

DEVELOPMENT OF A WEB BASED DOCTOR APPOINTMENT SYSTEM

BY

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "Development of a web-based Doctor appointment system", submitted by Md. Rafiul Islam Id:192-15-2780 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on July 14, 2024.

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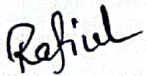
We hereby declare that, this project has been done by us under the supervision of **Md.Sazzadur Ahamed**, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Online system is a web application system for search doctor. This main objective of my project “Online doctor appointment system”. This is a system where anyone can create appointment and connect with their required doctor. Here General User can create their profile. User also see their personal data and easily access their personal data. Doctor also have a personal profile to know about patients and appointment. Its build with good relationship between doctor and patient. Online Doctor Appointment System is a webbased application designed to simplify the process of finding and scheduling appointments with doctors. A patient can easily consult a doctor through video conference and the doctor can prescribe medicine. By using this website one can easily take doctor advice directly or online. This system provides an efficient platform where patients can search for doctors, book appointments, and manage their personal health data. A user can access this website easily. Using this website user’s money, suffering and time will be reduced.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The total population of the country is 16 crore 97 lakh 28 thousand 911 people. As a percentage, 68.34 percent live in rural areas and 31.66 percent live in urban areas. 68.34 percent of the total population lives in villages. They are deprived of modern medical services. But for the remaining 31.66 percent, all the facilities and services of modern life are available. People in the village have to go to the city to consult a good doctor. The Online Doctor Appointment System is a web-based application designed to simplify the process of finding and scheduling appointments with doctors. A patient can easily consult a doctor through video conference and the doctor can prescribe medicine. By using this website one can easily take doctor advice directly or online. This system provides an efficient platform where patients can search for doctors, book appointments, and manage their personal health data. Village people can easily consult a good doctor at home while going to the city. Doctors can also manage their schedules and patient information through this system. The application aims to reduce the time, cost, and inconvenience typically associated with the traditional appointment booking process, thereby improving the overall healthcare experience for both patients and doctors. Admin can easily edit and delete a user's profile. A user can easily use this website using all types of smartphones, laptops, mobile phones and internet access device.

1.2 Motivation

The motivation behind developing the Online Doctor Appointment System is driven by several key factors. Firstly, the increasing demand for telemedicine, which has been significantly accelerated by the COVID-19 pandemic, highlights the necessity for remote healthcare solutions. Secondly, in Bangladesh, many people face challenges in accessing timely and effective medical care due to geographical and infrastructural barriers. This system aims to overcome these obstacles by providing healthcare services directly to

patients' homes. Thirdly, the widespread availability of internet access and smartphones provides a strong foundation for implementing online healthcare services. Fourthly, the system will enhance patient convenience by reducing the need for travel and waiting times in clinics, which is particularly beneficial for patients with mobility issues or those living in remote areas. Lastly, it will enable healthcare providers to manage their time and resources more effectively, potentially increasing the number of patients they can serve. By addressing these objectives, the Online Doctor Appointment System is poised to revolutionize healthcare delivery in Bangladesh. The motivation behind developing the Online Doctor Appointment System is to leverage technology to address these issues. By providing a seamless and user-friendly platform, we aim to enhance the accessibility and efficiency of healthcare services. This system not only saves time and reduces the hassle for patients but also helps doctors manage their appointments and patient information more effectively.

1.3 Objectives

- If User have smart phone, laptops, computer with internet access they can easily use this website.
- Simplify appointment booking system: Patient easily search doctor and get appointment their required doctor.
- Improving health care system: Patients can easily consult a good doctor through video conferencing at home
- Enhance doctor-patient interaction: To facilitate better communication and relationship-building between patients and doctors through a streamlined appointment management system.
- Efficient data management: Using this website doctor and patients to manage their profile and get appointment data efficiently.
- Reduce Time and cost: Using this website will not waste time and money like traditional appointment system.
- Administrative Control: Admin can add doctors and patients to the website and edit ,delete and take necessary action their profile .

1.4 Expected Outcome

This website is a user-friendly website. Using this website, a user can easily search doctor and see doctor profile and book required doctor appointment. By using the online doctor appointment system website a user can easily book a doctor's appointment at any time and take consultation through video conferencing very easily. Patient can easily make a doctor's appointment even on weekends. Online doctor appointment system allows patients to book appointment any day. The diagnostic center's receptionists will be less hassled as they will not have to deal with the phone all day long because they can just log in their computer to see who has made the doctor's appointment.

1.5 Project Management and Finance

I have not accepted any external grant to complete my project. Complete this project with own financing. To complete my project divided my tasks several parts. Step by step complete my project. First, I complete frontend site of this project. Many Challenges and problems were faced while completing this project. When I face problem then I meet with my supervisor and she help to me solve this problem.

1.6 Report Layout

In this my project I have discussed motivation, objectives and expected outcome. The report will be able to reveal the results.

CHAPTER 2

BACKGROUND

2.1 Preliminaries/Terminologies

Understanding the foundational terms and concepts is essential for grasping the functionality and scope of the Online Doctor Appointment System. This web application is designed to facilitate the process of finding and scheduling appointments with doctors. Key terms include Web Application, which refers to software accessed via a web browser, offering functionalities similar to those of a native application. User Profile involves storing personal data and settings for patients and doctors, allowing them to manage their information and interactions on the platform. Appointment Booking is the core process where patients select a convenient time to meet with doctors. Admin users have elevated privileges, enabling them to manage other user accounts and maintain the system's integrity. Authentication and Authorization are critical security mechanisms; the former verifies user identities, while the latter controls access to various system resources based on user roles. A Database stores all necessary information, including user details and appointments, ensuring organized and accessible data management. The Front-End of the system involves the interface and user experience aspects, typically developed using HTML, CSS, and JavaScript, while the Back-End handles server-side logic, database interactions, and overall system operations.

2.2 Related works

Several existing platforms and studies have influenced the development of online appointment systems, providing insights into their functionality and areas for improvement. In Bangladesh, notable examples include Doctorola, Jibon Health, and Seba.xyz.

Doctorola is a popular online medical scheduling service in Bangladesh, allowing patients to book appointments with doctors across various specialties. It emphasizes ease of use and accessibility, providing a straightforward interface for appointment booking. However, its features for managing doctor and patient profiles are somewhat limited, focusing primarily on the scheduling aspect.

Jibon Health offers a more comprehensive platform, including telemedicine services, appointment scheduling, and health record management. While Jibon Health provides extensive services, it may present a steeper learning curve for users seeking a simple and intuitive appointment booking system.

Seba.xyz integrates appointment scheduling with a broader range of healthcare services, including pharmacy delivery and health insurance. Its comprehensive approach aims to cater to various healthcare needs, but the integration of multiple services can sometimes complicate the user experience, particularly for those primarily interested in booking appointments.

These systems highlight the importance of a user-friendly interface, robust feature set, and seamless integration with existing healthcare infrastructures, providing valuable insights for the development of the Online Doctor Appointment System. These applications have paved the way for innovative solutions in the Bangladeshi healthcare sector, demonstrating the potential of digital platforms to improve accessibility and efficiency. The Online Doctor Appointment System aims to build on the successes of these existing platforms by providing an enhanced user experience, incorporating video consultations, and offering robust administrative functionalities. By learning from these related works, this project aspires to further advance the telemedicine infrastructure in Bangladesh, ensuring that high-quality healthcare services are available to a broader population.

2.3 Comparative Analysis

There are many websites in our country like online doctor appointment system. I have seen many projects but the main features of all project are same. Among this website “Doctorola”, “Jibon Health”, “Sheba.xyz” are most popular . I will try to compare with this website. Doctorola excels in providing high ease of use and accessible appointment booking but falls short in extensive profile management for doctors and patients. Jibon Health and Seba.xyz offer comprehensive features, including telemedicine and detailed profile management, but may present a steeper learning curve and higher costs. The Online Doctor Appointment System aims to strike a balance by offering high ease of use,

essential profile management features, robust data security, and scalability, making it suitable for various healthcare providers. This system's design emphasizes userfriendliness, security, and efficiency, ensuring a positive experience for patients, doctors, and admins.

2.4 Scope of Problem

The Online Doctor Appointment System addresses several key issues inherent in traditional healthcare appointment scheduling. One major problem is the Inefficiency in Booking Appointments, where the process often involves multiple phone calls and physical visits, leading to wasted time and resources. Lack of Accessibility is another significant issue, especially for patients in remote areas or those with limited mobility, who find it challenging to access healthcare services. The Administrative Burden on healthcare providers managing appointments and patient information manually is substantial, often leading to errors and inefficiencies. Data Management Issues also pose challenges, as ensuring secure storage and easy access to patient data is crucial. Finally, Communication Gaps between doctors and patients outside scheduled appointments can hinder continuous care and effective treatment.

2.5 Challenges

Developing and implementing the Online Doctor Appointment System involves addressing several significant challenges. User Adoption is a critical hurdle, as both patients and doctors need to be convinced to adopt the new system, which can be particularly challenging for those less comfortable with technology. Ensuring Data Security and Privacy is paramount, given the sensitivity of health information; robust measures must be implemented to protect against breaches. Scalability is another challenge, as the system must be capable of handling an increasing number of users without compromising performance. Integrating the appointment system with existing healthcare management systems and Electronic Health Records (EHR) can be complex,

requiring careful planning and execution. Regulatory Compliance is essential, particularly adherence to healthcare regulations like HIPAA (Health Insurance Portability and Accountability Act) to protect patient information. Finally, designing an intuitive and user-friendly interface that meets the needs of diverse users is crucial for the system's success, ensuring a smooth and efficient user experience. Addressing these challenges will enable the Online Doctor Appointment System to provide a robust, secure, and userfriendly solution for managing healthcare appointments.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Software and Hardware

Software uses:

- Windows operating system.
- Browser
- Visual studio Hardware Uses:
 - Computer/laptop
 - Server

3.2 Requirement Collection and Analysis

Front-End:

- HTML
- CSS
- TAILWIND CSS
- BOOTSTRAP
- JAVASCRIPT
- REACT.JS

Back-End:

- ❖ Node.js
- ❖ Express.js Database:
- ❖ MongoDB

3.3 Use case Modeling and Description

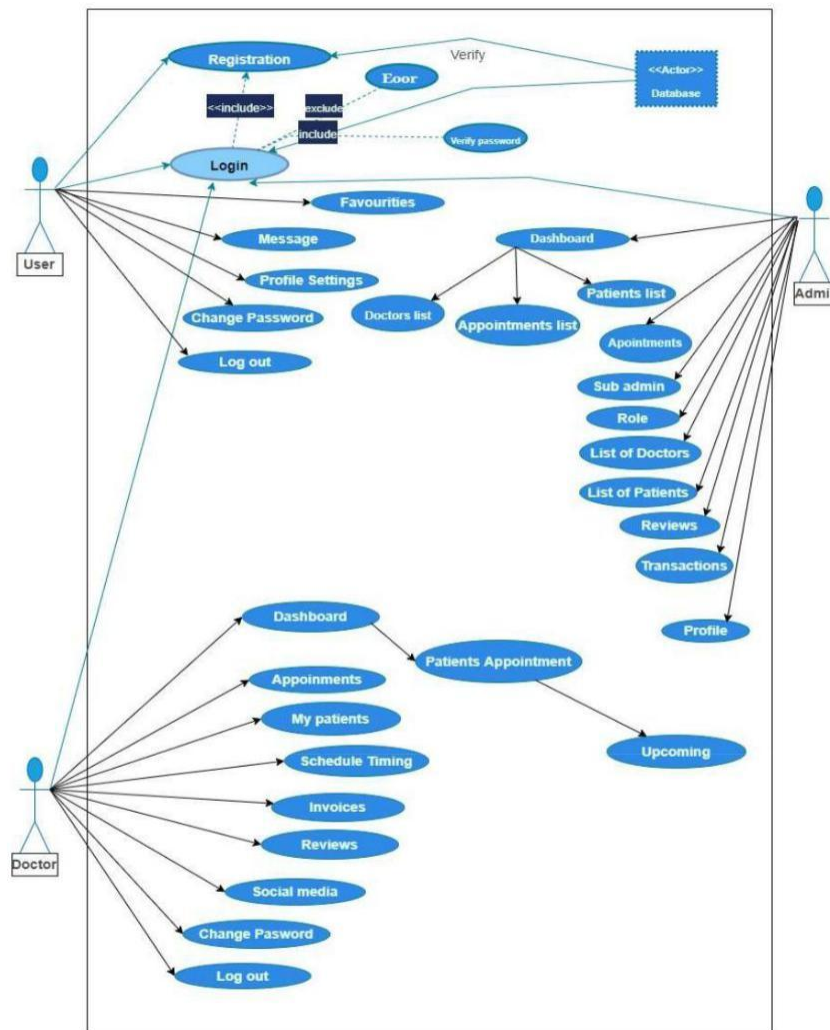


Figure 3.1 : Use Case Model

The Online Doctor Appointment System is designed to facilitate interactions between three main user types: patients, doctors, and administrators. Each user type has distinct

functionalities and roles within the system. Patients can sign up, log in, book and cancel appointments, attend video consultations, and view their medical history. This streamlined process ensures that patients can easily manage their healthcare needs from the comfort of their homes.

Doctors, upon signing up and logging in, can attend video consultations with patients and write prescriptions, which are then stored in the patients' medical history. This feature enhances the convenience and efficiency of delivering healthcare services, allowing doctors to provide care remotely.

Administrators have a crucial role in maintaining the system's integrity and functionality. They can sign up, log in, and manage user profiles by adding, editing, or removing profiles of both patients and doctors. This administrative capability ensures that the system remains up-to-date and secure.

Overall, the system emphasizes high-quality video consultations, robust data management, and user-friendly interfaces, thereby enhancing the accessibility and efficiency of healthcare services in Bangladesh. The combination of these features positions the Online Doctor Appointment System as a significant advancement in the telemedicine landscape, contributing to improved healthcare outcomes.

CHAPTER 4

DESIGN AND SPECIFICATION

4.1 Front-end Design:

The implementation of the Online Doctor Appointment System's front-end design involves a structured process using HTML, CSS, and the Tailwind CSS framework, along with JavaScript and the React.js framework. Initially, HTML is used to create the basic structure of the web pages, defining the essential elements such as forms, buttons, and content sections for different users including patients, doctors, and administrators. Tailwind CSS is then applied to style these elements, leveraging its utility-first approach to ensure a responsive and modern design that adapts seamlessly to various devices and screen sizes.

JavaScript, combined with the React.js framework, is utilized to bring interactivity and dynamic functionality to the system. React.js components are developed for each part of the application, such as the sign-up and login forms, appointment booking system, video consultation interface, and administrative dashboard. These components allow for a modular and reusable codebase, facilitating easier maintenance and scalability.

The process begins with setting up the development environment by installing the necessary dependencies, including Node.js, npm, and React.js. Following this, the project structure is organized, and the React components are created. Tailwind CSS is integrated into the React project by configuring the Tailwind CSS setup file and incorporating Tailwind classes within the React components to style the application effectively.

Next, JavaScript is employed to handle the application's logic, such as form validations, API calls for user authentication, appointment scheduling, and video conferencing functionalities. The interaction between the front end and back end is managed through asynchronous operations using JavaScript's fetch API or libraries like Axios.

Throughout the development process, emphasis is placed on ensuring a smooth user experience. This involves rigorous testing of the interface across different browsers and devices, optimizing the performance of the React components, and continuously refining the user interface based on feedback.

In summary, the implementation of the Online Doctor Appointment System's front-end design integrates HTML for structure, Tailwind CSS for styling, and JavaScript with React.js for interactivity and dynamic content, resulting in a robust, user-friendly, and responsive web application.

4.1.1 Home Page

Home page details:

The home page has a navbar at the top. Brand name is the left side of the navbar. Right side has menu bar. Has a logo and a banner section. Here is a home button that we can use to get home page. Here is an appointment button which we can use to get the appointment page and get appointment. Here is a doctor button which we can use to see doctor information. Here also has a dashboard button which we can use to see our information. Here also has a sign up/login button which we can use to login this website.

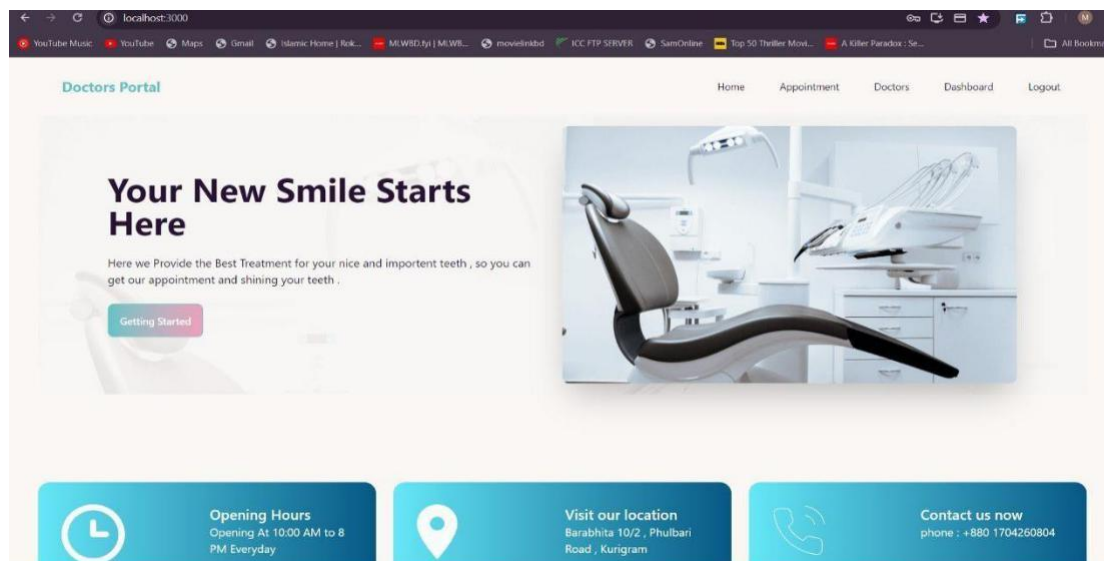


Figure 4.1 : Home Page Structure

4.1.2 Home Page Card Section:

There Three type of card. First card is Opening Hours .Use this Opening Hours card we can see the hospital/diagnostic/doctor opening time. Use Location card can see hospital/diagnostic location. Use contact card can contact with hospital receptionist use mobile phone.

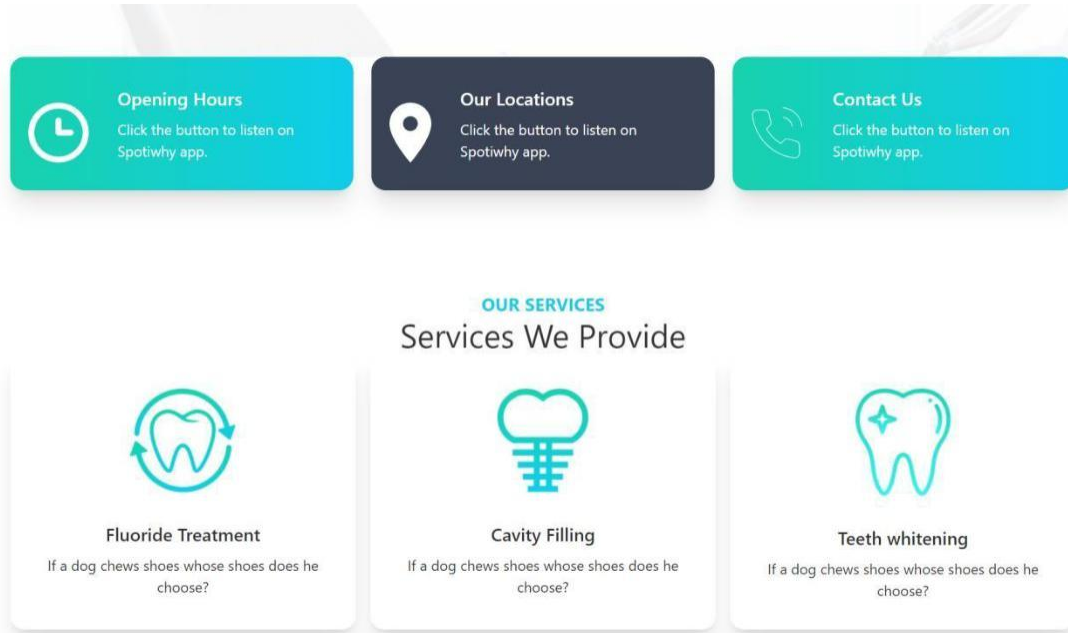


Figure 4.2 : Service and Card Structure

4.1.3 Home Page Banner Section:

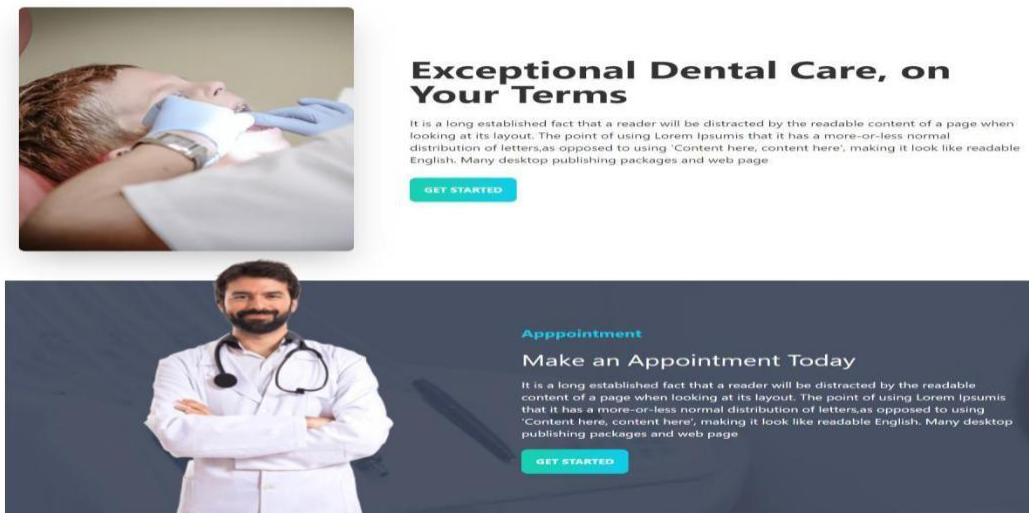


Figure 4.3 : Banner and Appointment Structure

4.1.4 Home Page Contact From and footer:

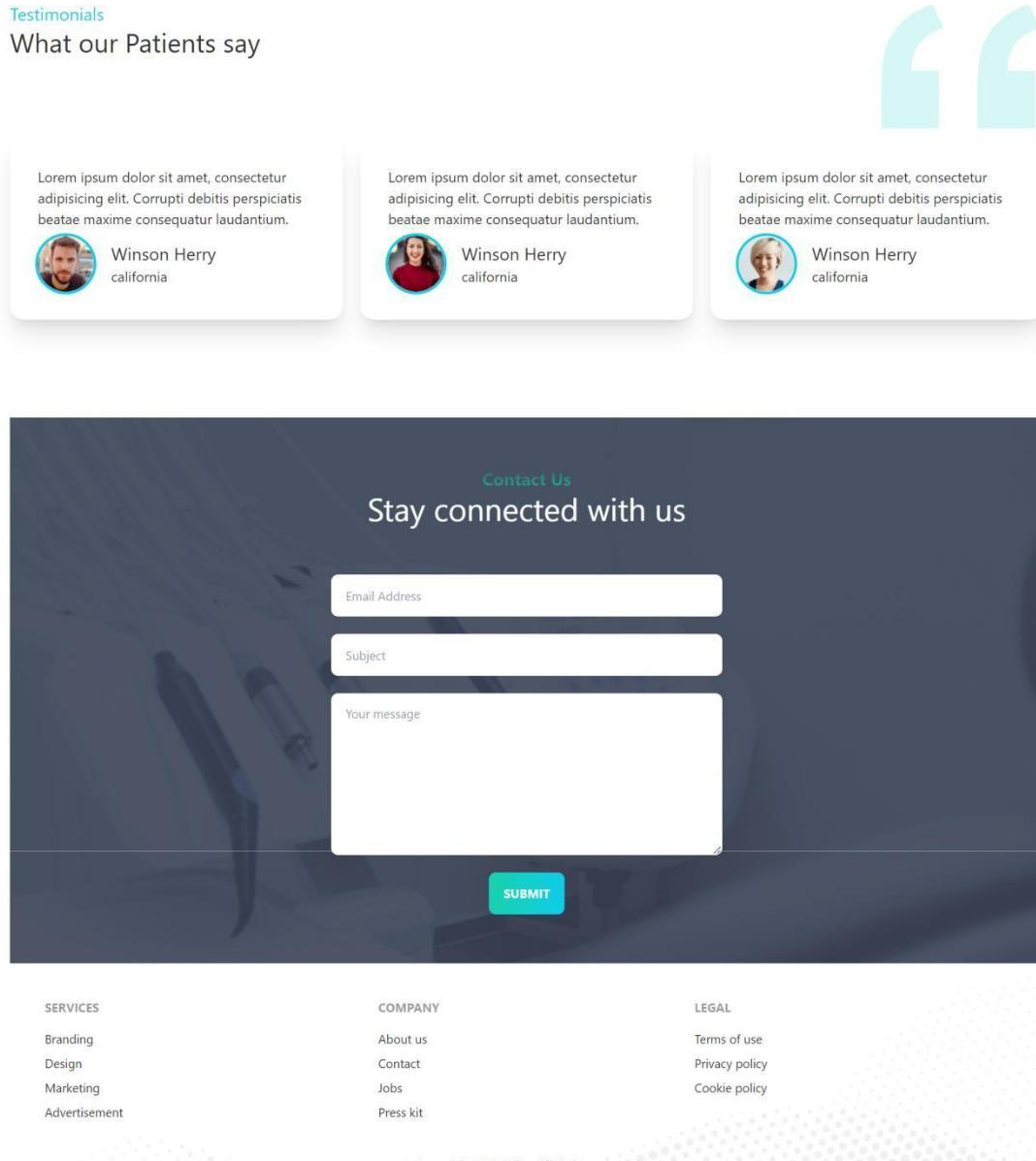


Figure 4.4 : Testimonials and Contact System

4.1.5 Appointment Page:

Appointment has all doctor information. Here can see different type of doctor. Click on the “Get Appointment “ button then a page where we can select appointment date ,time and submit our phone number.

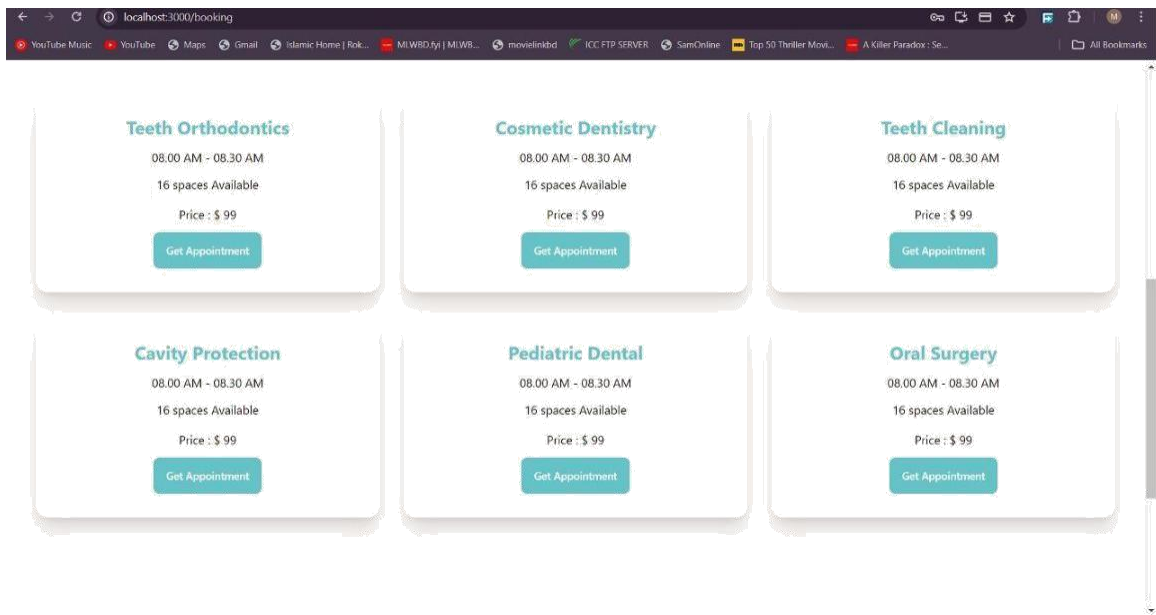


Figure 4.5 : Appointment System

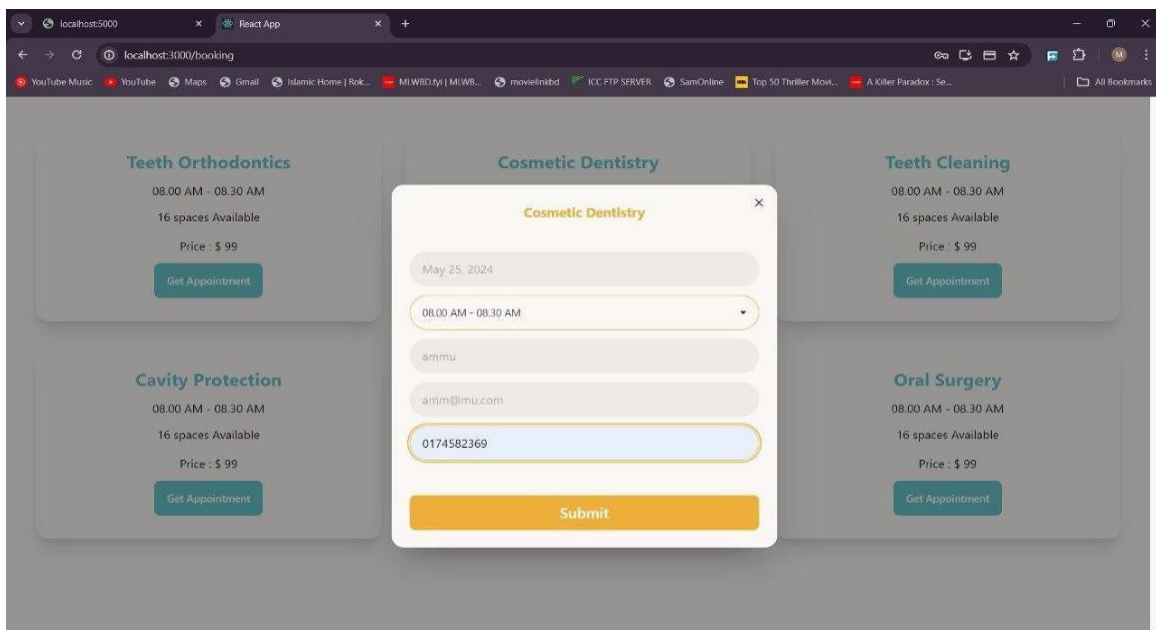


Figure 4.6 : Appointment Card System

4.1.6 Doctor information:

Here is a doctor information page. Where we can easily see doctor's information and talk with doctor through video conference. Clicking on the “Make Meeting” button here will show all the information of that doctor. Anyone can easily consult a doctor through Meet Link .

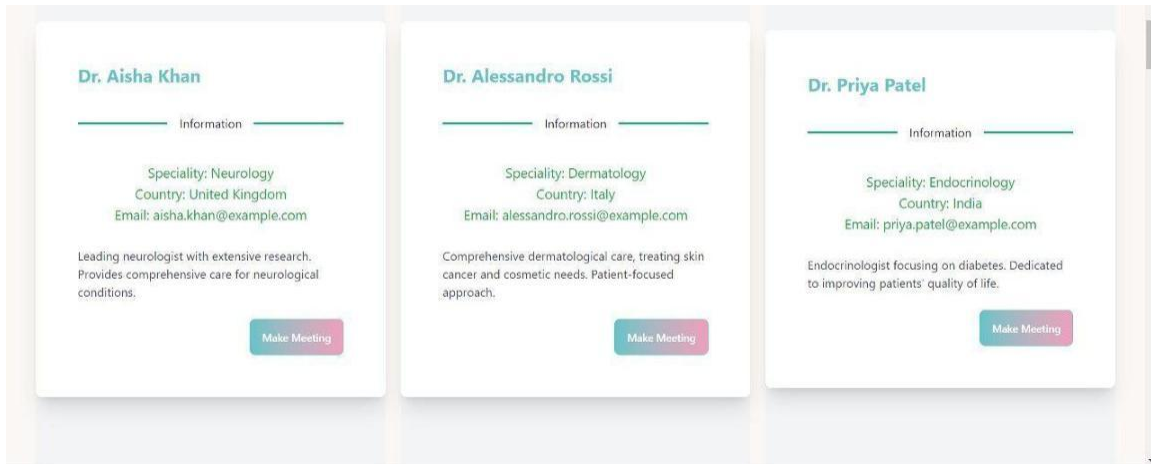


Figure 4.7 : Doctors Details

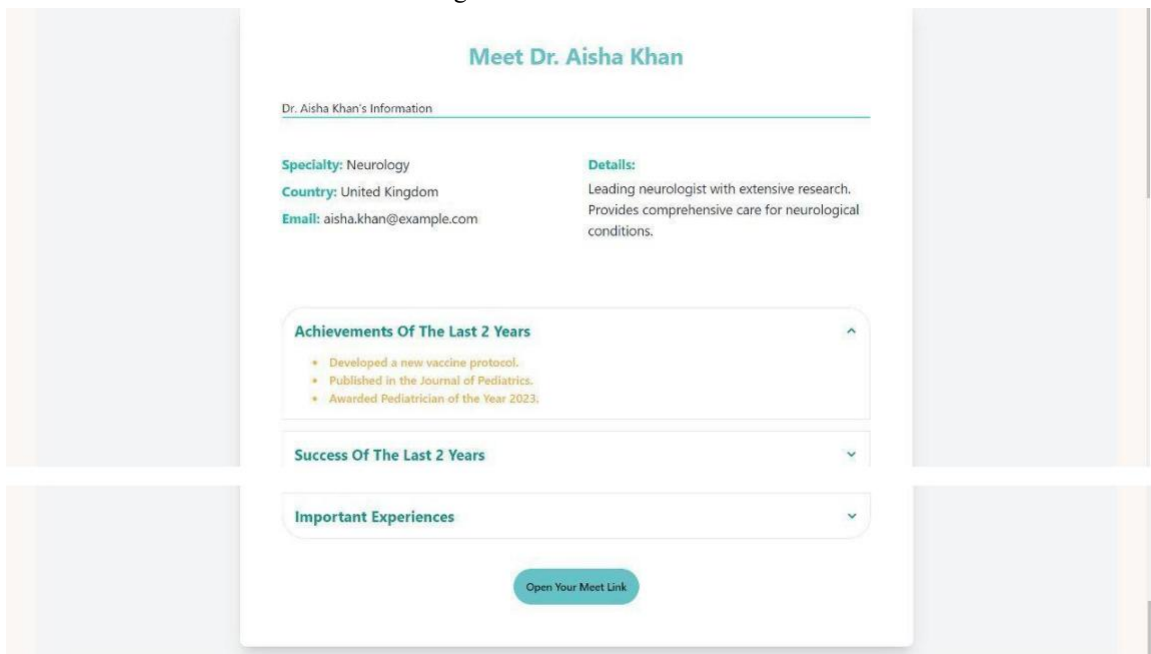


Figure 4.8 : Doctor Details and Achievements

4.1.7 Payment page:

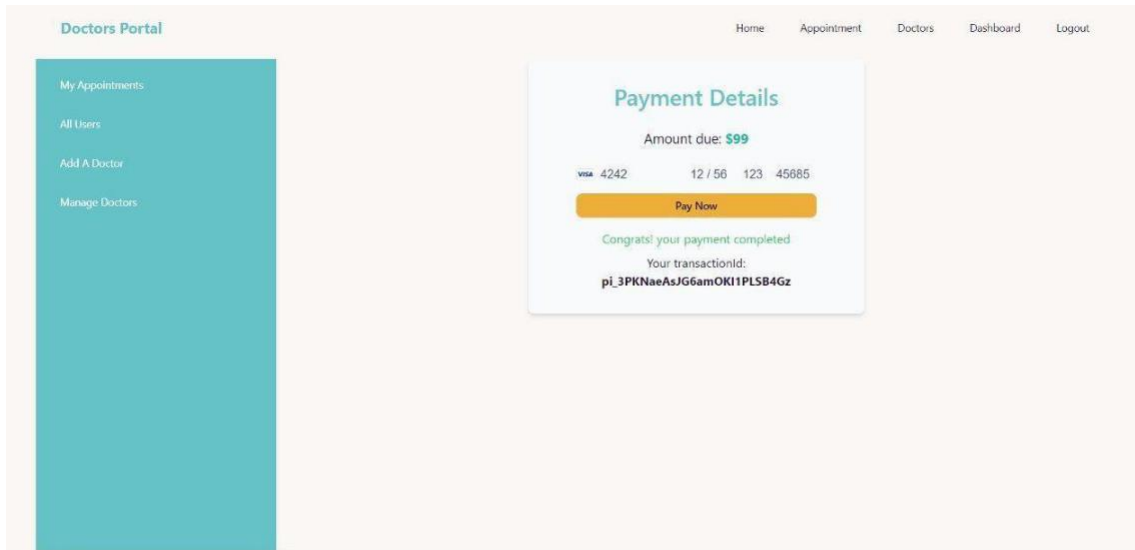


Figure 4.9.1 : Payment System

4.1.8 Patient Dashboard:

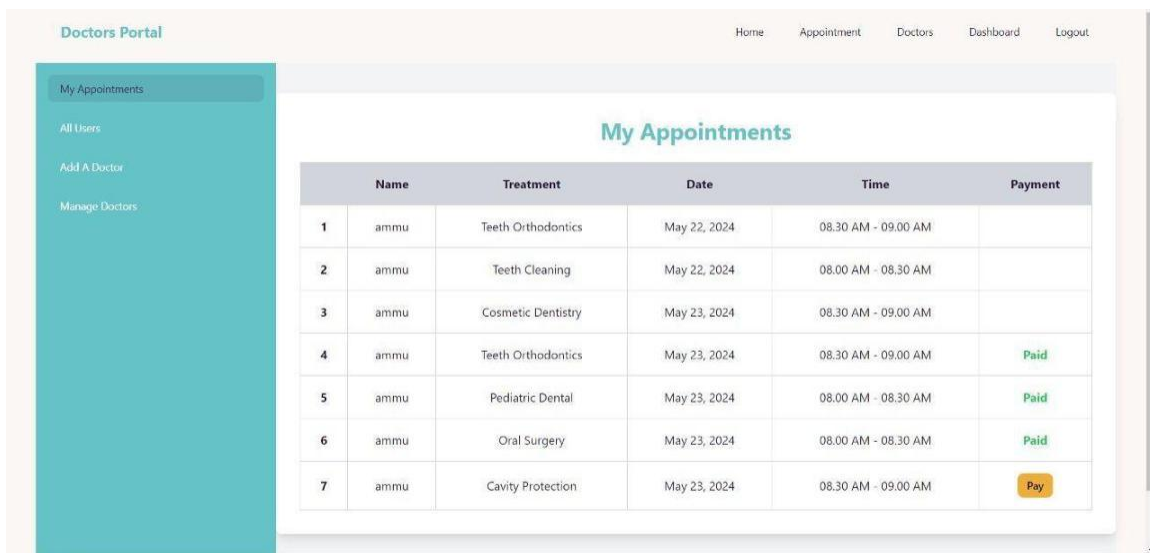
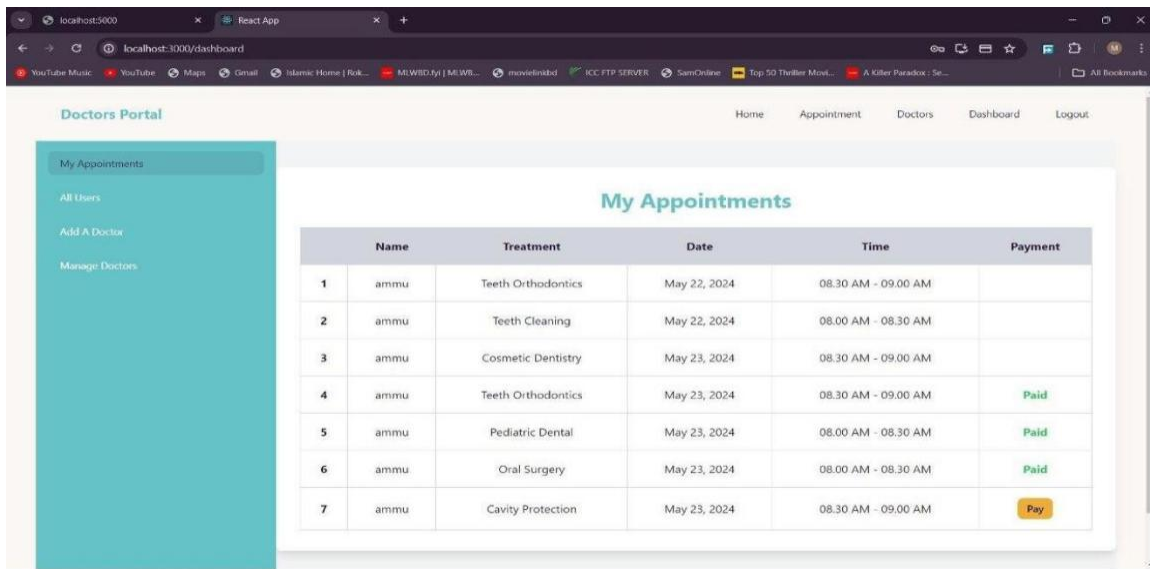


Figure 4.9.2 : User Appointment Details

4.1.9 Admin Dashboard:

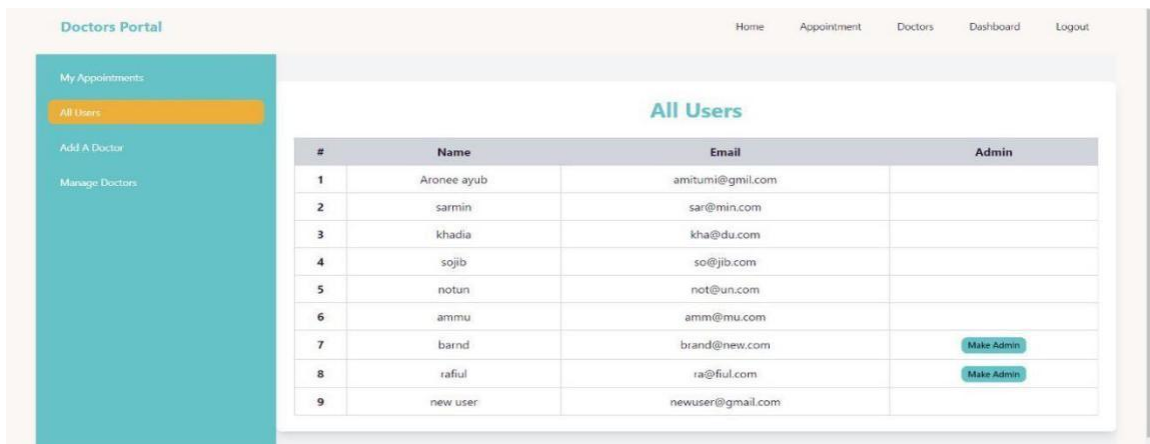
Admin dashboard has Four button of the left side. These buttons are “My Appointments”, “All Users”, “Add A Doctor”, “Manage doctor”. Use “My Appointment” button admin can see all patient’s serial. Use “All Users” button admin can see all user’s information. Here also has ‘Add a doctor’ button use this button admin can add doctor in this website. Here also has a “Manage doctor button” use this button admin can delete doctor form this website.



	Name	Treatment	Date	Time	Payment
1	ammu	Teeth Orthodontics	May 22, 2024	08.30 AM - 09.00 AM	
2	ammu	Teeth Cleaning	May 22, 2024	08.00 AM - 08.30 AM	
3	ammu	Cosmetic Dentistry	May 23, 2024	08.30 AM - 09.00 AM	
4	ammu	Teeth Orthodontics	May 23, 2024	08.30 AM - 09.00 AM	Paid
5	ammu	Pediatric Dental	May 23, 2024	08.00 AM - 08.30 AM	Paid
6	ammu	Oral Surgery	May 23, 2024	08.00 AM - 08.30 AM	Paid
7	ammu	Cavity Protection	May 23, 2024	08.30 AM - 09.00 AM	Pay

Figure 4.9.3 :Admin Appointment Details

4.1.10 All User’s Page:



#	Name	Email	Admin
1	Aronee ayub	amitumi@gmail.com	
2	sarmin	sar@min.com	
3	khadia	kha@du.com	
4	sojib	so@jib.com	
5	notun	not@un.com	
6	ammu	amm@mu.com	
7	barnd	brand@new.com	Make Admin
8	rafiul	ra@fiul.com	Make Admin
9	new user	newuser@gmail.com	

Figure 4.9.4 : Managed User Section for Admin

4.1.11 Add Doctor Page:

Only admin use this page and can add doctor on this website.

Doctors Portal

Home Appointment Doctors Dashboard Logout

My Appointments

All Users

Add A Doctor

Manage Doctors

Add A Doctor

Name

Email

Specialty

Teeth Orthodontics

Photo

Choose File No file chosen

Add Doctor

localhost:3000/dashboard/adddoctor

Figure 4.9.5 : Add Doctor System for Admin

4.1.12 Manage Doctor Page:

Only admin can use this website and can remove doctor from this website.

Doctors Portal

Home Appointment Doctors Dashboard Logout

My Appointments

All Users

Add A Doctor

Manage Doctors

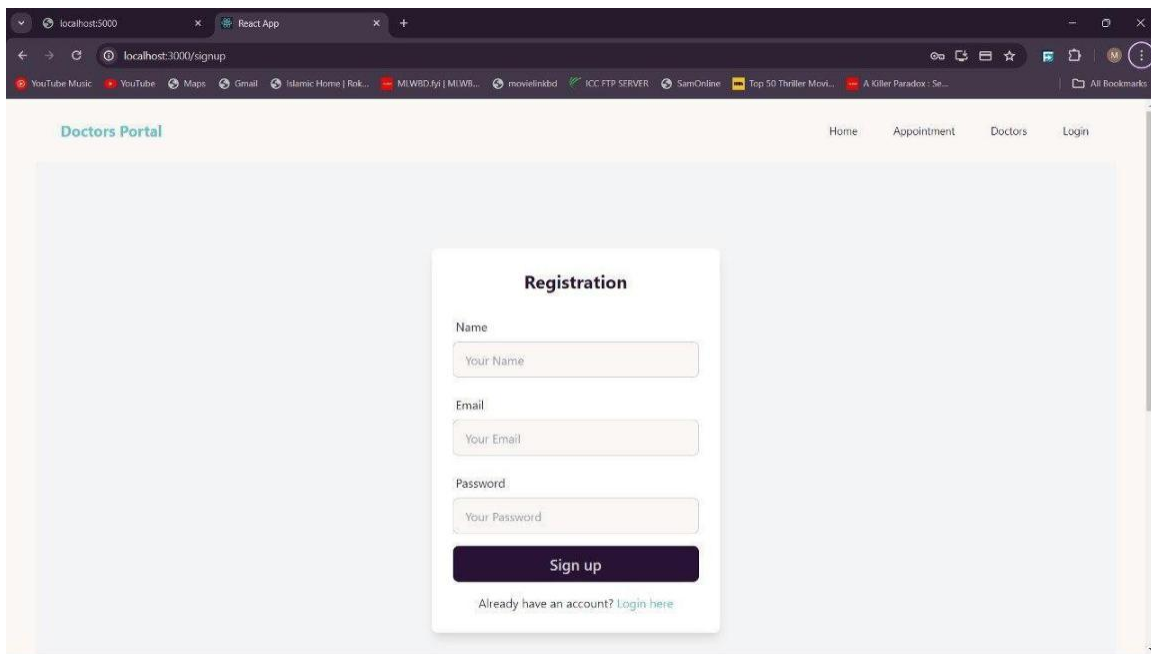
Manage Doctors: 2

	Avatar	Name	Email	Specialty	Action
1		Aronee	amitumi@gmail.com	Pediatric Dental	Delete
2		Dr. Amzad	amin@yopmail.com	Cosmetic Dentistry	Delete

localhost:3000/dashboard/managedoctors

Figure 4.9.6 : Added Doctor Details

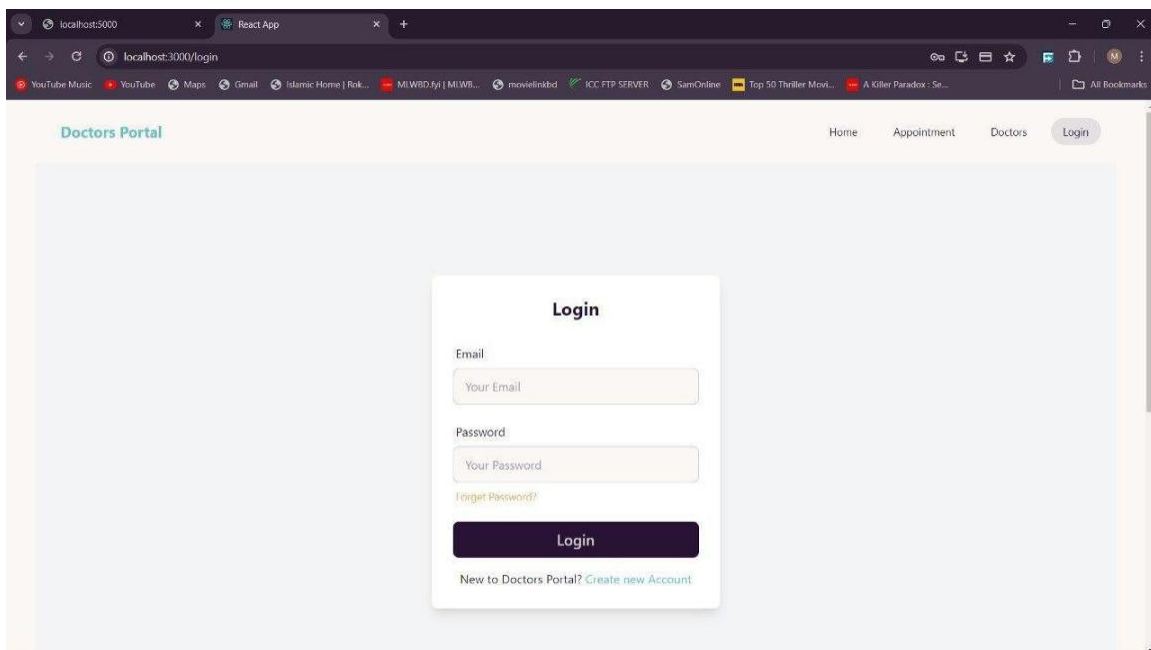
4.1.13 Registration Page:



The screenshot shows a web browser window with the address bar displaying 'localhost:3000/signup'. The page title is 'Doctors Portal'. The navigation bar includes links for 'Home', 'Appointment', 'Doctors', and 'Login'. The main content area features a central white card titled 'Registration'. This card contains three input fields labeled 'Name', 'Email', and 'Password', each with placeholder text 'Your Name', 'Your Email', and 'Your Password' respectively. Below these fields is a dark blue 'Sign up' button. At the bottom of the card, there is a link that says 'Already have an account? [Login here](#)'.

Figure 4.10 : Registration Page

4.1.14 Login Page:



The screenshot shows a web browser window with the address bar displaying 'localhost:3000/login'. The page title is 'Doctors Portal'. The navigation bar includes links for 'Home', 'Appointment', 'Doctors', and 'Login'. The main content area features a central white card titled 'Login'. This card contains two input fields labeled 'Email' and 'Password', each with placeholder text 'Your Email' and 'Your Password' respectively. Below the password field is a link that says 'I forgot Password?'. Below these fields is a dark blue 'Login' button. At the bottom of the card, there is a link that says 'New to Doctors Portal? [Create new Account](#)'.

Figure 4.11 : Login Page

4.2 Backend design

For the backend implementation of the Online Doctor Appointment System, Node.js, Express.js, and MongoDB database are utilized to create a scalable, efficient, and secure web application. Node.js serves as the runtime environment, providing a non-blocking, event-driven architecture that enables handling multiple concurrent connections efficiently. Express.js, a web application framework for Node.js, simplifies the process of building robust APIs by providing a streamlined and minimalist approach to server-side development.

The implementation process begins with setting up the Node.js environment and installing necessary packages using npm, including Express.js for routing, middleware, and request handling. Express.js routes are defined to handle different HTTP requests from the front end, such as user authentication, appointment scheduling, and data retrieval from the MongoDB database.

MongoDB, a NoSQL database, is chosen for its flexibility, scalability, and ease of integration with Node.js applications. It stores user profiles, appointment details, medical records, and other relevant data in a structured format. Mongoose, an Object Data Modeling (ODM) library for MongoDB and Node.js, is employed to define schemas, models, and interact with the MongoDB database. This allows for seamless communication between the Node.js application and the MongoDB database, enabling CRUD (Create, Read, Update, Delete) operations and ensuring data consistency and integrity.

User authentication and authorization are implemented using techniques such as JSON Web Tokens (JWT) and bcrypt for password hashing. When a user signs up or logs in, their credentials are validated, and a JWT token is generated and returned to the client for subsequent authenticated requests. Middleware functions are used to verify the authenticity of JWT tokens and grant access to protected routes.

Additionally, error handling middleware and validation middleware are implemented to ensure robustness and reliability. Error responses are formatted appropriately and returned to the client, providing meaningful feedback in case of unexpected errors or invalid requests.

Throughout the development process, testing and debugging are conducted rigorously to identify and resolve any issues or inconsistencies. Automated testing frameworks such as Mocha and Chai may be used to write unit tests and integration tests to validate the functionality of the backend APIs.

In summary, the backend implementation of the Online Doctor Appointment System leverages Node.js, Express.js, and MongoDB to create a scalable, efficient, and secure web application. By following best practices in server-side development, such as proper data validation, error handling, and security measures, the system ensures reliability, performance, and usability for users.

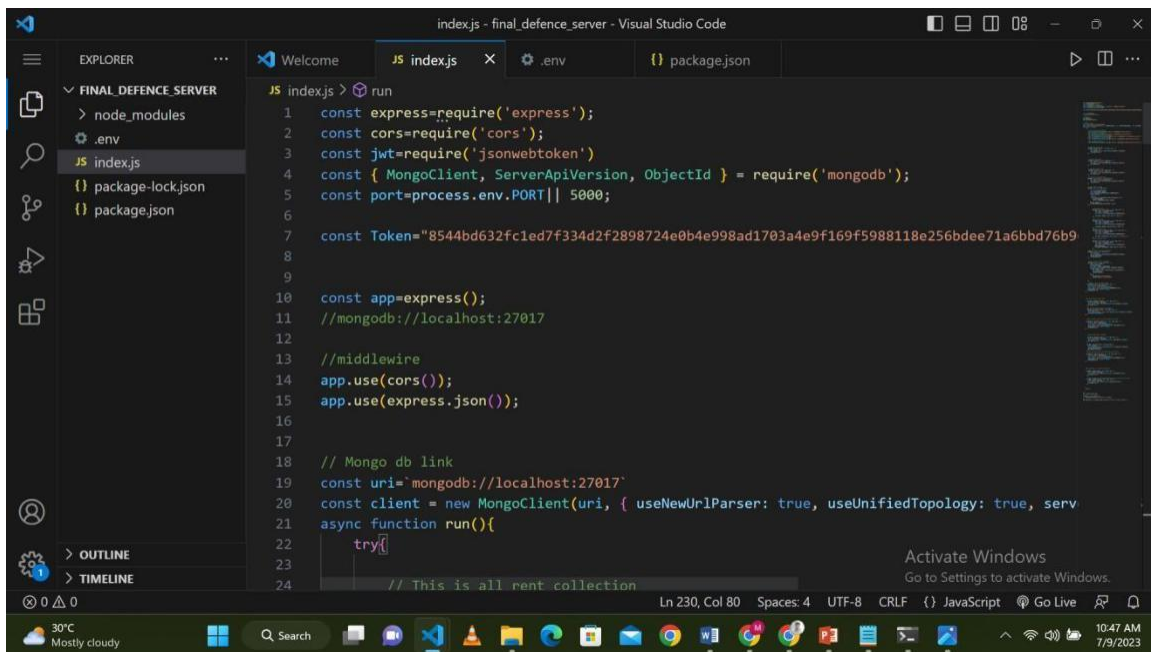


Figure 4.12 : Back-end Coding Structure

4.3 Interaction Design & UX:

I used React.js and tailwind for this website. The interaction design and user experience (UX) of the Online Doctor Appointment System have been meticulously crafted to ensure a seamless and intuitive user journey. Leveraging React.js for the front end, the system offers a dynamic and responsive interface that adapts smoothly to various devices, enhancing accessibility for all users. Tailwind CSS has been utilized to create a modern and visually appealing design, ensuring that the interface is not only functional but also aesthetically pleasing. For the backend, Node.js ensures robust and efficient data handling, enabling quick and secure access to patient and doctor information. The UX design focuses on simplicity and clarity, allowing patients to easily navigate through appointment booking, video consultations, and accessing medical records. Doctors can effortlessly manage their schedules and view patient information, while admins have streamlined controls for user management. Overall, the system prioritizes user satisfaction by delivering a cohesive and engaging experience, promoting ease of use and efficiency in healthcare management.

4.4 Implementation Requirements

The implementation of the Online Doctor Appointment System necessitates a robust technological infrastructure and a set of specific requirements to ensure its efficient functioning. For the front-end development, React.js is used to build a dynamic and responsive user interface, which requires a modern web browser and a reliable internet connection to deliver optimal performance. Tailwind CSS is employed to maintain a consistent and appealing design across the platform. On the backend, Node.js is utilized to handle server-side operations, requiring a server environment capable of running Node.js applications. The system also demands a secure database, such as MongoDB or MySQL, to store patient and doctor information, ensuring data integrity and security. Additionally, the implementation requires WebRTC or a similar technology for enabling video conferencing capabilities. Proper security measures, including SSL certificates, authentication protocols, and encryption methods, are essential to protect sensitive user data. Lastly, a dedicated team of developers, designers, and IT support personnel is required to maintain and update the system, ensuring it runs smoothly and remains secure against potential threat.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of database

The database implementation for the Online Doctor Appointment System plays a crucial role in storing, managing, and retrieving various types of data, including user profiles, appointment details, medical records, and administrative information. MongoDB, a NoSQL database, is chosen for its flexibility, scalability, and ease of integration with Node.js applications.

Schema Design:

The database schema is designed to reflect the structure of the application and ensure efficient storage and retrieval of data. MongoDB's flexible schema allows for dynamic document structures, enabling the accommodation of diverse data types and relationships. The schema design includes collections for users (patients, doctors, administrators), appointments, prescriptions, medical records, and system settings.

Data Modeling:
Mongoose, an Object Data Modeling (ODM) library for MongoDB and Node.js, is utilized to define schemas, models, and interact with the MongoDB database. Each data entity in the system, such as users and appointments, is represented by a Mongoose schema, which specifies the structure, data types, and validation rules for documents stored in the database. Relationships between different entities are established using references or embedding as appropriate, ensuring data integrity and consistency.

CRUD Operations:

The database implementation supports CRUD (Create, Read, Update, Delete) operations to enable seamless interaction with the data. Node.js and Express.js routes are defined to handle HTTP requests from the front end, such as creating new user profiles, retrieving appointment details, updating medical records, and deleting user accounts. Mongoose methods are used to perform database operations, including querying, inserting, updating, and deleting documents based on the specified criteria.

Indexing and Query Optimization:

To improve query performance and optimize data retrieval, appropriate indexing strategies are employed for frequently accessed fields and queries. Compound indexes are created to support efficient querying of complex data structures and relationships. Query optimization techniques, such as query profiling and analysis, are applied to identify and address performance bottlenecks, ensuring optimal database performance under varying workloads.

Security and Compliance:

Data security measures, including encryption, access control, and data validation, are implemented to protect sensitive information and comply with regulatory requirements such as HIPAA (Health Insurance Portability and Accountability Act). User authentication and authorization mechanisms are integrated to ensure that only authorized users can access and modify data, preventing unauthorized access and data breaches.

Backup and Recovery:

Regular database backups are performed to safeguard against data loss and ensure data integrity. Backup schedules, retention policies, and disaster recovery plans are established to minimize the impact of potential data loss events such as hardware failures, software errors, or accidental deletions. Backup data is stored securely and can be restored as needed to maintain business continuity and service availability.

By implementing a robust database infrastructure with MongoDB and adhering to best practices in schema design, data modeling, CRUD operations, query optimization, security, and compliance, the Online Doctor Appointment System ensures efficient and reliable data management, supporting the delivery of high-quality healthcare services to patients, doctors, and administrators.

5.2 Implementation of interaction

The interaction details implementation in the Online Doctor Appointment System focuses on providing a seamless and intuitive user experience for patients, doctors, and administrators. Leveraging HTML, CSS, JavaScript, and the React.js framework, the system offers a responsive and interactive interface that facilitates efficient navigation and task completion.

Frontend Interaction Design:

1. User Authentication and Authorization:

User authentication mechanisms, such as login forms and registration pages, allow users to securely access the system.

Authorization controls ensure that users have appropriate permissions to access specific features and functionalities based on their roles (patient, doctor, admin).

2. Appointment Booking and Management:

Interactive calendars and scheduling interfaces enable patients to browse available appointment slots, select preferred dates and times, and book appointments with doctors. Real-time updates and notifications keep users informed about appointment confirmations, cancellations, and rescheduling.

3. Video Consultation Interface:

A user-friendly video conferencing interface facilitates seamless communication between doctors and patients during virtual consultations.

Interactive features such as chat boxes, screen sharing options, and file uploads enhance the collaboration and information exchange process.

4. Medical Record Access and Management:

Intuitive dashboards and menus allow users to access and manage their medical records, including past appointments, prescriptions, lab results, and treatment histories. Interactive data visualization tools may be incorporated to present medical information in a clear and comprehensible manner.

5. Administrative Functions:

Administrative interfaces provide administrators with tools to manage user profiles, appointments, and system settings.

Interactive forms and controls enable administrators to add, edit, or remove user accounts, update appointment schedules, and configure system preferences.

Backend Interaction Design:

1. API Endpoints and Routing:

Express.js routes define API endpoints that handle incoming requests from the frontend, such as user authentication, appointment booking, and data retrieval.

Middleware functions implement logic for request preprocessing, authentication, authorization, and response formatting.

2. Database Interaction:

MongoDB queries and Mongoose models facilitate interaction with the database, allowing for efficient retrieval, insertion, updating, and deletion of data.

Data validation and error handling mechanisms ensure data integrity and reliability.

3. External Service Integration:

Integration with external services, such as video conferencing platforms or third-party APIs for SMS notifications and email alerts, enhances system functionality and user experience.

4. Real-time Communication:

WebSocket connections or server-sent events (SSE) may be implemented to enable realtime communication between the frontend and backend, supporting features like live chat and instant notifications.

By focusing on frontend and backend interaction design principles, the Online Doctor Appointment System delivers a user-centric experience that prioritizes usability, efficiency, and reliability, ultimately enhancing the accessibility and effectiveness of healthcare services for all stakeholders.

5.3 Implementation Test:

Testing is an integral part of the implementation process for the Online Doctor Appointment System, ensuring that the application functions as intended, meets user requirements, and maintains reliability and performance. The testing strategy encompasses various types of testing, including unit testing, integration testing, and end-to-end testing, to validate different aspects of the system's functionality and behavior.

Unit testing involves testing individual components or modules in isolation to verify their correctness and functionality. For the Online Doctor Appointment System, unit tests are written using testing frameworks such as Jest or Mocha to validate the behavior of functions, methods, and React components. Mocking libraries like Sinon or Jest Mocks are used to simulate dependencies and isolate components for testing.

Integration testing focuses on testing the interactions and integration between different components or subsystems of the application. Integration tests are written to verify that various modules work together harmoniously and that data flows correctly between different layers of the system. API endpoints, database interactions, and external service integrations are thoroughly tested to ensure seamless communication and interoperability. End-to-end testing involves testing the entire application flow from start to finish, simulating real-world user interactions and scenarios. Automated end-to-end tests are written using tools like Selenium or Cypress to mimic user actions such as navigating through the application, filling out forms, and interacting with UI elements. These tests validate the overall functionality, usability, and performance of the system across different user roles and use cases.

Additionally, manual testing may be conducted to supplement automated testing efforts, allowing for exploratory testing, usability testing, and validation of edge cases and corner scenarios that may not be covered by automated tests. Feedback from users and stakeholders is also incorporated into the testing process to identify usability issues, bugs, and areas for improvement.

By implementing a comprehensive testing strategy encompassing unit testing, integration testing, end-to-end testing, and manual testing, the Online Doctor Appointment System

Features	Priority	Description
Login	L	After login user should access the system
Logout	L	After logout session have to destroyed
Assign Doctor	M	Admin can assign doctor
Patient profile	M	Admin and doctor can browse profile
Doctor profile	M	Admin can browse doctor profile
Book appointment	M	Patients can book appointment
My profile	L	Patients, admin and doctor can edit his/her profile
Appointment list	H	This is most important part doctor, patients and admin everyone knows his/her appointment
Approved appointment	H	Doctor can approve appointment
Cancel appointment	H	Doctor can cancel patient appointment
Message	H	Doctor and patient message each other
Video conferencing	H	Doctor and patient video call each other

Table:5.3 Testing implementation

5.4 Test Case Scenario:

SN	Test Name	Input	Expected Result	Actual Result	Test Result
1	User Sign-Up - Valid Data	Enter valid sign-up details (e.g., name, email, password)	User is successfully registered and redirected to the login page.	User successfully registered and redirected to the login page.	Pass
2	User Sign-Up - Invalid Data	Enter invalid sign-up details (e.g., invalid email format, short password)	User receives an error message and is prompted to correct the data.	Error message displayed, prompting user to correct the data.	Pass
3	User Login - Valid Credentials	Enter valid username and password	User is successfully logged in and redirected to their dashboard.	User successfully logged in and redirected to their dashboard.	Pass
4	User Login - Invalid Credentials	Enter invalid username or password	User receives an error message indicating invalid credentials.	Error message displayed, indicating invalid credentials.	Pass
5	Book Appointment - Valid Data	Log in as a patient, select doctor, date, and time	Appointment is successfully booked and a confirmation message is displayed.	Appointment successfully booked, confirmation message displayed.	Pass
6	Book Appointment - Invalid Data	Log in as a patient, enter invalid data (e.g., select a past date)	User receives an error message indicating invalid data.	Error message displayed, indicating invalid data.	Pass
7	Start Video Conference - Valid Appointment	Log in as a doctor, click "Start Video Conference" for a valid appointment	Video conference starts successfully.	Video conference started successfully.	Pass
8	Start Video Conference - No	Log in as a doctor, attempt to	User receives an error message indicating no valid	Error message displayed, indicating no valid	Pass

	Appointment	start a video conference for a non-existent or invalid appointment	appointment.	appointment.	
9	Admin - Add User	Log in as an admin, enter details for a new user (e.g., doctor, patient)	New user is successfully added to the system.	New user successfully added to the system.	Pass

Table:5.4 Test Case Scenario

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

The implementation of the Online Doctor Appointment System holds significant promise for both rural and urban areas of Bangladesh, addressing unique challenges and providing transformative benefits tailored to the specific needs of each region.

Impact on Rural Areas: Improved Healthcare Access: Rural areas often face challenges in accessing quality healthcare due to geographical remoteness and limited healthcare infrastructure. The Online Doctor Appointment System brings healthcare services closer to rural communities by allowing residents to schedule appointments with doctors remotely, eliminating the need for long and costly journeys to urban centers.

Reduced Healthcare Disparities: Rural populations in Bangladesh often experience disparities in healthcare access compared to urban areas. By providing virtual consultations and medical advice through the system, individuals in rural areas can receive timely healthcare services that were previously inaccessible, reducing disparities and improving health outcomes.

Enhanced Preventive Care: Preventive care is crucial for rural populations to mitigate the impact of common health challenges such as infectious diseases and malnutrition. The system can facilitate remote health monitoring, provide access to educational resources, and enable early detection and intervention, empowering rural residents to prioritize preventive healthcare measures.

Increased Healthcare Efficiency: In rural areas where healthcare resources are limited, the system can streamline healthcare delivery processes, optimize resource utilization, and improve efficiency. By digitizing appointment scheduling, medical record management, and teleconsultations, healthcare providers can deliver more timely and effective care to rural communities, maximizing the impact of available resources.

Impact on Urban Areas: Convenience and Time Savings: Urban residents often face long wait times and overcrowded healthcare facilities, leading to inconvenience and delays in accessing care. The Online Doctor Appointment System offers urban dwellers a convenient and time-saving alternative by enabling them to book appointments and consult with doctors remotely, reducing wait times and improving overall patient experience.

Reduced Healthcare Costs: Urban areas in Bangladesh can experience high healthcare costs, particularly for transportation and lost productivity due to time spent traveling to

and waiting at healthcare facilities. By offering virtual consultations and minimizing the need for physical visits, the system helps urban residents save on transportation expenses and reduces the economic burden associated with seeking healthcare services.

Enhanced Specialist Access: Access to specialized healthcare services, such as consultations with specialists or diagnostic tests, can be limited in urban areas due to resource constraints and high demand. The system facilitates easier access to specialist care by connecting urban residents with a network of healthcare providers, including specialists, thereby improving health outcomes and treatment options.

Support for Vulnerable Populations: Urban areas are often home to vulnerable populations, including low-income individuals, migrant workers, and marginalized communities. The system's accessibility and affordability make it an invaluable resource for these populations, providing a lifeline for those who may face barriers to accessing traditional healthcare services.

Overall, the Online Doctor Appointment System has the potential to make a profound impact on both rural and urban areas of Bangladesh, transforming the delivery of healthcare services, reducing disparities, and improving health outcomes for millions of people across the country.

6.2 Impact on Environment

While the primary focus of the Online Doctor Appointment System is to improve healthcare accessibility and efficiency, its implementation can also have positive indirect impacts on the environment. Although the project's environmental impact may not be as direct as initiatives in sectors like renewable energy or waste management, it still contributes to sustainability in several ways:

Reduction in Carbon Emissions:

Decreased Travel: By enabling patients to consult with doctors remotely through video conferencing, the system reduces the need for physical travel to healthcare facilities. This results in fewer vehicles on the road, leading to lower emissions of greenhouse gases and air pollutants associated with transportation.

Optimized Resource Utilization:

Efficient appointment scheduling and management help minimize wait times at healthcare facilities, reducing the idling of vehicles and the associated emissions. Additionally, by streamlining administrative processes and reducing paperwork, the system contributes to overall resource conservation and environmental sustainability.

Conservation of Natural Resources:

Paperless Operations: The digitization of appointment booking, medical records, and prescriptions reduces the need for paper-based documentation and administrative paperwork. This conservation of paper resources helps mitigate deforestation and reduces the environmental impact associated with paper production, including water usage and chemical pollutants.

Energy Efficiency:

Hosting the Online Doctor Appointment System on cloud-based servers enables more efficient use of computing resources compared to traditional on-premises infrastructure. Cloud computing providers often prioritize energy-efficient data centers and employ technologies to optimize energy consumption, resulting in reduced energy usage and carbon emissions compared to self-hosted solutions.

Promoting Sustainable Practices:

Awareness and Education: The Online Doctor Appointment System can serve as a platform for raising awareness about environmental issues and promoting sustainable healthcare practices. By incorporating educational resources and information on topics such as public health, environmental sustainability, and preventive healthcare, the system empowers users to make informed decisions about their health and lifestyle choices.

Corporate Social Responsibility:

Organizations involved in the development and implementation of the Online Doctor Appointment System can demonstrate their commitment to environmental stewardship

through corporate social responsibility initiatives. By prioritizing sustainable business practices, including energy-efficient operations, waste reduction, and community engagement, these organizations can minimize their environmental footprint and contribute to a healthier planet.

While the environmental impact of the Online Doctor Appointment System may be indirect, its contribution to reducing carbon emissions, conserving natural resources, promoting sustainable practices, and raising awareness about environmental issues underscores the importance of integrating environmental considerations into digital healthcare solutions. By embracing sustainability principles, the project aligns with global efforts to address climate change and build a more resilient and sustainable future for all.

6.3 Ethical Aspects

Ethical considerations are paramount in the implementation of the Online Doctor Appointment System. Privacy and data security measures must be robust to safeguard sensitive medical information and ensure patient confidentiality. Transparency regarding data usage and consent is essential, with clear policies in place to inform users about how their data will be collected, stored, and utilized. Additionally, the system should prioritize equity and inclusivity, ensuring that all individuals, regardless of socioeconomic status or background, have equal access to healthcare services. Ethical guidelines should govern interactions between patients and healthcare providers, promoting professionalism, respect, and empathy in virtual consultations. Overall, adherence to ethical principles such as autonomy, beneficence, and justice is crucial in ensuring the integrity and trustworthiness of the Online Doctor Appointment System.

6.4 Sustainable Plan

The sustainable plan for the Online Doctor Appointment System prioritizes environmental, social, and economic considerations. Energy-efficient infrastructure and paperless operations minimize carbon emissions and waste. Equitable access ensures all individuals can benefit, while community engagement fosters collaboration with local healthcare providers and NGOs. Cultural sensitivity and diverse language options accommodate various user needs. Cost-effective strategies, such as leveraging open-source technologies and exploring revenue models, ensure financial viability. Long-term

maintenance plans, including regular updates and technical support, guarantee system longevity. By integrating these principles, the project aims to create a sustainable healthcare ecosystem that prioritizes environmental stewardship, social equity, and economic resilience.

CHAPTER 7

CONCLUTION AND FUTURE SCOPE

7.1 Discussion and conclusion

The Online Doctor Appointment System represents a significant advancement in healthcare technology, offering patients, doctors, and administrators a streamlined platform for appointment scheduling, medical consultations, and data management. By leveraging digital tools and innovative solutions, the project addresses key challenges in healthcare accessibility, efficiency, and quality, particularly in Bangladesh's rural and urban areas.

Through features such as video consultations, electronic medical records, and appointment reminders, the system enhances patient convenience, reduces healthcare disparities, and improves overall health outcomes. Additionally, administrative functionalities empower healthcare providers to optimize resource utilization, streamline operations, and deliver more effective care. Furthermore, the project's emphasis on sustainability, ethics, and social responsibility underscores its commitment to creating a healthcare ecosystem that prioritizes environmental stewardship, patient confidentiality, and equitable access to healthcare services. In conclusion, the Online Doctor Appointment System has the potential to revolutionize the delivery of healthcare services in Bangladesh and beyond. By harnessing the power of technology and embracing principles of sustainability and ethics, the project offers a scalable and innovative solution to address the evolving needs of patients, healthcare providers, and communities. Moving forward, continued collaboration with stakeholders, ongoing monitoring and evaluation, and iterative improvements based on user feedback will be essential to ensure the system's success and sustainability in the long term. Ultimately, the Online Doctor Appointment System represents a significant step towards building a more accessible, efficient, and equitable healthcare system that benefits individuals, communities, and society as a whole.

7.2 Scope of Further Development

The Online Doctor Appointment System lays a strong foundation for further development and expansion, offering opportunities to enhance its functionality, usability, and impact on healthcare delivery. Future development efforts could focus on several key areas to maximize the system's potential and address evolving user needs.

Enhanced Telemedicine Features: Expanding telemedicine capabilities to include additional features such as remote monitoring, telepsychiatry, and tele-rehabilitation can broaden the scope of services offered through the platform, catering to a wider range of medical specialties and patient needs.

Integration with Wearable Devices: Integrating the system with wearable devices and IoT (Internet of Things) sensors enables real-time health monitoring and data collection, empowering patients and healthcare providers with valuable insights into health trends and behaviors.

Artificial Intelligence and Data Analytics: Leveraging AI (Artificial Intelligence) algorithms and data analytics tools can enhance decision-making processes, personalized treatment recommendations, and predictive modeling for disease prevention and management.

Expansion to New Markets: Expanding the system's reach to new markets, both domestically and internationally, presents opportunities for growth and scalability. This may involve localization efforts to accommodate diverse languages, cultures, and regulatory requirements.

Patient Engagement and Education: Implementing features to promote patient engagement, such as health education resources, wellness programs, and gamification elements, fosters proactive healthcare management and encourages healthier lifestyles.

Blockchain for Data Security: Integrating blockchain technology for enhanced data security, integrity, and privacy protection can further safeguard patient information and mitigate cybersecurity risks associated with centralized data storage. Collaboration with Healthcare Ecosystem: Collaborating with other stakeholders in the healthcare ecosystem, including hospitals, clinics, pharmacies, and insurance providers, fosters interoperability and seamless data exchange, facilitating holistic patient care and continuity of treatment. By prioritizing these areas of further development, the Online Doctor Appointment System can evolve into a comprehensive healthcare platform that revolutionizes the delivery of medical services, improves patient outcomes, and contributes to the advancement of healthcare globally.

REFERENCE

- [1] "Document Instruction for Make This Web Model," W3Schools, [Online]. Available: <https://www.w3schools.com/html/>, <https://www.w3schools.com/css/>. Accessed: Jul. 9, 2023.
- [2] "For Styling My Website Component Design I Used DaisyUI," DaisyUI, [Online]. Available: <https://daisyui.com/>. Accessed: July. 9, 2024.
- [3] "For Styling My Website Design I Used TailwindCSS," TailwindCSS, [Online]. Available: <https://tailwindcss.com/>. Accessed: July. 9, 2024.
- [4] "For Styling My Website Font Design Used Google Fonts," Google Fonts, [Online]. Available: <https://fonts.google.com/>. Accessed: July. 9, 2024.
- [5] "Material Source and Documentation for Storing Data Format is NoSQL ," MongoDB, [Online]. Available: <https://www.mongodb.com/>. Accessed: July. 9, 2024.
- [6] "Material Source and Documentation ," Node.js, Express, [Online]. Available: <https://nodejs.org/en>, <https://expressjs.com/>. Accessed: July. 9, 2024.
- [7] Wikipedia, [Online]. Available: <https://www.wikipedia.org/>. Accessed: May 20, 2024.

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