channels.

2.1.4 Cost and Return on Investment:

Although system development requires an initial financial investment, the long-term benefits include:

- Reducing operational costs by automating administrative tasks.
- Increasing revenue through optimized appointment scheduling and reduced cancellations.
- Enhancing the clinic's reputation by delivering high-quality services.

The modern dental clinic management system represents a significant step toward improving clinic operations through technology adoption. By embracing digital solutions, dental clinics can enhance operational efficiency, reduce costs, and provide better care for patients.

2.2 Software Development Life Cycle (SDLC):

The Software Development Life Cycle (SDLC) is a systematic process used to develop high-quality software at the lowest possible cost and in the shortest time.[2] [3]

2.2.1 Stages of SDLC:

1. Planning :Defining requirements, objectives, budget, and timeline.
2. Defining Objectives: Identifying the main goals of the project and what needs to be achieved.
3. Feasibility Assessment: Evaluating the technical and financial feasibility of the project.
4. Resource Allocation: Identifying the human and technical resources required.
5. Setting a Timeline: Establishing a realistic timeline for project completion.
6. Analysis :Gathering and analyzing requirements to understand user needs.
7. Gathering Requirements: Collecting requirements from all stakeholders.
8. Analyzing Requirements: Analyzing requirements to understand the actual needs.
9. Documenting Requirements: Documenting requirements clearly and accurately.
10. Design :Designing the system architecture, interfaces, and databases.
11. System Design: Designing the system architecture and its various modules.
12. Interface Design: Designing user interfaces to ensure ease of use.
13. Database Design: Designing databases to store data efficiently.
14. Implementation :Writing code and building the system.
15. Writing Code: Writing code according to design specifications.
16. Integration: Integrating different modules with each other.
17. Code Review: Reviewing the code to ensure its quality.
18. Testing :Testing the system to ensure it is free of errors
19. Unit Testing: Testing each unit individually.
20. Integration Testing: Testing the integration of different units.
21. System Testing: Testing the system as a whole to ensure it works as expected.
22. Acceptance Testing: Testing the system with end-users to ensure it meets their needs.
23. Deployment :Deploying the system in the live environment.
24. System Installation: Installing the system on servers.
25. User Training: Training users on how to use the system.
26. Data Migration: Migrating data from the old system to the new one.
27. Maintenance: Maintaining and updating the system as needed.
28. Bug Fixing: Correcting any errors that appear after deployment.
29. Updates: Performing necessary updates to improve the system.
30. Technical Support: Providing technical support to users.

2.2.2 Types of SDLC Models:

- Waterfall Model: Sequential and linear, suitable for projects with fixed requirements.
- Iterative Model: The system is developed through repeated cycles, with improvements in each cycle.
- Spiral Model: Combines the Iterative and Waterfall models, focusing on risk management.
- Agile Model: Focuses on iterative and incremental development with continuous customer involvement.[2] [3]

2.2.3 Waterfall Model:

It is one of the oldest SDLC models, following a sequential, linear approach where each phase is completed before moving to the next. The Waterfall Model has six phases which are:

1. **Requirements:** The first phase involves gathering requirements from stakeholders and analyzing them to understand the scope and objectives of the project.
2. **Design:** Once the requirements are understood, the design phase begins. This involves creating a detailed design document that outlines the software architecture, user interface, and system components.
3. **Development:** The Development phase include implementation involves coding the software based on the design specifications. This phase also includes unit testing to ensure that each component of the software is working as expected.
4. **Testing:** In the testing phase, the software is tested as a whole to ensure that it meets the requirements and is free from defects.
5. **Deployment:** Once the software has been tested and approved, it is deployed to the production environment.
6. **Maintenance:** The final phase of the Waterfall Model is maintenance, which involves fixing any issues that arise after the software has been deployed and ensuring that it continues to meet the requirements over time.

2.2.3.1 When to Use the Waterfall Model?

Here are some cases where the use of the Waterfall Model is best suited:

- Well-understood Requirements: Before beginning development, there are precise, reliable, and thoroughly documented requirements available.
- Very Little Changes Expected: During development, very little adjustments or expansions to the project's scope are anticipated.
- Small to Medium-Sized Projects: Ideal for more manageable projects with a clear development path and little complexity.
- Predictable: Projects that are predictable, low-risk, and able to be addressed early in the development life cycle are those that have known, controllable risks.
- Regulatory Compliance is Critical: Circumstances in which paperwork is of utmost importance and stringent regulatory compliance is required.
- Client Prefers a Linear and Sequential Approach: This situation describes the client's preference for a linear and sequential approach to project development.
- Limited Resources: Projects with limited resources can benefit from a set-up strategy, which enables targeted resource allocation.

2.2.3.2 Advantages of the Waterfall Model:

- Easy to understand and use.
- Suitable for projects with fixed and known requirements.
- Disadvantages of the Waterfall Model:
- Inflexible, difficult to adapt to changes in requirements.
- Errors are only detected during the testing phase, which may increase costs.[2] [3]

2.2.3.3 Comparison with Other Models:

- Comparison with Agile :The Waterfall Model is less flexible than Agile, as it does not allow for major changes after the project starts.
- Comparison with the Iterative Model: The Waterfall Model does not allow an easy return to previous phases, unlike the Iterative Model.[2] [3]

Chapter 3

Related Works

Chapter 3
Related Works

Chew and Hong Tan (2024) emphasize the importance of improved systems for managing patient records and appointments in response to the increasing demand for dental care. Many clinics still rely on paper records, which are not easily accessible. To address this, they propose a Dental Clinic Management System (DCMS) that allows patients to manage appointments, view their dental history, and receive feedback. Dentists can access patient appointments and provide treatment, while administrators can manage appointments, records, and invoices. The DCMS requires users, including dental staff and patients, to register and log in to perform tasks such as creating, editing, and canceling appointments, viewing past treatments, and generating invoices. By digitizing these processes, the system aims to enhance efficiency and the overall quality of oral healthcare in dental clinics. [4].

Assadi An, H. (2024) highlights how the integration of artificial intelligence (AI) with human expertise is transforming oral healthcare by addressing challenges in detecting, diagnosing, and managing oral diseases. AI technologies, such as machine learning and deep learning, process vast clinical data, including radiographs and patient histories, to identify disease patterns quickly and accurately. This is particularly effective in diagnosing conditions like dental caries, periodontal disease, and oral cancers at earlier stages, improving patient outcomes through early intervention. While AI excels in data analysis, human expertise remains essential for contextualizing findings and making clinical decisions. The collaboration between AI and clinicians enhances treatment planning, offering personalized, evidence-based strategies and enabling remote monitoring and real-time patient engagement. Predictive analytics provided by AI also help anticipate disease progression and implement preventive measures. This partnership promises to make dental care more efficient, accessible, and cost-effective, with significant implications for global health equity [5].

Daly, K. A., Diaz-Gutierrez, K. A., Beheshti an, A., Heyman, R. E., Smith Sleep, A. M., & Wolff, M. S. (2024).)**.** highlight that Mobile apps have the potential to increase access to effective treatments with greater flexibility and user convenience, and the iterative, user-feedback-driven app design enhances ease of use and engagement. However, the app faces challenges such as the length of time to complete modules and the lack of options for specific types of fears. Research gaps indicate that current CBT apps often lack comprehensive usability testing and strong alignment with evidence-based practices, with few studies focusing on improving user engagement in fear reduction modules [6].

Sihombing, D. J. C. (2024) focuses on enhancing dental practice management through digital systems, specifically e-appointment solutions, and the application of Agile methodology to create flexible, user-oriented systems. The paper highlights the challenges of traditional methods like manual scheduling, which result in inefficiencies and errors. Agile methodology, with its iterative cycles, offers a more responsive approach, fostering collaboration and improving user engagement. While current tools like My Dental Clinic and Timely offer partial solutions, they lack advanced features such as dynamic scheduling and reporting analytics. The study points out that, despite the benefits of digital systems, such as increased operational efficiency and data security, challenges remain, including high implementation costs, poor scalability, and the absence of advanced analytics. The research emphasizes the need for frameworks to assess system adaptability and maintain long-term user engagement. By focusing on flexibility, reducing waiting times, and improving resource management, the study aims to enhance patient satisfaction. It suggests that Agile practices like iterative planning and prototyping can improve system effectiveness, with the need for further development of analytical tools to address future challenges [7].

Syafitri and Sancoko (2023) focus on designing and implementing a mobile-based dental clinic application for both doctors and patients. The application provides information and reservation services, developed using Dart, PHP, Flutter, and Laravel frameworks. The study addresses the issue of traditional, manual patient data recording in dental clinics, which often leads to inefficiencies. By digitalizing services, the application allows patients to make reservations and access dental clinic information anytime, anywhere. It also facilitates the creation of digital reports and the management of dental examination plans. The proposed mobile application aims to optimize reservation control, improving both user experience and clinic management through easy-to-use, one-click booking. The study emphasizes the importance of mobile applications in enhancing the digitalization of dental health services. [8] .

Zawawi and Ibrahim (2023) review the development of a management system for Telangana Dental Clinic, designed to address inefficiencies caused by manual record-keeping in rural clinics. The study highlights challenges such as misplaced records, data insecurity, and the use of tools like Excel and WhatsApp for scheduling and communication. The proposed system integrates Management Information Systems (MIS) and mobile technologies, offering modules for appointment scheduling, secure medical record storage, staff coordination, employee scheduling, and equipment management. Compared to systems like I Dentist and My Dental Clinic, Telangana's system is tailored to meet the specific needs of rural clinics. The system improves record management, scheduling, and user satisfaction, though it lacks online payment options and automation for unattended appointment cancellations. Gaps identified in existing solutions include the absence of real-time equipment tracking and comprehensive scheduling tools. The development follows a structured Software Development Life Cycle (SDLC), with successful functional tests. The study highlights the potential of customized digital solutions in overcoming administrative challenges in rural healthcare, suggesting future improvements like integrated payment systems and advanced automation [9].

Kim, S., & Walker, D. (2023) highlighted that the paper evaluated the role of digital tools, including appointment systems, mobile apps, and EHRs (Electronic Health Records.), in improving overall clinic productivity and patient satisfaction. Key Findings Digital tools collectively led to a 50% reduction in patient waiting times and improved clinic workflows significantly. The researchers combined data from surveys across 20 clinics with performance data from implemented digital solutions over a year. [10].

Wang, H., & Patel, R. (2022). highlights that this research investigated the application of artificial intelligence (AI) in dental appointment scheduling, focusing on predictive analytics for no-show rates and dynamic scheduling. The Key Findings AI-based systems predicted appointment cancellations with 85% accuracy, enabling clinics to reallocate resources effectively. Clinics using AI experienced a 20% increase in revenue due to better slot utilization. The study employed machine learning models on historical scheduling data from three dental clinics over two years. Interviews with clinic staff supplemented quantitative findings. [11].

Saeeda, M. H., & Ahmed, B. T. (2021) address the challenges hospitals and clinics face in managing patient documents and tasks without management software. The paper proposes a web-based dental clinic application developed using ASP.NET, JavaScript, Bootstrap, and Microsoft Azure Cloud to educate and manage patients. Evaluated in a clinic, the application met its objectives and can be extended to other healthcare facilities. It includes two main components: one for managing patient data and another for patient education through multimedia documents. The system allows admins to add patient information, dentists to create treatment plans, and patients to access their visit details and educational content. The application ensures security through various methods, including username/password authentication and Captcha. Feedback from 25 patients showed that 75.2% were satisfied with its features, particularly the ease of access and appointment time savings, while a small percentage expressed concerns about the app's design and information usefulness. The system effectively enhances patient-dentist interaction, manages data, and provides educational content, though it could benefit from design improvements. Future work includes refining the design, extending its use, and adding advanced reporting features [12].

Crisan, E. L., Covaliu, B. F., & Chis, D. M. (2021) focus on quality management initiatives (QMIs) in dental clinics, highlighting their role in improving care delivery and service quality. Using the Context–Intervention–Mechanism–Outcome (CIMO) framework, the paper evaluates the impact of QMIs on internal processes, patient satisfaction, service quality, and clinic efficiency. Analyzing 72 studies, it shows the application of frameworks like Six Sigma, Total Quality Management, and Lean Six Sigma in optimizing healthcare operations. Key challenges include variability in QMI adoption, inconsistent outcomes, and a lack of standardized metrics for quality management. Common interventions, such as satisfaction surveys and process digitization, have shown positive effects on patient satisfaction and service delivery. However, gaps remain, such as the absence of uniform definitions for quality in oral healthcare and limited integration of business outcomes with service improvements. The study advocates for scalable methodologies that integrate business metrics into quality strategies. It concludes that while QMIs have significant potential to enhance patient experience and clinic operations, future research should focus on developing standardized, scalable approaches that link service quality with business performance [13].

Melo, E. A., Probst, L. F., Guerra, L. M., Tagliaferro, E. P. D. S., De-Carli, A. D., & Pereira, A. C. (2021). This paper focuses on the factors influencing dental appointment scheduling in the Brazilian primary health care system, highlighting individual and contextual determinants based on a large cross-sectional study using PMAQAB (Program a de Melhoria do Accesso e da Qualidade da Atenção Básica): It is a national program that aims to assess the quality of health care services in Brazil. data. Key findings include the influence of demographic factors such as age and gender, as well as organizational variables such as the structure of oral health teams .Integrated oral health policies, such as the Brassil Sorry dente program, are emerging as a transformative factor in improving access to services and reducing health gaps [14].

Doe, J., & Smith, A. (2021). highlight that This study examined various digital dental management systems and their impact on improving clinical efficiency. It highlighted the integration of electronic health records (EHR) and automation of administrative tasks as the key advancements. The Key Findings Implementation of a well-structured dental management system led to a 35% improvement in appointment scheduling and reduced administrative errors by 40%. It also increased patient satisfaction due to seamless communication channels. The authors conducted a comparative analysis of five popular dental clinic software systems, utilizing user feedback surveys and performance metrics as the primary data collection tools [15].

Mariwan Hama Saeed.(.2021).This study focuses on the development of a web-based application for dental patient education and management. The system integrates patient record management with educational resources to improve patient awareness and streamline clinical operations. The application is designed using JavaScript, Bootstrap, and Microsoft Azure. It allows dentists to record medical histories, document treatments, and notify patients of appointments. The educational component includes multimedia content to guide patients through dental procedures. Strengths: Enhances patient engagement and clinic efficiency. Limitations: The design lacks aesthetic appeal, and future improvements should focus on better usability and advanced reporting features. The system successfully merges education and management, improving patient experience and clinical workflow. Future updates should enhance design and expand functionalities to serve broader healthcare needs [16].

Tamgadge, S., Nayak, A., Tamgadge, A., Pai, V., & Saini, S. (2021) focus on Tamgadge et al. (2021) focus on developing advanced online clinic management systems to address the inefficiencies of traditional manual operations. Their approach automates patient registration, appointment scheduling, medical record management, and billing, while integrating notifications and enhancing data security. While existing systems like the Dental Appointment Management System (DAMs) cover basic functions, they lack advanced features such as dynamic scheduling, seamless interfaces, and comprehensive integration. Challenges with manual systems include errors, misplaced records, long waiting times, and inadequate security. The proposed solutions, such as GSM-based notifications and automated workflows, aim to improve efficiency and patient experience. However, challenges like scalability for multi-location clinics, lack of real-time analytics, and user interface issues remain. The study suggests customizable and scalable systems, recommending the iterative waterfall model for robust design, and emphasizes the need for future enhancements in analytics, real-time reporting, and interfaces to meet evolving healthcare needs [17].

N. e. a. Kunanets‹(2020).the development of an information system for "smart" dental clinics, focusing on optimizing business processes, patient care, and management efficiency through technology. Key features include electronic medical records, appointment scheduling, insurance settlements, and reporting. The system aims to streamline clinic operations, enhance service quality, and address challenges such as managing large information flows and increasing competition. It highlights the importance of automation and digital transformation in modern dentistry to improve both patient outcomes and operational efficiency [18].

Brown, T., & Lee, K. (2020). highlight that this work explored mobile healthcare applications, focusing on their functionality in tracking patient health, facilitating remote consultations, and managing clinic appointments. The Key Findings Mobile apps improved accessibility to healthcare services, particularly for patients in remote areas. Dental clinics using mobile apps for patient engagement observed a 25% increase in appointment adherence. A literature review of 50 mobile healthcare apps, followed by case studies in 10 clinics implementing app-based systems, provided a robust data set for analysis. [19] .

Garcia, L., & Thompson, P. (2019) highlight that this study reviewed integrated patient management systems focusing on combining EHR, treatment planning, and billing. Findings Clinics with integrated systems achieved higher patient retention and reduced billing discrepancies by 50%. The centralized database improved care continuity. A mixed-method approach was adopted, using quantitative data from clinic operations and qualitative interviews with dental professionals. patient management, integrated systems, billing automation, dental healthcare [20].

Brown, J., & Lin, H. (2019) highlight that this study focused on mobile apps designed for dental care, evaluating their role in scheduling, reminders, and remote consultations. Key Findings Patients using mobile apps demonstrated higher satisfaction levels, citing convenience and transparency. Clinics observed a 20% drop in missed appointments. Analysis of app usage patterns and patient feedback over a 12-month period across five dental practices. mobile healthcare apps, patient interaction, remote consultations, dental technology [21].

Sidek and Jorge (2017) discuss how Electronic Health Records (EHR) have improved healthcare by enhancing access to patient histories, yet their implementation in dental clinics remains underexplored. Their study focused on identifying critical success factors for EHR adoption in Brunei's national EHR system, Bru-HIMS, using Grounded Theory. The research found six key success factors: system usability, emergent behavior, requirements analysis, training, change management, and project organization. A significant challenge identified was the disconnect between clinician needs and the system's capabilities, particularly regarding workflow disruptions due to limited system modularity. The authors recommend fostering greater stakeholder collaboration and commitment to align system goals, ensuring smoother EHR integration into dental clinics for successful implementation [22].

Dhanore, Shaik, and Ramtekkar (2016) address the challenges faced by traditional clinic management systems, such as issues with scheduling, patient records, and treatment management. They propose a digital solution that centralizes patient data, streamlines appointments, and automates billing, which improves access to real-time information, enhances patient care, reduces administrative burdens, and boosts efficiency. The system is developed using an Iterative and Incremental Development approach, allowing for continuous feedback and adaptability. Built with technologies like Microsoft Access, ASP.NET, SQL Server, and C#, the system is scalable and can be improved over time to meet the needs of larger clinics, with future enhancements aimed at expanding its functionality despite current financial and time constraints [23].

Alabduljabbar, and El-Masri. (2013) highlights that Emphasize that Maintaining a long-term relationship between dental laboratories and their clients (dental clinics and dentists) encourages an active communication process between both sides [24].

- Several existing systems have been analyzed, focusing on improving clinic management. Systems such as **My Dental Clinic** and **Timely** have offered partial solutions for appointment scheduling and medical records management. However, these systems lack advanced features such as dynamic scheduling and integrated billing management. The modern dental clinic management system aims to bridge this gap by offering a comprehensive and integrated solution.

Chapter 4

Methodology

Chapter 4
Methodology

Technology has had a big impact on the economy during the last ten years and will continue to influence how businesses operate in the future. Mobile devices are being used for an increasing range of activities due to the quick development of websites and mobile applications. To stay competitive in the growing digital market, many businesses are giving top priority to creating mobile-friendly websites. The website creation industry has seen great growth and competitiveness as a result of this change .A suitable software development methodology must be chosen in order to guarantee an organized and effective development process. The waterfall model of the Software Development Life Cycle (SDLC) has been used for this project because it offers a methodical way to create websites. The five phases of the project are:

- **Requirement Analysis**: The first phase involves gathering requirements from stakeholders and analyzing them to understand the scope and objectives of the project.
- **Design**: Creating an organized system design to the given specifications .
- **Implementation**: involves coding the software based on the design specifications .
- **Testing**: In the testing phase, the system is tested and tuned to ensure it is bug-free and meets the user's needs, ready for deployment.
- **Deployment**: Once the software has been tested and approved, it is deployed to the production environment.

The model is shown in Figure 1 below:

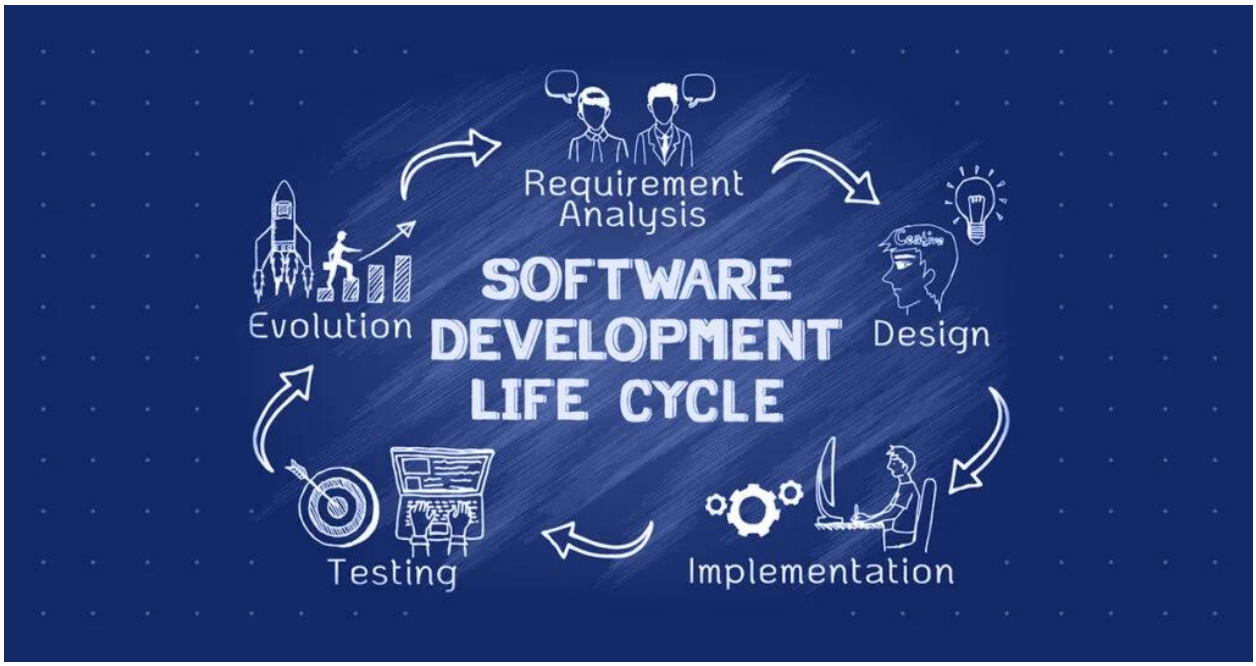


Figure 1 Methodology

Chapter 5

Requirements Analysis

Phase 1
Requirement Analysis

Managing dental clinic operations efficiently has always been a challenge for healthcare providers. Doctors often face difficulties in scheduling appointments, communicating effectively with patients, conducting follow-up evaluations, and maintaining accurate medical records. Therefore, the primary objectives of this study are to reduce waiting times and enhance patient-physician communication through an innovative digital solution. The proposed solution is a comprehensive Dental Clinic Management System that leverages modern technology to streamline clinic operations. This system aims to:

- Facilitate seamless patient information access and communication for dentists.
- Utilize Electronic Health Records (EHR) to simplify administrative tasks, enhance data security, and promote better communication among dental professionals involved in patient care.

5.1 Gathering Requirements:

To develop an effective system, it is essential to gather requirements from all stakeholders involved. The stakeholders identified for this project include:

1. **Identify Stakeholders**

a) Clinic owners: Practice owners and managers who aim to enhance clinic management and operational efficiency.
b) Dentists: Primary users responsible for managing appointments, patient records, and follow-up evaluations.
c) Patients: End users who utilize the application to book appointments and access healthcare services.
d) Technical team: Developers and support staff who build, maintain, and update the application.

2. **Functional Requirements**

a) Patient management:
- Registration of patient data .
- Keeping medical records .

b) Billing and payments:
- Sending notifications to patients for outstanding bills.

c) Appointment booking:
- View available appointments and choose the right one.
- Receive booking confirmations via push notifications.

d) Access medical records:
- View treatment history.
- Download medical reports.

e) Reminders:
- Send notifications to patients to confirm or modify appointments.
- Reminders for upcoming appointments.

3. Non-Functional Requirements:

a) Performance:
- The application must be responsive.
- Support a large number of concurrent users.

b) Security:
- Encrypt personal and medical data.
- Protect accounts with strong passwords.

c) Ease of use:
- Simple and easy-to-understand user interface.

d) Compatibility:
- Works across all modern web browsers.
- Optimized for both desktop and mobile devices.
- Compatible with low-bandwidth and resource-constrained environments.

e) Availability:
- The website is available around the clock.
- Technical support when issues arise.

f) Maintenance:
- Periodic updates to optimize performance and fix bugs.

Chapter 6

Design

Phase 2:
Design

The design process starts once the analytical phase is finished. In this step, concepts and specifications are turned into a website design that is both aesthetically pleasing and useful for dental practice. The website's aesthetics, usability, and capacity to accomplish goals are all determined by the design phase .The design process concentrates on developing visually appealing and intuitive user interfaces, rationally arranging content, and putting in place necessary features like online appointment scheduling, contact forms, and an image gallery .The main objective is to create a website that meets patients' demands and functions as an effective means of communication. The clinic's dedication to providing top-notch services and treatment will be reflected on the website.

6.1 Features of the System:

The features that are included in this system are:

- Develop a website using HTML and CSS to facilitate dental appointment booking and optimize the user experience.
- Enabling patients to log in online to easily book their appointments according to their medical condition.
- Design a clear and intuitive user interface that displays the nature of dental clinics and their services as soon as the site is opened.
- Allow patients to browse the list of doctors and choose the right doctor based on reviews and experience.
- Provide detailed information about doctors with the ability to book directly through the website.
- Improve access to electronic health records to enable doctors to make informed treatment decisions.
- Facilitate communication between patients and doctors through virtual consultations or direct messaging.

The following Program illustrates the structure of a modern dental clinic management website. It shows how the user navigates through the different pages of the system, making it easier to understand how it works and interact with each page. The home page contains a group of doctors, and each doctor has a dedicated page for booking appointments. Clicking on a booking button takes to the appointment booking page, which is a single page for patients that links to the doctors' pages. The bookings will then appear on the home page in Manage Your Inventory.

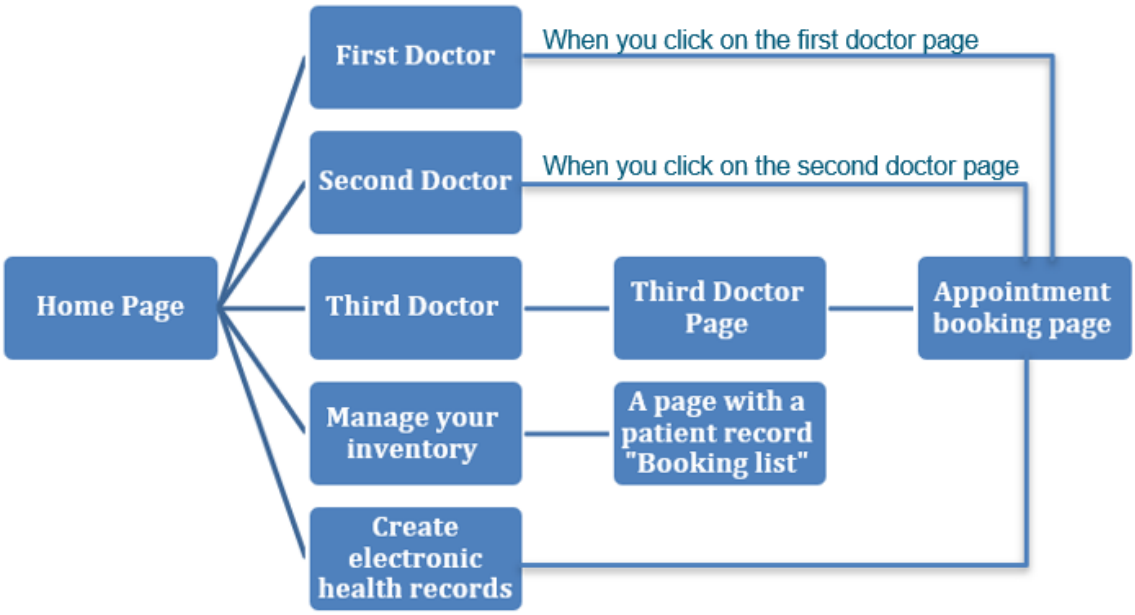


Figure 2 Website Block Diagram

6.2 Website Pages Designs:

The Modern Medical Clinic Management website features an integrated design aimed at providing patient convenience, facilitating the process of scheduling appointments, and identifying specialists. The website contains several pages, including:

- **Home Page:** Provides an overview of the website and its functionalities.
- **Doctor Profiles:** Dedicated pages for individual doctors, including:
  - **First Doctor's Page**
  - **Second Doctor's Page**
  - **Third Doctor's Page**
  - **Fourth Doctor's Page**
  - **Fifth Doctor's Page**
  - **Sixth Doctor's Page**
- **Appointment booking Page:** Allows users to book an appointment online by selecting the appropriate service, date, and time, and entering their data to confirm the reservation.
- **pre-registration booking list page:** the page does a list of reservations appears Only after registering
- **booking list page after registration:** the page shows confirmed bookings after registration.

6.2.1 Home Page Design:

- ✓ The home page features a full-cover background image that fills the entire space, eliminating margins for a seamless visual experience. The primary headline, **"Modern Dental Clinic Management System,"** is styled with a large, sophisticated font in a golden hue to enhance readability and elegance. Content is structured using a grid layout, ensuring equal distribution across columns. as illustrated in Figure 3 below:

Figure 3 "Home Page Design 1"

- ✓ **The home page** also provides an overview of the clinic's services, guiding visitors through the website for further exploration such as:

  - **Services Section (What We Offer):**
    The **Services Section** presents the clinic's offerings in a structured grid layout. Styling elements such as text-align center, margin-top, and margin-left ensure proper alignment and a visually appealing design.

    The interface highlights the core features and services of the dental clinic's website, including:

    - **Inventory Management:** Securely stores patient data when an appointment is scheduled.
    - **Electronic Health Records (EHR) Creation:** Records essential patient information, including name, age, phone number, and preferred appointment date and time.
    - **Automated Reminders:** Sends SMS notifications to patients well in advance of their appointments, reducing the likelihood of missed visits.
    - **Online Appointment Scheduling:** Enables seamless booking through the appointment scheduler, eliminating the need for phone calls to the clinic.

This structured approach enhances accessibility and efficiency for both patients and clinic staff, as illustrated in the figure 4 below:

Figure 4 Features and Services

- ✓ **The home page** also provides **Doctors Section**:
  The **Doctors Section** presents images of physicians alongside their names and links them to individual profile pages. Grid styling elements such as grid-template-columns, margin-top, and margin-left ensure uniform spacing and alignment. The interface highlights the most prominent physicians and provides essential details to assist prospective patients in selecting the most suitable doctor. As illustrated in the figure 5 below:

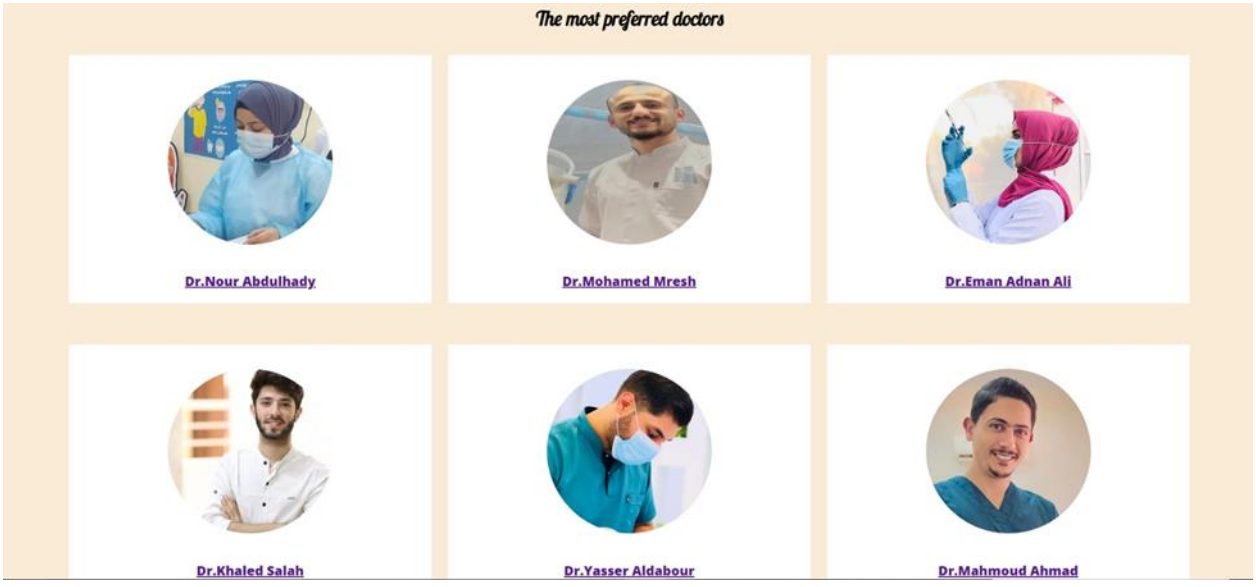


Figure 5 Doctors Section Design

- ✓ **The home page** also provides The **Gallery Section**:

The **Gallery Section** displays a set of photos related to the dental clinic and its services and aims to review the activities and services in a way that enhances the confidence of patients and gives a positive impression of the quality of services provided. The page is formatted using techniques such as margin-top, left, and grid template columns to achieve an orderly and attractive distribution of images. In addition, a **VIEW MORE** button has been added to display more images, as it is designed with a yellow background, with border: none, border-radius, text-align: center, and margin-left, bottom to increase the aesthetic of the display. [25] . As illustrated in the figure 6 below:

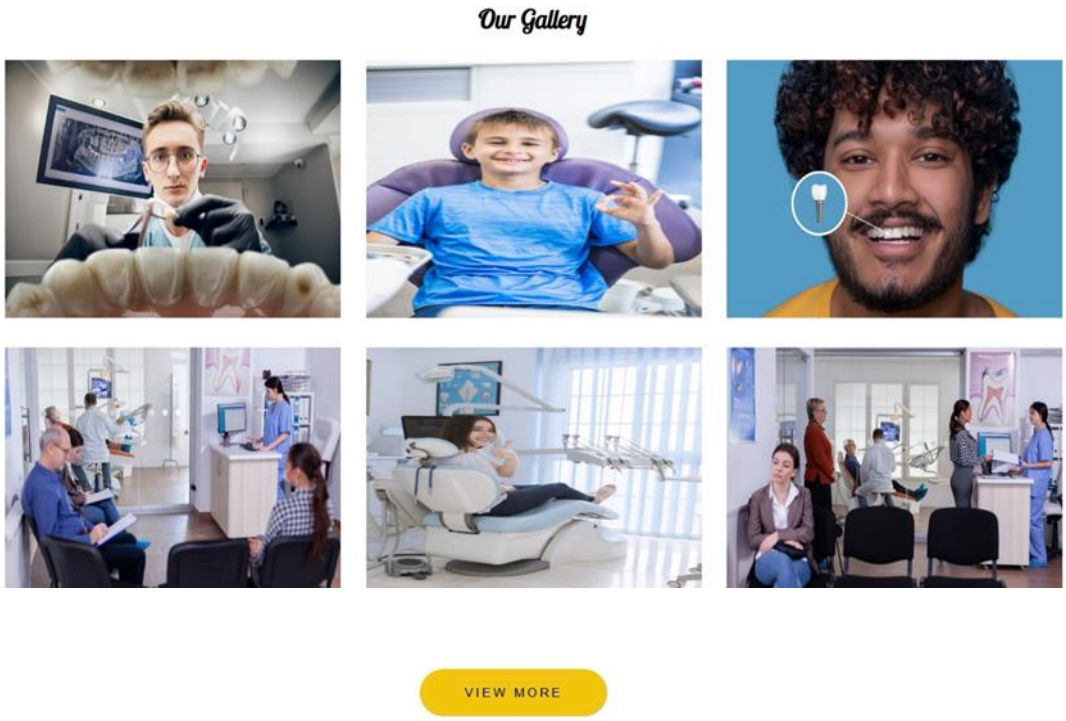


Figure 6 Gallery Section Design

- ✓ **The home page** also allows Visitors to book directly through the platform to simplify the booking process. A "Book Now" button has been added for convenience, featuring the following styling: Background color: White, Border radius: Rounded corners, Margin-left: Applied for spacing. As shown in figure 7 below:

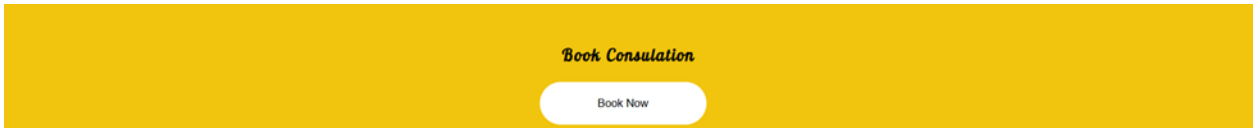


Figure 7 Home page footer

6.2.2 Doctor Profiles Design:

The information page for a dental clinic provides an interface that clearly outlines the doctor and the services they offer; the dental clinic's information page makes it easier to schedule appointments for medical examinations. The interfaces provide details about the clinic's address, phone number, related costs, and services offered. Additionally, the interfaces let you select a good time to book and show the other services that are offered. The doctors were contacted and consented to show their content, and they were quite friendly.

Pages Design and Layout:

- Main container design: using Flexbox to arrange the sections in reverse order from right to left, flex-direction: row-reverse.
- Doctor's card design: The doctor's card is designed with an image and information arranged horizontally. For styling, a background color: white, border-radius, box-shadow, and blue color.
- Services and symptoms: background color: white, blue color, and borders for styling.
- Booking and medical consultation information: a large blue-color H2 heading.
- Available working hours for booking: Styled in blue color, background color: white with border-radius.
- For booking days: a background color: blue with white -color and border-radius.
- Book button: a background color: red with white -color and border-radius.

All will be illustrated in the figures below:

- **First Doctor's Page**

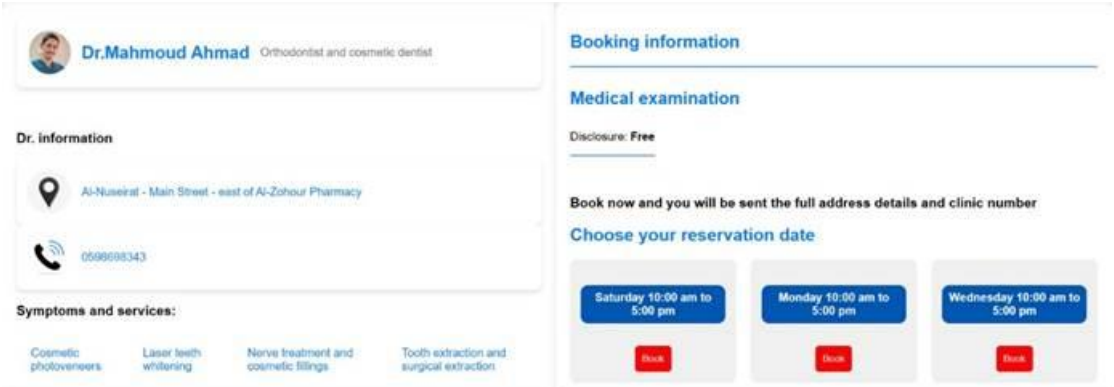


Figure 8 First Doctor's Page

○ Second Doctor's Page

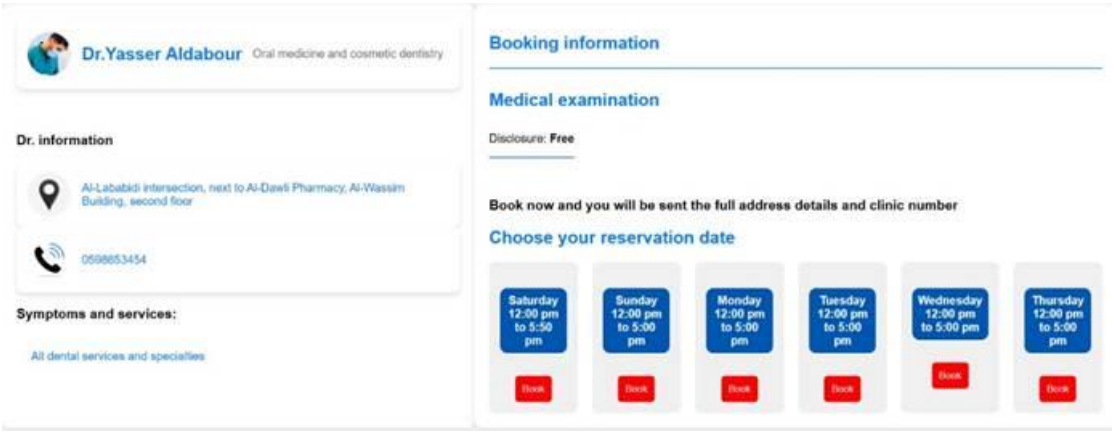


Figure 9 Second Doctor's Page

○ Third Doctor's Page

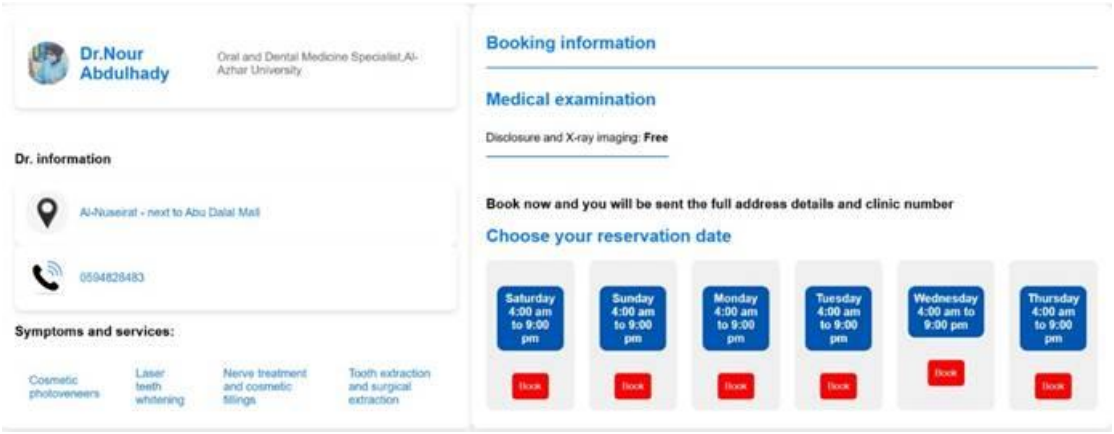


Figure 10 Third Doctor's Page

○ Fourth Doctor's Page

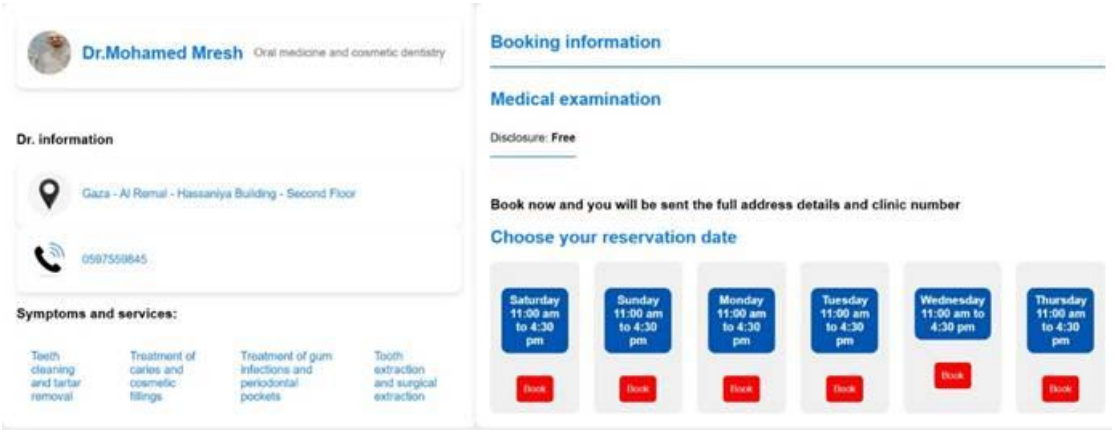


Figure 11 Fourth Doctor's Page

○ Fifth Doctor's Page

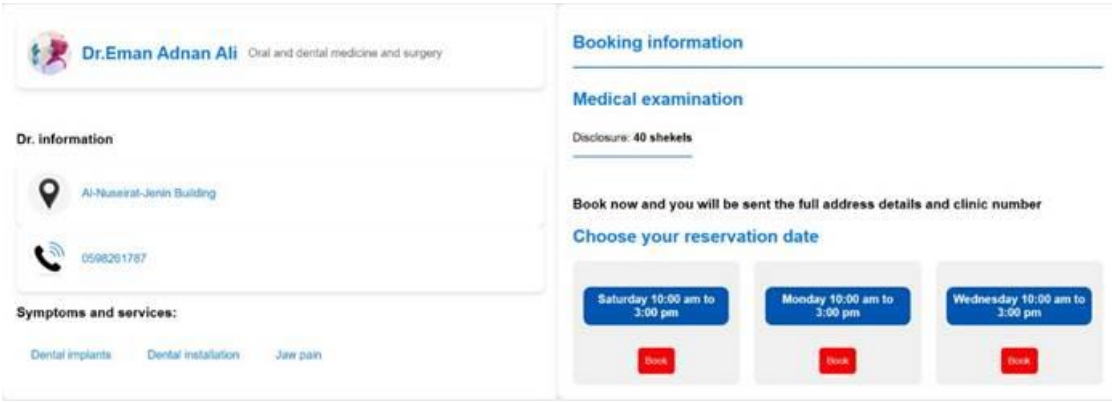


Figure 12 Fifth Doctor's Page

○ Sixth Doctor's Page

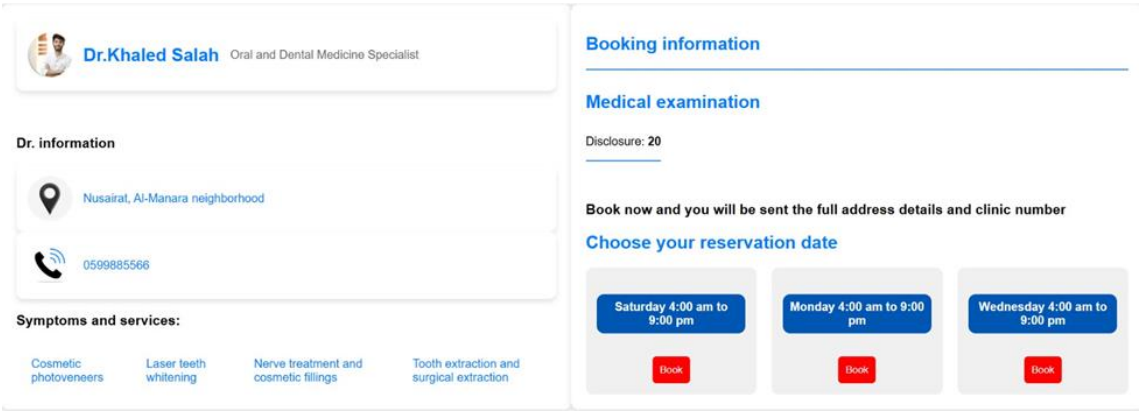


Figure 13 Sixth Doctor's Page

6.2.3 Appointment Booking Page:

Appointment Booking page makes it easier to schedule appointments and enter personal information. Input options on the website include name, age, mobile number, preferred booking day, and appointment time. The reservation is confirmed by the **"Book"** button and canceled by the **"Delete"** button.

Page Design and Layout:

- The overall font for the page was set, and a background color was used. The text direction was set from left to right. In the container, the width was set, and the background-color: was white, with rounded corners and a shadow.

- The main title "Patient Data" was designed in large H1 size and blue color.

- The form was designed with a margin-top and created for entering the patient's data. The form will be submitted to the POST page.

- A text input field was created for the patient's name.

- A numeric input field for the patient's age, ranging from 1 to 90.

- A phone number input field.

- A text input field for the day.

- A time input field.

- The input fields were styled with width, padding, and border-radius.

- Button Design:
  - A cancel booking button was created with a gray background, border radius, and Cursor: pointer to make the mouse cursor turn, indicating it's clickable.

  - A confirm booking button was created with a background-red, white text, border-radius, padding, and Cursor: pointer to make the mouse cursor turn, indicating it's clickable. As shown in figure14 below.

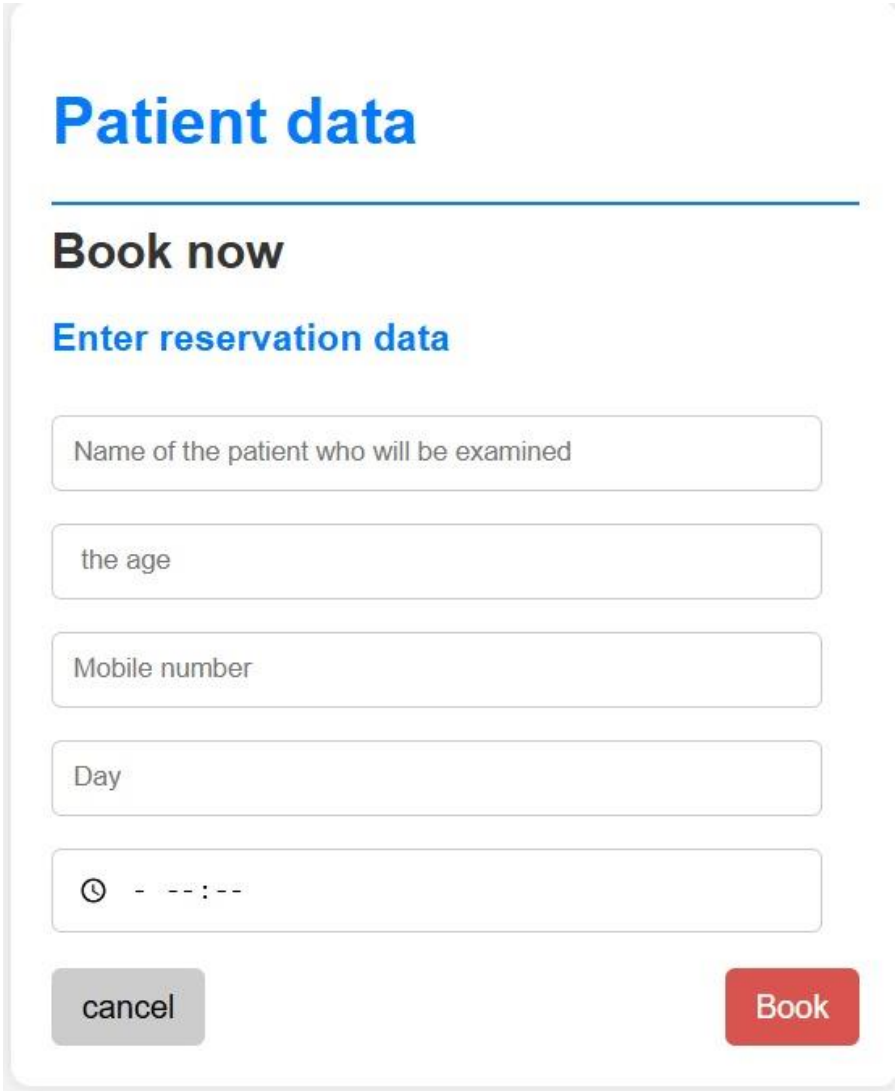


Figure 14 Appointment booking Page

6.2.4 pre-registration booking list page design:

The Bookings List page displays confirmed reservations after completing the registration or booking process. The information is shown only after registration. By selecting the "Back to Booking" option, users can return to the booking page to make changes or create a new reservation. The page retrieves and displays the list of bookings saved in the Firebase Realtime Database. It features a clean and simple design with a white background, padding, margin, border-radius, and centered text alignment for a neat and organized appearance. As shown in figure 15 below:

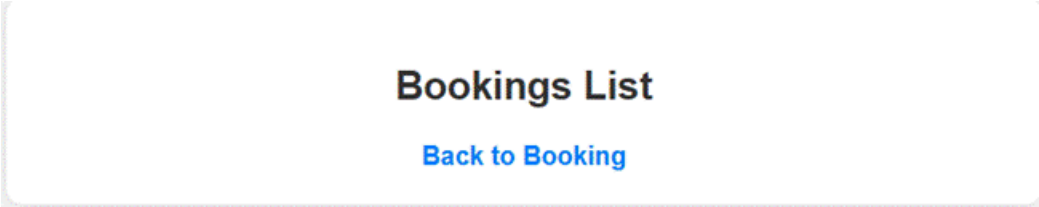


Figure 15 pre-registration booking list page

6.2.5 booking list page after registration

Once the registration process is completed, the booking list page displays confirmed reservations, including patient names, appointment details, and contact numbers, enabling efficient appointment management and follow-up for the clinic. The page retrieves the booking data from the Firebase Realtime Database and presents it in a well-formatted, user-friendly interface with a white background, padding, margin, border-radius, and centered text. A link is provided to navigate back to the previous page. As shown in the figures 16& 17 below:

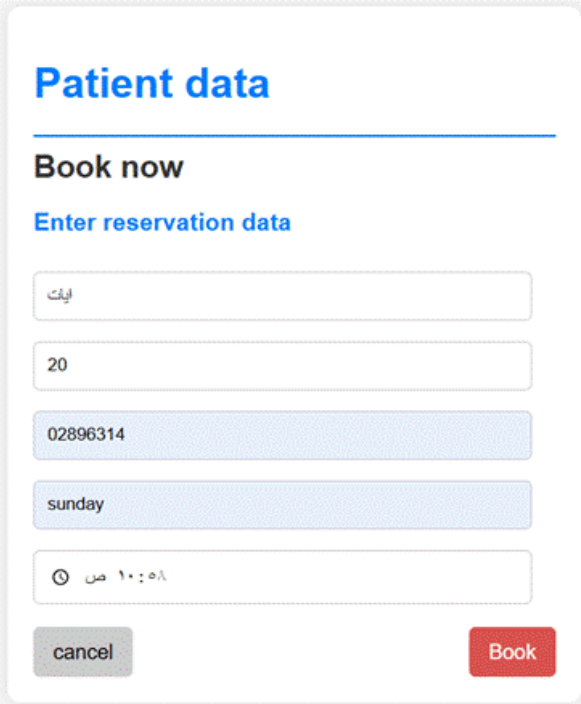


Figure 16 Appointment booking through registration

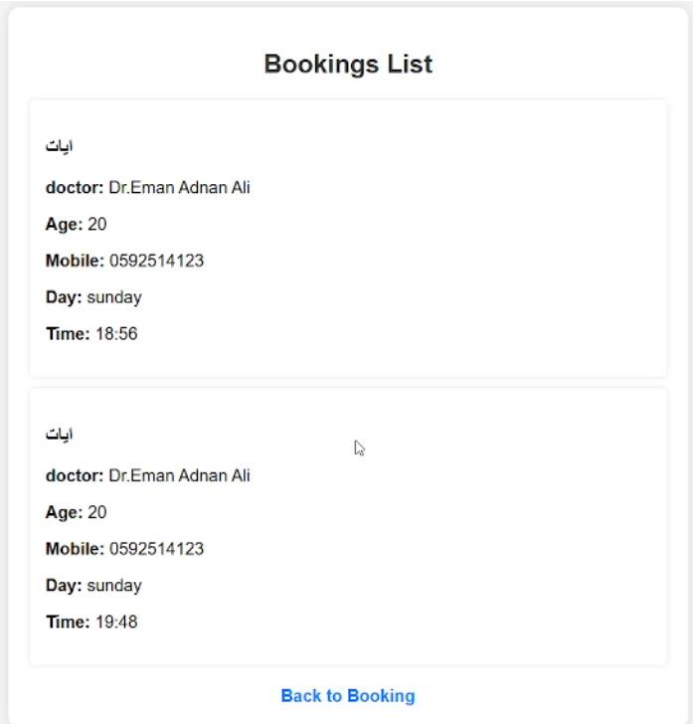


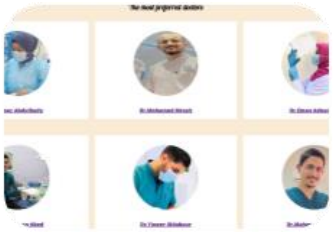
Figure 17 Post-registration appointment booking

Chapter 7
Implementation

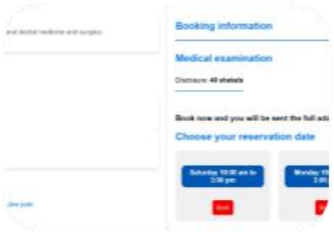
Phase 3:
Implementation

The website was developed using HTML, CSS, and JavaScript featuring the following structured pages:

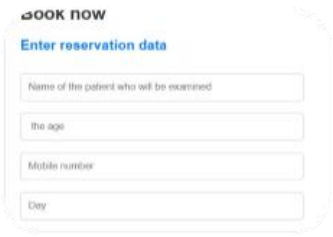
Opening the dental clinic's website



Selecting a doctor



See the information of the doctor the user has selected



Register the user's information to book an appointment

Figure 18 Website pages designs

7.1 Website coding implementation:

7.1.1 Home page coding:

- The main address of the site is the Modern Dental Clinic Management System. The code will be shown in Figure 19 and its design will be shown in figure 20

```
<main>
    <div class="a0">
      <div class="back">
        <div class="b">
          <p class="Modern Dental Clinic Management System"><b>Modern Dental Clinic Management System</b></p>
        </div>
      </div>
```

Figure 19 Home page coding 1

Figure 20 Home Page Design

- View clinic services. Patients can book through Create Electronic Health Records and Display a Manage Your Inventory list of reservations. The code will be shown in figure 21 and its design will be shown in figure 22.

```
<div class="img2">
        <h3>What We DO</h3>
         <div class="grid1">
            <div class="divgrid1">
             <img class="imggrid" src="https://website-assets.dentiflow.com/inventory.svg" alt="...">
             <p class="p"><a href="http://127.0.0.1:5500/reservdata.html">Manage Your Inventory</p></a>

            </div>
            <div class="divgrid2">
            <img class="imggrid" src="https://website-assets.dentiflow.com/ehr.svg" alt="...">
            <p class="p"><a href="http://127.0.0.1:5500/data.html"> Create Electronic Health Records</p></a>

            </div>
            <div class="divgrid3">
            <img class="imggrid" src="https://website-assets.dentiflow.com/reminders.svg" alt="...">
            <p class="p">Send Automated Reminders</p>

            </div>
            <div class="divgrid4">
            <img class="imggrid" src="https://website-assets.dentiflow.com/calendar.svg" alt="...">
            <p class="p">Schedule Appointments</p>

            </div>
         </div>
      </div>
```

Figure 21 Features and services coding

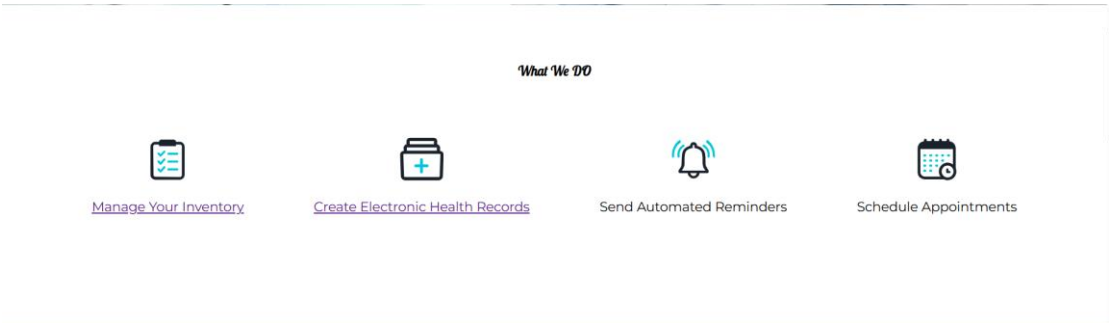


Figure 22 Features and services design

- Display pictures of the most preferred doctors, and the patient can choose the doctor by clicking on him and booking an appointment with him. The code will be shown in Figures 23&24 and its design will be shown in figure 25.

```
<div class="cla222">
<h2 class="h3">The most preferred doctors</h2>
<div class="a1">
 <div class="a2">
<div class="cla21">
<img class="img21" src="img5.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%205/Dr.Nour%20Abdulhady.html"> Dr.Nour Abdulhady</b></p> </a>


</div>
<div class="cla21">
<img class="img21" src="img31.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%204/Dr.Mohamed%20Mresh.html"> Dr.Mohamed Mresh</b></p></a>


</div>
<div class="cla21">
<img class="img28" src="img8.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%202%20photos/Dr.eman%20adnan%20ali.html">Dr.Eman Adnan Ali</a>



</div>
<div class="cla21">
<img class="img29" src="img9.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%207/Dr.Abdlrhman%20Abed.html"> Dr.Khaled Salah</b></p></a>
```

Figure 23 Doctor's profile coding1

```
</div>
<div class="cla21">
<img class="img21" src="img10.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%206/Dr.Yasser%20Aldabour.html"> Dr.Yasser Aldabour</b></p></a>


</div>
 <div class="cla21">
<img class="img21" src="IMG33.jpg" alt="...">
<p class="name"><b><a href="http://127.0.0.1:5500/page%203/Dr.Mahmoud%20ahmad.html"> Dr.Mahmoud Ahmad</b></p></a>


</div>
 </div>
</div>
 </div>
</div>
```

Figure 24 Doctor's profile coding2

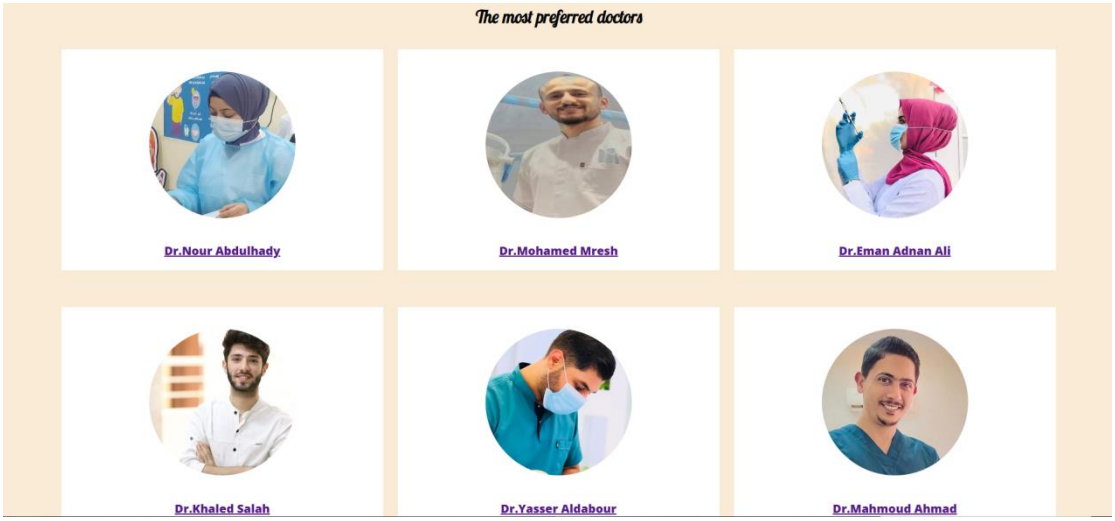


Figure 25 Doctor's profile design

7.1.2 Doctor Profiles Coding:

7.1.2.1 First doctor's page coding:

- The doctor's page displays information about the doctor and the services he provides at the clinic. It also displays information about available appointments, allowing patients to select an appointment and book by clicking "Book". The code will be shown in Figure 26&27 and its design will be shown in Figure 28.

```
    <div class="doctor-section">
    <div class="doctors-list">
        <div class="doctor-card">
            <img src="img8.jpg" alt=".."><h2>Dr.Eman Adnan Ali</h2>
            <p>Oral and dental medicine and surgery</p>
            </div>
            </div>

        <div class="doctor-info">
            <h3>Dr. information</h3>

    <div class="">
        <div class="doctor-card">
            <img src="2344.jpg" alt="..">Al-Nuseirat-Jenin Building

            </div>
            </div>
            <div class="">
        <div class="doctor-card">
            <img src="phone3.jpg" alt="..">0598261787
            </div>
            </div>
        </div>

            <h3>Symptoms and services:</h3>
            <div class="buttons-container">

    <button class="custom-button">Dental implants</button>
    <button class="custom-button">Dental installation</button>
    <button class="custom-button">Jaw pain</button>
        </div>
    </div>
</div>
```

Figure 26 First doctor's page coding1

```
    <div class="doctor-section">
    <div class="doctors-list">
        <div class="doctor-card">
            <img src="img8.jpg" alt=".."><h2>Dr.Eman Adnan Ali</h2>
            <p>Oral and dental medicine and surgery</p>
            </div>
            </div>

        <div class="doctor-info">
            <h3>Dr. information</h3>

    <div class="">
        <div class="doctor-card">
            <img src="2344.jpg" alt="..">Al-Nuseirat-Jenin Building

            </div>
            </div>
            <div class="">
        <div class="doctor-card">
            <img src="phone3.jpg" alt="..">0598261787
            </div>
            </div>
        </div>

            <h3>Symptoms and services:</h3>
            <div class="buttons-container">

    <button class="custom-button">Dental implants</button>
    <button class="custom-button">Dental installation</button>
    <button class="custom-button">Jaw pain</button>
        </div>
    </div>
</div>
```

Figure 27 First doctor's page coding2

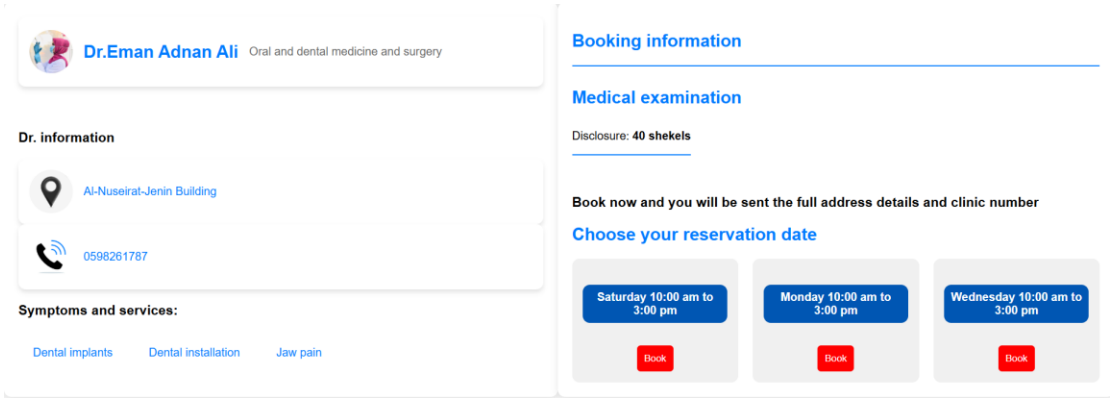


Figure 28 First doctor's page design

7.1.2.2 Second doctor's page coding:

- A page dedicated to booking appointments with Dr. Mohamed Ahmed, who specializes in oral medicine and cosmetic dentistry. It shows the doctor's information and the address of his clinic, as well as the clinic's hours and booking procedures. The code will be shown in figures 29&30 and its design will be shown in figure 31.

```
<div class="doctor-section">
<div class="doctors-list">
    <div class="doctor-card">
        <img src="IMG33.jpg" alt=".."><h2>Dr.Mahmoud Ahmad</h2>
        <p>Orthodontist and cosmetic dentist</p>
        </div>

        </div>

    <div class="doctor-info">
        <h3>Dr. information</h3>


<div class="">
    <div class="doctor-card">
        <img src="2344.jpg" alt="..">Al-Nuseirat - Main Street - east of Al-Zohour Pharmacy

        </div>
        </div>
        <div class="">
    <div class="doctor-card">
        <img src="phone3.jpg" alt="..">0598698343

        </div>
        </div>
    </div>


        <h3>Symptoms and services:</h3>
        <div class="buttons-container">

<button class="custom-button">Cosmetic photoveneers</button>
<button class="custom-button">Laser teeth whitening</button>
<button class="custom-button">Nerve treatment and cosmetic fillings</button>
```

Figure 29 The second doctor's profile coding1

```
<div class="container">
    <div class="booking-section">
        <h2>Booking information</h2>
        <div class="booking-box">
            <h2>Medical examination</h2>
            <div class="info">
                <span>Disclosure: <strong>40 shekels</strong><p> <div class="booking-box"></div></p></span>

            </div>
            <div class="clinic-location">
                <h3>Book now and you will be sent the full address details and clinic number</h3>
            </div>
             <h2>Choose your reservation date</h2>
<div class="appointments">
    <div class="day">
        <h4>Saturday 10:00 am to 3:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="documant.location">Book</button></a>
    </div>

    <div class="day">
        <h4>Monday 10:00 am to 3:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="documant.location">Book</button></a>
    </div>

    <div class="day">
        <h4>Wednesday 10:00 am to 3:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="documant.location">Book</button></a>
    </div>
</div>
```

Figure 30 The second doctor's profile coding2

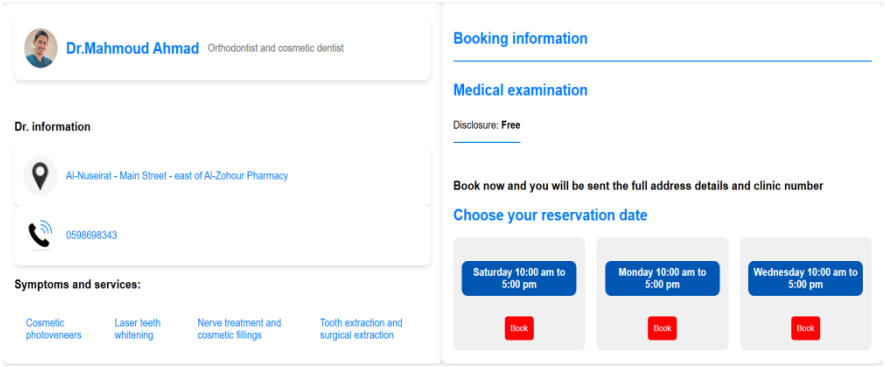


Figure 31 The second doctor's profile design

7.1.2.3 Third doctor's page coding:

- A special page for the doctor, through which the patient can find out information about the clinic and reservation information. He can choose the day and make a reservation by clicking on "Book". The code will be shown in figures 32&33 and its design will be shown in figure 34.

```
<div class="container">
    <div class="booking-section">
        <h2>Booking information</h2>
        <div class="booking-box">
            <h2>Medical examination</h2>
            <div class="info">
                <span>Disclosure: <strong>Free</strong><p> <div class="booking-box"></div></p></span>

            </div>
            <div class="clinic-location">
                <h3>Book now and you will be sent the full address details and clinic number</h3>
            </div>
             <h2>Choose your reservation date</h2>
<div class="appointments">
    <div class="day">
        <h4>Saturday 11:00 am to 4:30 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Sunday 11:00 am to 4:30 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Monday 11:00 am to 4:30 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>
    <div class="day">
        <h4>Tuesday 11:00 am to 4:30 pm</h4>
```

Figure 32 The third doctor's profile coding1

```
        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>
</div>

    </div>
    </div>

    <div class="doctor-section">
    <div class="doctors-list">
        <div class="doctor-card">
            <img src="img31.jpg" alt=".."><h2>Dr.Mohamed Mresh</h2>
            <p>Oral medicine and cosmetic dentistry</p>
            </div>

            </div>

        <div class="doctor-info">
            <h3>Dr. information</h3>


    <div class="">
        <div class="doctor-card">
            <img src="2344.jpg" alt="..">Gaza - Al Remal - Hassaniya Building - Second Floor

            </div>
            </div>
            <div class="">
        <div class="doctor-card">
            <img src="phone3.jpg" alt="..">0597559845

            </div>
```

Figure 33 The third doctor's profile coding2

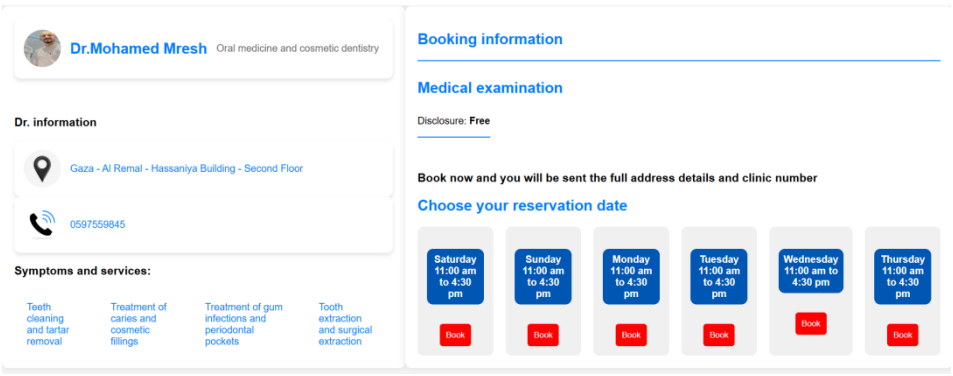


Figure 34 The third doctor's profile design

7.1.2.4 Fourth doctor's page coding:

- A page displaying information about Dr. Nour Abdullhady, the services she provides, and booking information. A table displays the days of the week available for booking. Each day appears as a separate booking button. The code will be shown in Figure 35&36 and its design will be shown in Figure 37.

```
<div class="doctors-list">
        <img src="img5.jpg" alt=".."><h2>Dr.Nour Abdulhady</h2>
        <p>Oral and Dental Medicine Specialist,Al-Azhar University</p>
        </div>

        </div>

    <div class="doctor-info">
        <h3>Dr. information</h3>


<div class="">
    <div class="doctor-card">
        <img src="2344.jpg" alt="..">Al-Nuseirat - next to Abu Dalal Mall

        </div>
        </div>
        <div class="">
    <div class="doctor-card">
        <img src="phone3.jpg" alt="..">0594828483

        </div>
        </div>
    </div>



        <h3>Symptoms and services:</h3>
        <div class="buttons-container">

<button class="custom-button">Cosmetic photoveneers</button>
<button class="custom-button">Laser teeth whitening</button>
<button class="custom-button">Nerve treatment and cosmetic fillings</button>
<button class="custom-button">Tooth extraction and surgical extraction</button>
```

Figure 35 The fourth doctor's profile coding1

```
<div class="container">
    <div class="booking-section">
        <h2>Booking information</h2>
        <div class="booking-box">
            <h2>Medical examination</h2>
            <div class="info">
                <span>Disclosure and X-ray imaging: <strong>Free</strong><p> <div class="booking-box"></div></p></span>

            </div>
            <div class="clinic-location">
                <h3>Book now and you will be sent the full address details and clinic number</h3>
            </div>
             <h2>Choose your reservation date</h2>
<div class="appointments">
    <div class="day">
        <h4>Saturday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Sunday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Monday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>
    <div class="day">
        <h4>Tuesday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
```

Figure 36 The fourth doctor's profil coding2

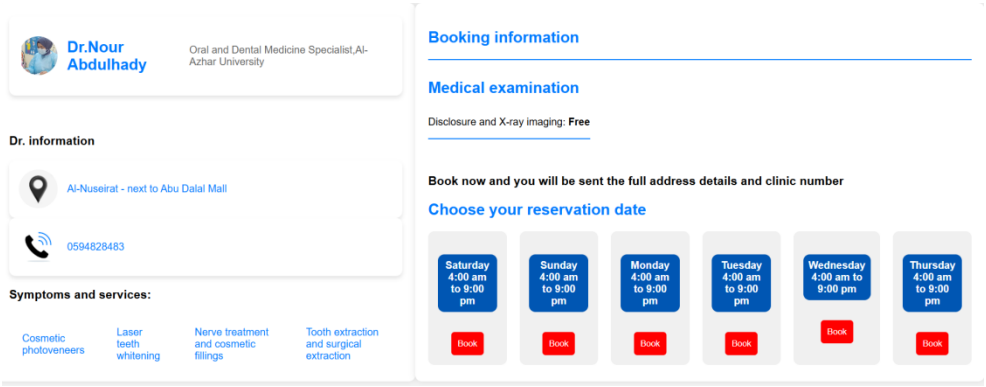


Figure 37 The fourth doctor's profil design

7.1.2.5 Fifth doctor's page coding:

- A special page for the doctor that displays information about the doctor, the services he provides, and reservation information. It also displays the days available in the clinic. The patient can make a reservation by clicking on "Book". The code will be shown in figures 38&39 and its design will be shown in figure 40.

```
<div class="container">
    <div class="booking-section">
        <h2>Booking information</h2>
        <div class="booking-box">
            <h2>Medical examination</h2>
            <div class="info">
                <span>Disclosure: <strong>Free</strong><p> <div class="booking-box"></div></p></span>

            </div>
            <div class="clinic-location">
                <h3>Book now and you will be sent the full address details and clinic number</h3>
            </div>
             <h2>Choose your reservation date</h2>
<div class="appointments">
    <div class="day">
        <h4>Saturday 12:00 pm to 5:50 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Sunday 12:00 pm to 5:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>

    <div class="day">
        <h4>Monday 12:00 pm to 5:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>
    <div class="day">
        <h4>Tuesday 12:00 pm to 5:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
```

Figure 38The fifth doctor's profile coding1

```
<div class="doctor-section">
<div class="doctors-list">
    <div class="doctor-card">
        <img src="img10.jpg" alt=".."><h2>Dr.Yasser Aldabour</h2>
        <p>Oral medicine and cosmetic dentistry</p>
        </div>

        </div>

    <div class="doctor-info">
        <h3>Dr. information</h3>


<div class="">
    <div class="doctor-card">
        <img src="2344.jpg" alt="..">Al-Lababidi intersection, next to Al-Dawli Pharmacy, Al-Wassim Building, second floor

        </div>
        </div>
        <div class="">
    <div class="doctor-card">
        <img src="phone3.jpg" alt="..">0598653454

        </div>
        </div>
    </div>


        <h3>Symptoms and services:</h3>
        <div class="buttons-container">

<button class="custom-button">All dental services and specialties</button>
```

Figure 39 The fifth doctor's profile coding2

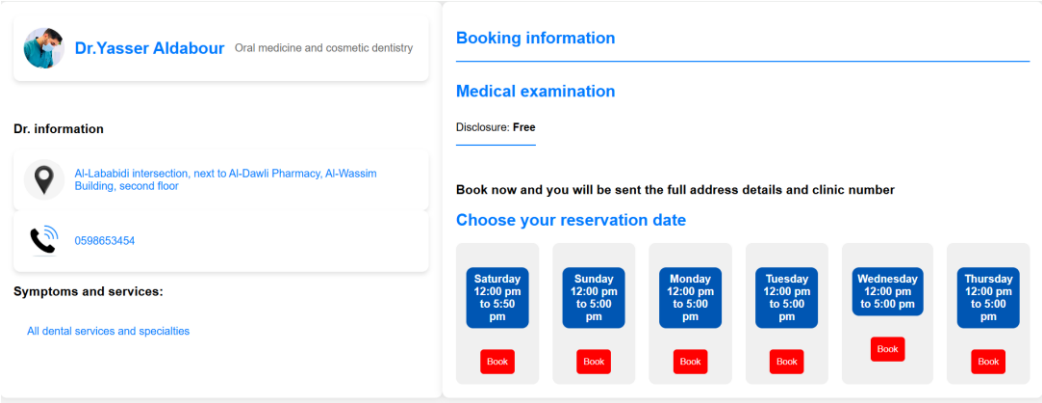


Figure 40 The fifth doctor's profile design

7.1.2.6 Sixth doctor’s page coding:

- This page contains information about Dr. Khaled Salah's medical clinic, which provides essential medical services. The page also contains information about booking and medical examinations. Bookings will be confirmed when you click "Book". The code will be shown in figures 41&42 and its design will be shown in figure 43.

```
<div class="container">
    <div class="booking-section">
        <h2>Booking information</h2>
        <div class="booking-box">
            <h2>Medical examination</h2>
            <div class="info">
                <span>Disclosure: <strong>20</strong><p> <div class="booking-box"></div></p></span>

            </div>
            <div class="clinic-location">
                <h3>Book now and you will be sent the full address details and clinic number</h3>
            </div>
             <h2>Choose your reservation date</h2>
<div class="appointments">
    <div class="day">
        <h4>Saturday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>



    <div class="day">
        <h4>Monday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>


    <div class="day">
        <h4>Wednesday 4:00 am to 9:00 pm</h4>

        <a href="http://127.0.0.1:5500/data.html"><button onclick="bookAppointment('Book')">Book</button></a>
    </div>
```

Figure 41 The sixth doctor's profile coding1

```
        <div class="doctor-section">
        <div class="doctors-list">
            <div class="doctor-card">
                <img src="img9.jpg" alt=".."><h2>Dr.Khaled Salah</h2>
                <p>Oral and Dental Medicine Specialist</p>
                </div>

                </div>

            <div class="doctor-info">
                <h3>Dr. information</h3>


        <div class="">
            <div class="doctor-card">
                <img src="2344.jpg" alt="..">Nusairat, Al-Manara neighborhood

                </div>
                </div>
                <div class="">
            <div class="doctor-card">
                <img src="phone3.jpg" alt="..">0599885566

                </div>
                </div>
            </div>


                <h3>Symptoms and services:</h3>
                <div class="buttons-container">

        <button class="custom-button">Cosmetic photoveneers</button>
        <button class="custom-button">Laser teeth whitening</button>
        <button class="custom-button">Nerve treatment and cosmetic fillings</button>
```

Figure 42 The sixth doctor's profile coding2

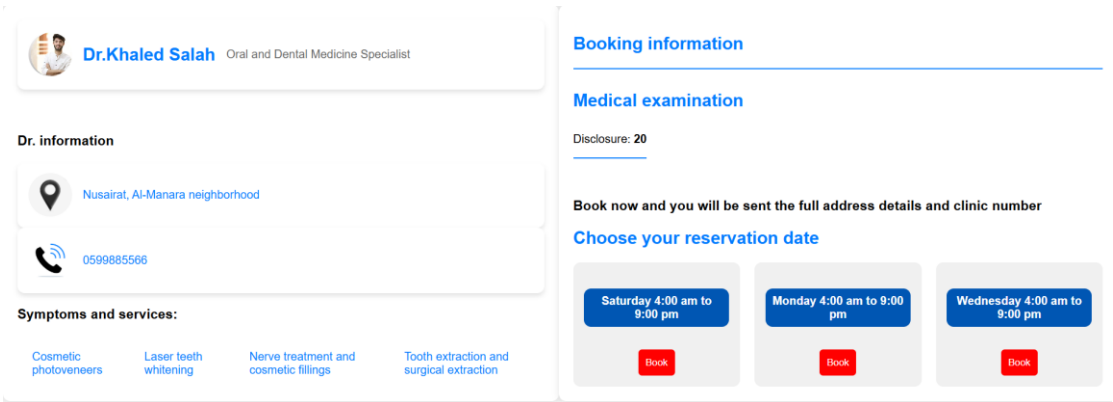


Figure 43 The sixth doctor's profile design

7.1.3 Appointment Booking Page coding:

- A form represents the entry of patient data and completion of the reservation process. After entering the data, click on “Book” and the reservation will be completed and will appear to the doctor in the reservations list. A web page was linked to a Firebase database for CRUD operations using plain JavaScript to display patient bookings.

When filling out the form and clicking "Book:"

- The input data is retrieved from the form (patient's name, age, phone number, day, and time)
- Data validation is performed to ensure no fields are left empty
- The doctor's name is retrieved from localStorage.
- The booking is saved in Firebase under the "bookings" section.
- A confirmation message is displayed upon successful booking, or an alert is shown in case of an error.
- Additionally, a back function was used to return the user to the previous page.

The code will be shown in the figure 44,45.46, 47and its design will be shown in the figure 48.

```
<div class="container">
    <h1>Patient data</h1>
    <div class="booking-box">
        <h2>Book now </h2>


        <div class="form">
            <h3>Enter reservation data</h3>
            <form action="data.html" method="POST">
            <input type="text" id="patientName" placeholder="Name of the patient who will be examined">
            <input type="number" id="age" name="age" min="1" max="90" placeholder=" the age">
            <input type="tel" id="mobile" placeholder="Mobile number">
            <input type="text" id="day" placeholder="Day">
            <input type="time" id="time" placeholder="The desired time">
form>

            <div class="buttons">
                <button class="cancel">cancel</button>
                <button class="submit" id="submitBtn">Book</button>
            </div>
        </div>
    </div>
</div>
```

Figure 44 Appointment booking coding

```
import { initializeApp } from "https://www.gstatic.com/firebasejs/11.3.1/firebase-app.js";
import { getDatabase, ref, push, set } from "https://www.gstatic.com/firebasejs/11.3.1/firebase-database.js";

// Firebase Configuration
const firebaseConfig = {
  apiKey: "AIzaSyAPpGpOfr0ALEmwJLouZCxpcanwMnxMztI",
  authDomain: "modern-dental-clinic-36e83.firebaseapp.com",
  databaseURL: "https://modern-dental-clinic-36e83-default-rtdb.asia-southeast1.firebasedatabase.app",
  projectId: "modern-dental-clinic-36e83",
  storageBucket: "modern-dental-clinic-36e83.firebasestorage.app",
  messagingSenderId: "914277993813",
  appId: "1:914277993813:web:2683fd025888ba83b033dc"
};

// Initialize Firebase
const app = initializeApp(firebaseConfig);
const db = getDatabase(app);
const contactFormDB = ref(db, "bookings"); // Reference to "bookings" collection in Firebase

console.log("Firebase initialized successfully!");

// Event Listener for Submit Button
document.getElementById("cancelBtn").addEventListener("click", back);
document.getElementById("submitBtn").addEventListener("click", submitBooking);

function back(){

    window.history.back();

}
```

Figure 45 Appointment booking coding

```
function submitBooking() {
    // Get form values
    var patientName = getElementVal("patientName");
    var age = getElementVal("age");
    var mobile = getElementVal("mobile");
    var day = getElementVal("day");
    var time = getElementVal("time");

    // Validate Input
    if (!patientName || !age || !mobile || !day || !time) {
        alert("Please fill in all fields");
        return;
    }

    ////###########
    const doctor_name = localStorage.getItem("doctorName");
    console.log(doctor_name); // Outputs: Hello, World!
    // Format Data as String for Saving to File
    var reservationData = `doctor :${doctor_name}\nPatient Name: ${patientName}\nAge: ${age}\nMobile: ${mobile}\nDay: ${day}\nTime: ${time}`

    // Save to Firebase
    saveMessages(patientName, age, mobile, day, time,doctor_name);

    // Save to File
   // saveToFile(reservationData);
}
```

Figure 46 Appointment booking coding

```
// Save Data to Firebase
const saveMessages = (patientName, age, mobile, day, time,doctor_name) => {
    const newContactForm = push(contactFormDB); // Create a new unique entry

    set(newContactForm, {
        doctor :doctor_name,
        name: patientName,
        age: age,
        mobile: mobile,
        day: day,
        time: time
    })
    .then(() => {
        console.log("Data saved successfully!");
        alert("Your reservation has been completed successfully!");
    })
    .catch((error) => {
        console.error("Error saving data: ", error);
        alert("Failed to save reservation. Please try again.");
    });
};

// Helper Function to Get Form Input Values
const getElementVal = (id) => {
    return document.getElementById(id).value;
};
```

Figure 47 Appointment booking coding

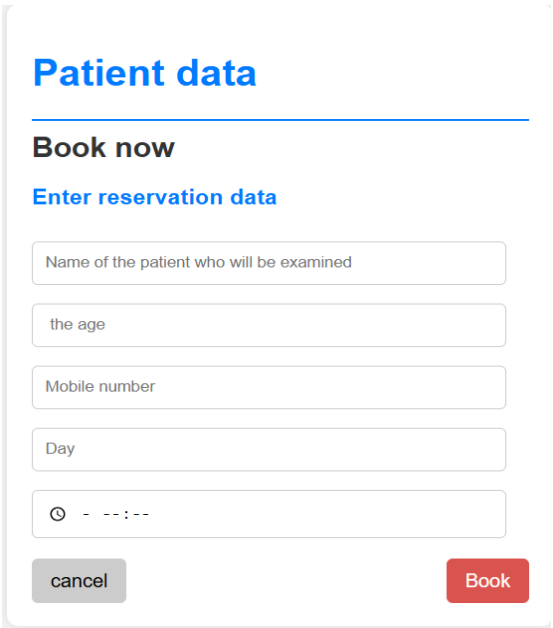


Figure 48 Appointment booking Design

7.1.4 Pre-registration booking list page coding:

- The reservations page will display the reservations that have been entered, and when you click on the reservation page, you will return to the previous page. The code will be shown in figure 49 and its design will be shown in figure 50.

```
<div class="container">
    <h2>Bookings List</h2>
    <div id="bookingsList" class="bookings-container"></div>
    <a href="index.html" class="back-home">Back to Booking</a>
</div>
```

Figure 49 pre-registration booking list coding

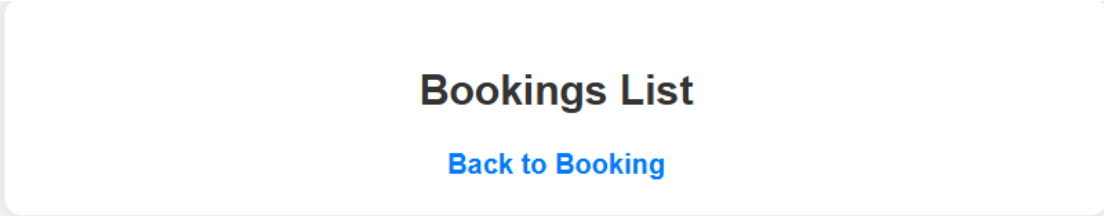


Figure 50 pre-registration booking list design

7.1.5 Booking list page after registration coding:

- displays a list of bookings from the Firebase database of the modern dental clinic. Upon loading the page, the code connects to the database via Firebase to retrieve the booking data and display it dynamically. There is a link that allows the user to go back to the previous booking page. The implementation utilizes JavaScript, where Firebase libraries are imported from CDN links. After defining the necessary contact information, Firebase is initialized and linked to the database. The fetch Bookings () function is triggered when the page loads, automatically retrieving bookings from the "Bookings" path in the database and dynamically updating the booking list by adding each booking as a new item. This ensures the page displays up-to-date reservations immediately upon opening. The code will be shown in Figures 51&52 and its design will be shown in Figure 53.

```
<body>
    <div class="container">
        <h2>Bookings List</h2>
        <div id="bookingsList" class="bookings-container"></div>
        <a href="javascript:void(0);" onclick="history.back();" class="back-home">Back to Booking</a>

    </div>

    <script type="module"
    >import { initializeApp } from "https://www.gstatic.com/firebasejs/11.3.1/firebase-app.js";
        import { getDatabase, ref, onValue } from "https://www.gstatic.com/firebasejs/11.3.1/firebase-database.js";

        // Firebase Configuration
        const firebaseConfig = {
          apiKey: "AIzaSyAPpGpOfr0ALEmwJLouZCxpcanwMnxMztI",
          authDomain: "modern-dental-clinic-36e83.firebaseapp.com",
          databaseURL: "https://modern-dental-clinic-36e83-default-rtdb.asia-southeast1.firebasedatabase.app",
          projectId: "modern-dental-clinic-36e83",
          storageBucket: "modern-dental-clinic-36e83.firebasestorage.app",
          messagingSenderId: "914277993813",
          appId: "1:914277993813:web:2683fd025888ba83b033dc"
        };

        // Initialize Firebase
        const app = initializeApp(firebaseConfig);
        const db = getDatabase(app);
        const contactFormDB = ref(db, "bookings");

        // Retrieve and Display Data from Firebase
        function fetchBookings() {
            onValue(contactFormDB, (snapshot) => {
                const bookingsList = document.getElementById("bookingsList");
```

Figure 51 post-registration booking list coding 1

```
const contactFormDB = ref(db, "bookings");

// Retrieve and Display Data from Firebase
function fetchBookings() {
    onValue(contactFormDB, (snapshot) => {
        const bookingsList = document.getElementById("bookingsList");
        bookingsList.innerHTML = ""; // Clear previous content

        snapshot.forEach((childSnapshot) => {
            const booking = childSnapshot.val();
            const bookingItem = document.createElement("div");
            bookingItem.classList.add("booking-card");

            bookingItem.innerHTML = `
                <h3>${booking.name}</h3>
                <p><strong>doctor:</strong> ${booking.doctor}</p>
                <p><strong>Age:</strong> ${booking.age}</p>
                <p><strong>Mobile:</strong> ${booking.mobile}</p>
                <p><strong>Day:</strong> ${booking.day}</p>
                <p><strong>Time:</strong> ${booking.time}</p>
            `;

            bookingsList.appendChild(bookingItem);
        });
    });
}
```

Figure 52 post-registration booking list coding 2

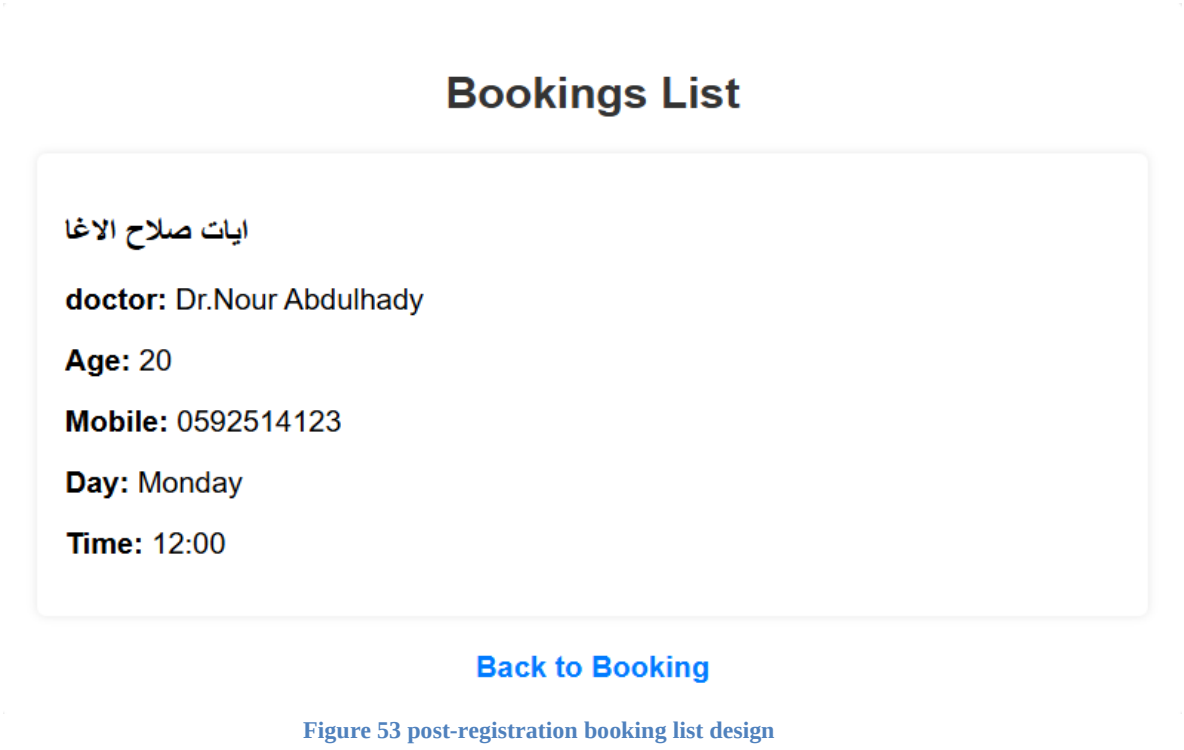


Figure 53 post-registration booking list design

Chapter 8

Testing

Phase 4:
Testing

8.1 Testing Booking List:

- A list of the most preferred doctors is displayed. Clicking on any doctor's name will take you to a dedicated page for that doctor, where you can book an appointment. as illustrated in Figure 54 below:

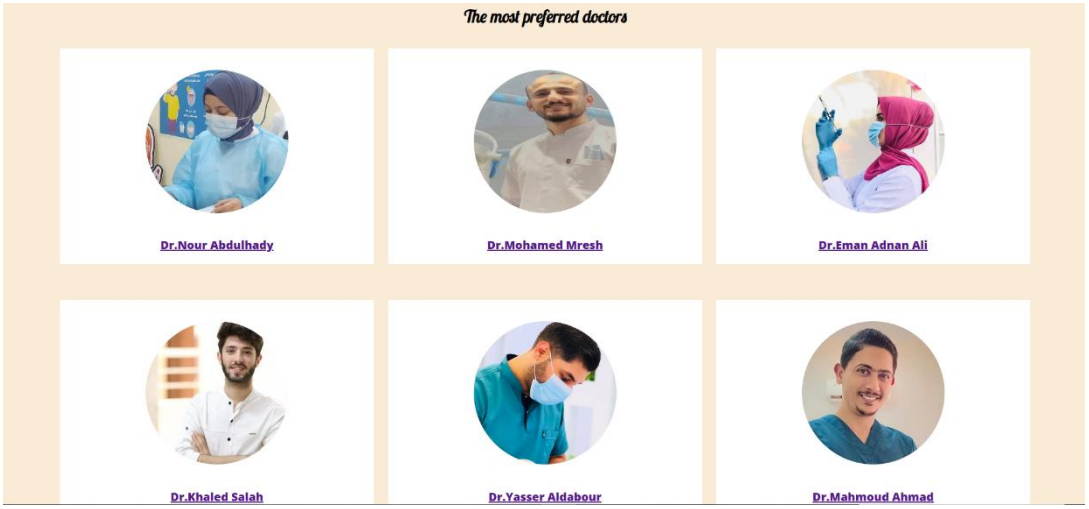


Figure 54 Selection of one doctor

- This page is dedicated to booking appointments with the doctor. A schedule of available days of the week is displayed. Clicking the 'Book' button takes you to a page containing a form for entering the necessary details. as illustrated in Figure 55 below:

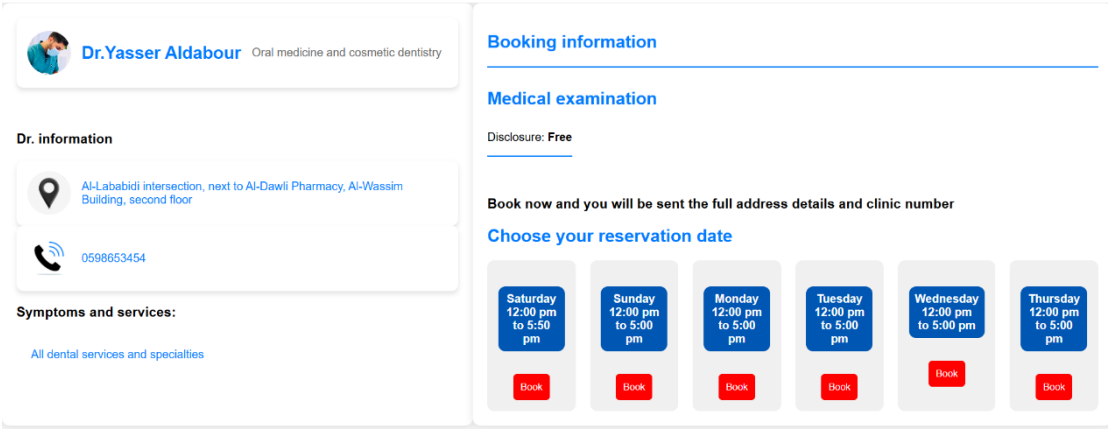


Figure 55 Selected doctor profile

- A form representing the patient's data entry and the completion of the booking process. After entering the data, the patient clicks "Book" to complete the booking. The data is then sent to a database and stored. as illustrated in Figure 56 below:

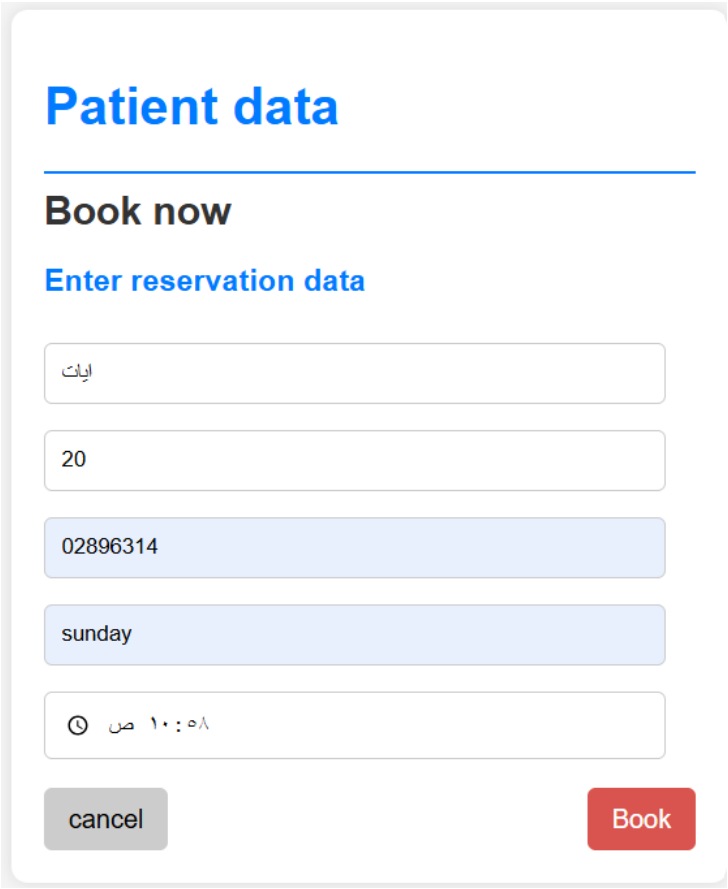


Figure 56 Booking suitable appointment

- When a patient enters information and makes a reservation, the data is stored in the real-time database and then appears in the reservations list. as illustrated in Figure 57 below:

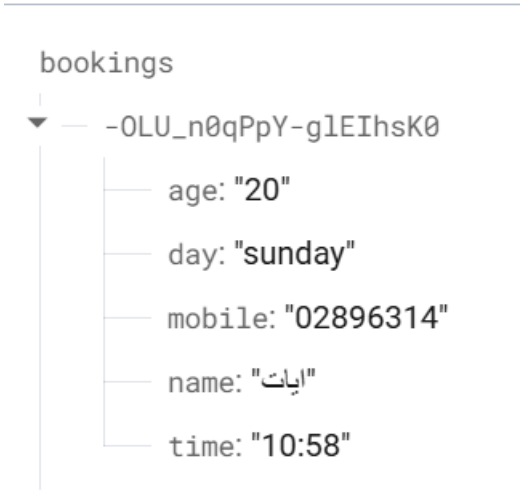


Figure 57 Store appointment booking in the database

- The booking page, before the patient enters the booking information. The user can be redirected to the home page by clicking the back button. as illustrated in figure 58 below:

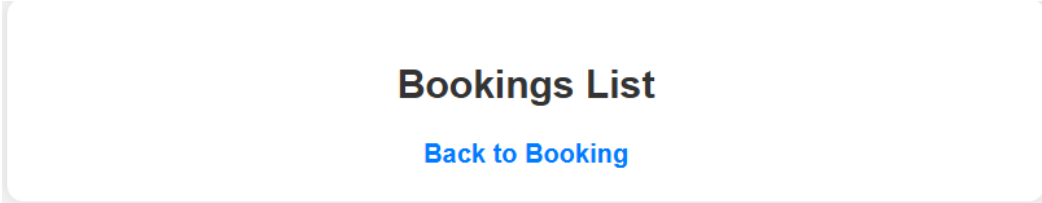


Figure 58 Booking list page before registration

- After refreshing the booking page, the patient's booking information appears. The doctor can view the bookings from the main page. The Website has been formatted, and we did not face many issues. as illustrated in the figure 59 below:

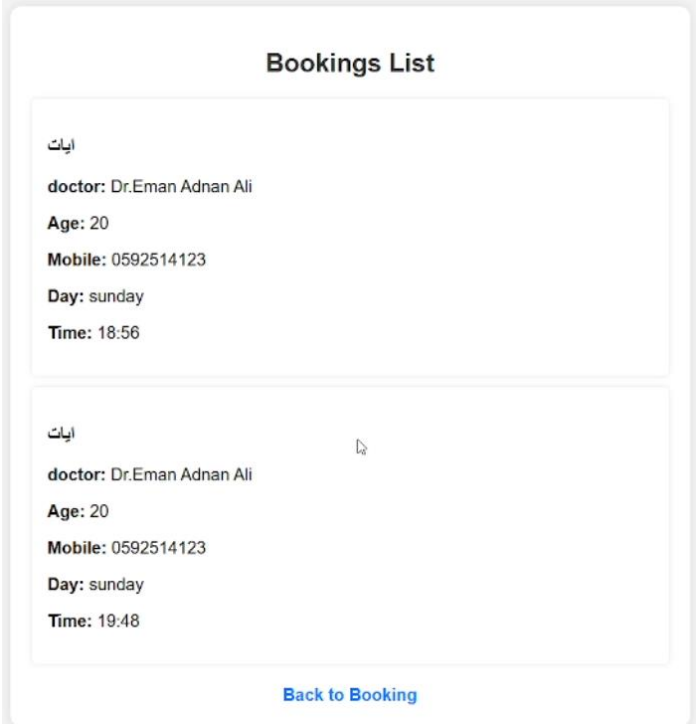


Figure 59 Booking list page after registration

8.2 Some of the problems that occurred:

1. When clicking on Block Booking on the Booking List page, a page appeared showing what is index.html. This issue was resolved by making it return to the previous page.

2. Data was not appearing in the Firebase database after being entered due to a connection issue between the database and the Web Application. The issue was resolved by fixing the connection between the Cloud Account and the database.

3. Buttons for interaction did not function properly.

4. Text direction conflict: Where dir="rtl" is specified to be right-to-left, direction: ltr is set, causing a discrepancy in page layout. The solution is to remove direction: ltr from the body to ensure consistent direction.

5. Images were not showing up in the browser. The problem was solved by checking the image extension in the properties and changing it in the code.

6. The doctor's name did not show up when stored in the browser localStorage.setItem due to a code error and it has been resolved.

7. There was a problem linking the doctor's page to the home page. The problem was solved by linking the page's link.

Chapter 9

Future work

Future Work

Online dental appointments offer accessibility and convenience but cannot fully replace in-person visits. For complex cases, a hybrid approach enhances patient engagement and accessibility by integrating virtual consultations and follow-ups with in-person treatments, ensuring comprehensive care .As part of future development, a mobile application for dental clinic management is being designed with four main interfaces to streamline operations and enhance patient experience. An initial prototype has been developed using Sigma as a foundational design. As shown in the figures below.

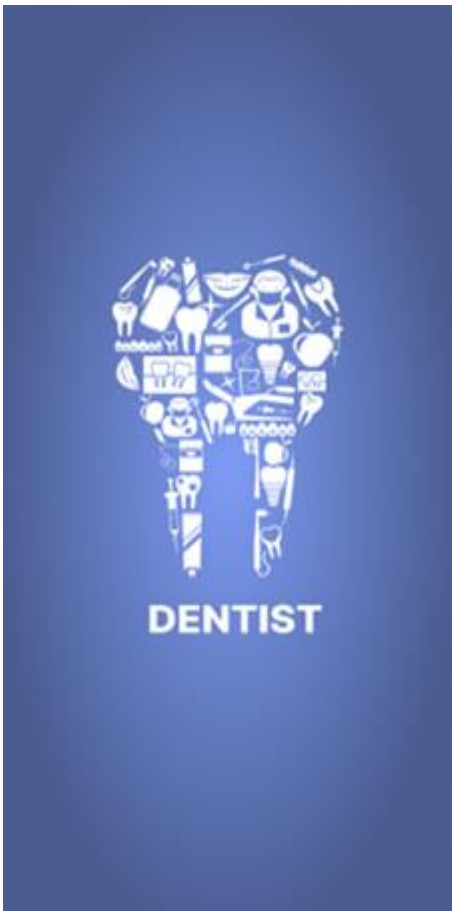


Figure 60 Starting application interface

Figure 61 Application log-in interface

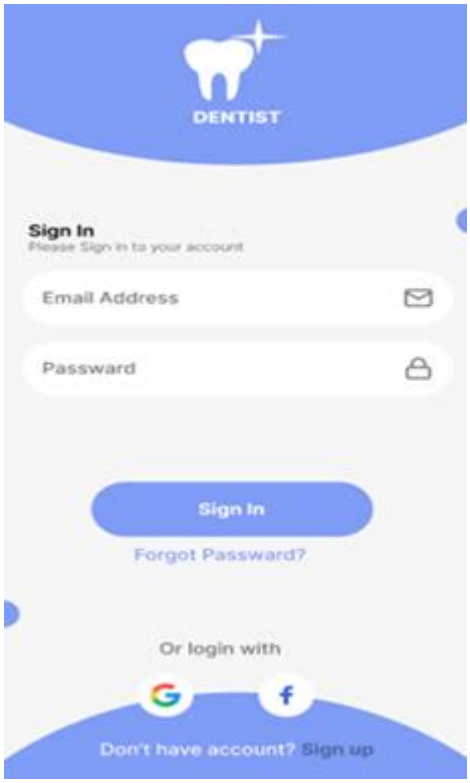


Figure 62 Application sign-in interface

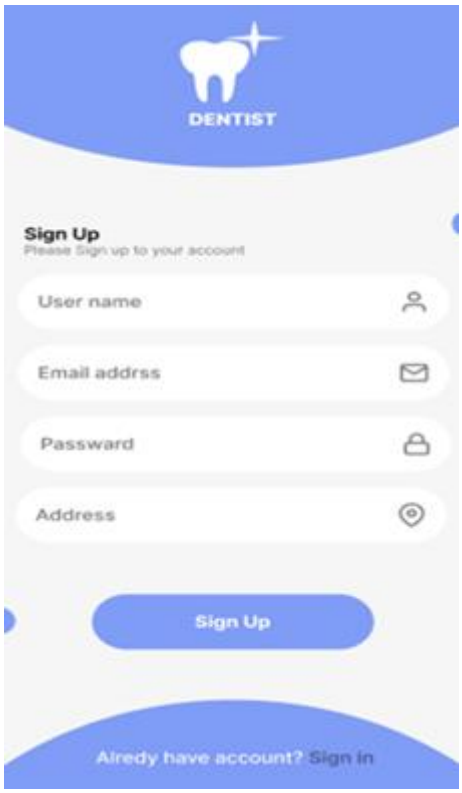


Figure 63 Application sign-up interface

With technological advances in healthcare systems, innovation in dental clinic management has become essential to improve patient experience and facilitate the work of doctors. This system aims to integrate modern dental practices with advanced technologies, ensuring a seamless and comfortable experience for both patients and doctors.

To ensure continuous development, the system can be improved in the future by adding advanced features, such as:

- Multilingual support to meet the needs of patients from diverse backgrounds.
- The ability to work offline to ensure continued operation during network outages.
- Integration with health insurance systems to facilitate claims management and streamline administrative processes.

Chapter 10

Conclusions

Conclusions

The Modern Dental Clinic Management System project is a successful example of how technology can be used to improve the management of medical clinics. Through this project, an integrated system was developed to streamline appointment scheduling, manage patient records, and enhance communication between patients and dentists. The main objectives of the project were achieved, including providing a user-friendly interface, improving administrative efficiency, and ensuring data security. The results of the project demonstrated that the new system can significantly reduce waiting times, minimize appointment cancellations, and enhance the overall patient experience. Additionally, the system helped improve resource management within the clinic, leading to increased operational efficiency and reduced manual errors. One of the most important conclusions from this project is that technology can be a powerful tool for improving healthcare management, especially in environments facing administrative and organizational challenges. However, further development is needed to integrate additional features such as AI-assisted diagnostics, multi-language support, and offline functionality. The project offers a practical and effective solution for modernizing dental clinic operations, paving the way for further innovations in healthcare management. This work demonstrates how technology can contribute to improving the quality of medical services and patient satisfaction while maintaining high operational efficiency.

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