

HealthCare+



College of Arts, Commerce & Science

A Project Report

Submitted in partial fulfillment of the
Requirements for the award of the Degree of

Bachelor of Computer Applications (BCA)

of

Kavikulaguru Kalidas Sanskrit University

Submitted by

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Kavikulaguru Kalidas Sanskrit University's

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Vashi

BATCH: 2022-2025



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CERTIFICATE

This is to certify that the project entitled undertaken at the PCP Center: Bakliwal Foundation College of Arts, Commerce & science, Vashi, Navi Mumbai by **MR. DARSHAN PRAKASH GAIKWAD** holding **Seat No. (PRN: 2022018100095411)** Studying **Bachelor of Computer Applications** Semester – VI has been satisfactorily completed as prescribed by the Kavikulaguru Kalidas Sanskrit University, during the year 2024 - 2025

Project In- Charge

Co-Ordinator

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Internal Examiner

Principal

DECLARATION

I hereby declare that the project entitled, “**HealthCare+**” done at **place where the project is done**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of **BACHELOR OF COMPUTER APPLICATION** to be submitted as final semester project as part of our curriculum.

Darshan Prakash Gaikwad

Acknowledgement

I would like to express my heartfelt gratitude and appreciation to all those who have contributed to the completion of my BCA project. Their support, guidance, and encouragement have been instrumental in making this project a success. First and foremost, I extend my sincere thanks to **Principal Dr. Sharadkumar shah, H.O.D Prof. Sneha Shashikant Lokhande, Prof. Shaikh Mohammed Umar, Prof. Divya Patil, Prof. Kalyani Kulkarni, Prof. Ankit Srivastava.**for their unwavering support and valuable guidance. Their expertise, feedback, and mentorship have been invaluable throughout this journey, shaping the direction and quality of my project. I am immensely thankful to the faculty members of the BCA program at PCP Center: Bakliwal Foundation College,Vashi Navi Mumbai for their extensive knowledge and dedication to teaching. Their insightful lectures, challenging assignments, and rigorous curriculum have provided me with a strong foundation in the field of Information Technology. I would like to acknowledge the individuals who participated in my research study. Their willingness to share their experiences and insights has greatly contributed to the depth and relevance of my project. Their valuable input and cooperation are deeply appreciated. I am grateful to my friends and family for their unwavering support and understanding. Their constant encouragement, belief in my abilities, and willingness to listen have been a source of strength throughout this challenging endeavor. I would also like to acknowledge my peers and colleagues for their collaboration, discussions, and exchange of ideas. Their perspectives and input have broadened my understanding and helped shape the project in meaningful ways. I extend my thanks to the library staff and online resources that provided me with access to a wealth of literature and research material. The availability of these resources has been crucial in conducting a thorough study and enhancing the depth of my work.

ABSTRACT

HealthCare+ is a web application designed to connect patients with healthcare professionals, offering convenient online consultations and streamlined access to essential medical information. In today's fast-paced world, many individuals struggle to receive timely medical attention, often resulting in delays in diagnosis and treatment. HealthCare+ addresses this challenge by enabling users to book appointments, engage in secure video, audio, or chat consultations, and manage prescriptions—all in one unified platform.

The platform offers detailed doctor profiles and patient reviews to help users make informed decisions when selecting healthcare providers. It also includes a comprehensive library of health articles and resources. HealthCare+ is committed to user safety, ensuring full compliance with healthcare regulations and data privacy laws.

Key features include user registration, appointment booking, online consultations with , access to educational health resources. The platform is built using modern technologies such as **HTML, CSS, and JavaScript** for the front end, and **Node.js, Express.js, and MongoDB** for the back end, aiming to deliver a reliable and efficient online healthcare experience.

Expected outcomes include stronger connections between patients and healthcare professionals, improved access to medical services, and enhanced support for nutrition and diet planning. With HealthCare+, the goal is to make healthcare more accessible, efficient, and user-friendly.

Healthcare +

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Chapter 1

Overview

Healthcare+ is becoming more digital with people looking for online consultations and resources due to busy schedules and difficulty accessing healthcare in person. Healthcare+ is created to address this issue by connecting patients with doctors and providing easy access to medical resources. Many people face problems such as not being able to get timely appointments or information, which can lead to health issues being diagnosed too late. Our platform aims to make healthcare more accessible by offering a simple solution where users can book appointments, consult doctors online, and access health-related articles.

Objective

- To provide a user-friendly platform where patients can book appointments at their convenience.
- To offer secure online consultations via video, audio, or chat.
- To provide detailed profiles of doctors along with reviews from other patients.
- To make health articles and resources easily accessible for users.
- To ensure that the platform follows all healthcare regulations and protects user data.

Purpose, Scope, and Applicability

Purpose

- Many people struggle to get timely medical help, so the platform aims to solve this issue by providing easy access to healthcare services.
- Patients often have to wait for appointments or travel far for consultations. Healthcare reduces this problem by offering online appointments and consultations.
- The platform also allows users to read up on health-related topics and manage their prescriptions.

Scope

- It will include features like user registration, doctor profiles, appointment bookings, and health articles.
- Healthcare+ will integrate video and chat consultation options, making it easier for users to connect with healthcare providers from anywhere.

Applicability

- To help users get timely access to healthcare services and avoid delays in diagnosis and treatment.
- To allow patients to read health resources and make informed decisions about their care.
- To provide online consultations, especially helpful for those in remote or busy areas.

Achievements

By using Healthcare+, users will be able to book online consultations and manage their health without having to leave their homes. The platform will improve access to healthcare services and help users receive the care they need quickly and securely.

Chapter 2

2 .LITERATURE SURVEY

Several online healthcare platforms have emerged in recent years, each aiming to provide virtual consultation and appointment services. A review of existing literature and systems reveals both strengths and limitations of current models:

Practo, DocOnline, and 1mg are popular telemedicine services in India offering online consultations and appointment booking. However, many of them focus on urban areas and often lack affordability or user-friendly interfaces for rural or elderly users.

A study published in the Journal of Telemedicine and Telecare (2020) highlighted that while telehealth increases access, many systems suffer from poor integration with patient data and limited scalability.

Research by WHO (World Health Organization) emphasizes the importance of telemedicine in pandemic responses, especially for continuity of care during lockdowns or isolation periods.

HealthCare+ improves upon these limitations by focusing on user experience, integrated patient-doctor interaction, and secure, scalable infrastructure to ensure consistent healthcare delivery across diverse user groups.

Chapter 3

3. Acquisition of Knowledge

Before starting the development of HealthCare+, a dedicated phase was undertaken to gather the necessary knowledge required for building an efficient and user-centric online doctor consultation system. This phase helped in understanding the healthcare ecosystem, the needs of users (patients and doctors), and the technical requirements for implementing a secure, scalable, and reliable platform.

3.1 Understanding the Domain

To build a relevant and effective platform, it was important to study the **healthcare and telemedicine domain**. This included:

- Exploring how online consultations are conducted
- Understanding the challenges faced by doctors and patients in digital health interactions
- Learning how data security and privacy play a crucial role in medical systems

3.2 Market Research

A comparison was made with popular platforms like **Practo**, **1mg**, and **Mfine** to identify:

- Core features expected in such platforms (e.g., appointment booking, video calls)
- Limitations and drawbacks of existing solutions
- Opportunities to introduce new or improved features in HealthCare+

3.3 Technical Knowledge

To develop the platform, knowledge was acquired in the following technologies:

- **Frontend:** HTML, CSS, JavaScript for building an interactive UI
- **Backend:** Node.js and Express.js for server-side logic and API handling
- **Database:** MongoDB for managing patient, doctor, and appointment records

- **Tools:** Postman (for testing APIs), Zoom Developer Portal (for video conferencing integration), MongoDB Atlas (for cloud database), VS Code (development environment)

3.4 API and Integration Study

Special attention was given to understanding how to integrate:

- **Zoom API** for video consultations
- **Secure payment gateways** for consultation fee transactions
- **Authentication systems** to protect user data and enable safe login/signup features

3.5 Legal and Ethical Considerations

Basic research was done on:

- **Data privacy policies** in digital healthcare (e.g., HIPAA guidelines, Indian Data Protection laws)
- **User consent and confidentiality** practices in online consultations

3.6 Skill Building

Team members enhanced their skills through:

- Online tutorials and documentation
- Hands-on practice with sample projects
- Participating in tech forums and discussions to resolve doubts

Outcome of Knowledge Acquisition

- Enabled the team to define clear objectives and scope for the project
- Helped in selecting the right tech stack for development
- Ensured the system is secure, user-friendly, and aligned with real-world needs
- Created a foundation for smooth development, testing, and deployment of HealthCare+

Chapter 4

4. Domain Knowledge

4.1 Introduction to the Domain

The HealthCare+ project falls under the domain of Telemedicine and Healthcare Information Systems (HIS). This domain focuses on leveraging digital technologies to deliver healthcare services remotely and manage patient-related data efficiently. With the rapid adoption of digital tools in healthcare, the domain is evolving to include video consultations, AI-assisted diagnostics, e-prescriptions, and electronic health records.

Telemedicine bridges the gap between doctors and patients who are geographically separated, while HIS ensures secure handling and access to medical data. Platforms like HealthCare+ combine these two domains to offer a unified solution for patients and doctors.

4.2 Key Components of the Domain

Telemedicine

Involves the remote diagnosis and treatment of patients using telecommunications technology. It allows real-time interactions between patients and healthcare providers, making healthcare more accessible, especially in rural or underserved areas.

Online Appointment Systems

These systems enable patients to schedule appointments with doctors based on their availability, specialization, and consultation fees. They automate the booking process and reduce administrative burdens.

Video Conferencing Integration

Secure video communication tools (e.g., Zoom API) are used to enable real-time consultations, ensuring privacy and quality interaction between patients and doctors.

Health Information Management

Patient information such as symptoms, history, consultation notes, and prescriptions are stored and managed using databases like MongoDB. These systems must comply with data protection laws (e.g., HIPAA, NDHM).

Secure Payment Gateways

Online payment systems integrated into healthcare apps allow patients to pay for consultations seamlessly while ensuring transaction security.

Patient Education

Blogs, FAQs, and health tips play a vital role in improving patient awareness and encouraging preventive healthcare.

4.3 Importance of Domain Knowledge in Project Development

User-Centric Design:

Understanding the needs of patients and doctors ensures that the system is designed to be intuitive, accessible, and efficient.

Security and Compliance:

Familiarity with healthcare regulations ensures that patient data is protected and the system adheres to legal standards.

Relevant Feature Development:

Features like consultation history, medical records, and doctor search filters are built with real-world utility in mind.

Scalability and Integration:

With insights from the domain, the system can be developed to scale efficiently and integrate new features like e-prescriptions, chatbots, or AI diagnostics in the future.

4.4 Advantages of Domain Knowledge

Helps developers anticipate user requirements and real-world scenarios.

Ensures the platform remains relevant and competitive with other healthcare solutions.

Improves the overall quality, usability, and impact of the system.

Enables proactive risk management related to data privacy, user errors, and consultation delays.

Chapter 5

5. SYSTEM STUDY

The system study phase of the **HealthCare+** project involved a detailed examination of the current challenges in healthcare access and how digital platforms can effectively bridge the gap between patients and medical professionals. This study was essential to understand user requirements, existing solutions, and how an online consultation system could improve efficiency, accessibility, and service quality.

. Existing System:

In the current healthcare scenario, patients must physically visit clinics or hospitals for consultations, even for minor health concerns. This often results in:

- Long waiting times.
- High exposure risk to infections, especially during pandemics.
- Unavailability of doctors due to scheduling issues.
- Lack of centralized platforms offering verified information, appointment booking, and digital consultation.

Moreover, traditional appointment systems (phone-based or walk-ins) lack transparency, user-friendliness, and do not support online payments or video consultations.

. Proposed System:

The **HealthCare+** system addresses the limitations of the existing system by offering a digital platform where:

- Users can book consultations with certified doctors from the comfort of their homes.
- Video conferencing (Zoom) is integrated for real-time consultations.
- Secure online payments are supported.
- Doctors are listed with details such as specialization, fees, and experience.
- The platform also includes verified health blogs and articles, improving health awareness.

Benefits of the System:

- Saves time and travel costs for patients.
- Reduces load on physical healthcare infrastructure.
- Ensures timely medical advice, especially for remote or non-emergency situations.
- Promotes digital health awareness via blogs and FAQs.

Chapter 6

6. PROBLEM DEFINITION & SCOPE OF PROJECT

Problem Definition

Many people face problems visiting hospitals for minor health issues due to busy schedules, long waiting times, or living far from medical centers. Traditional systems do not allow easy online booking, video consultations, or quick access to trusted health information.

There is also no single platform where users can:

- Find and book appointments with doctors,
- Consult with them online,
- Make secure payments,
- And read verified health blogs — all in one place.

Doctors also struggle to manage their time and reach patients remotely.

HealthCare+ solves these problems by providing a simple and modern online platform where users can:

- Book appointments easily,
- Consult doctors via Zoom,
- Pay online securely,
- And learn from trusted medical content.

Objective

- To provide a user-friendly platform where patients can book appointments at their convenience.
- To offer secure online consultations via video, audio, or chat.
- To provide detailed profiles of doctors along with reviews from other patients.
- To make health articles and resources easily accessible for users.
- To ensure that the platform follows all healthcare regulations and protects user data.

Purpose

- Many people struggle to get timely medical help, so the platform aims to solve this issue by providing easy access to healthcare services.
- Patients often have to wait for appointments or travel far for consultations. healthcare reduces this problem by offering online appointments and consultations.
- The platform also allows users to read up on health-related topics and manage their prescriptions.

Scope

- It will include features like user registration, doctor profiles, appointment bookings, and health articles.
- Healthcare+ will integrate video and chat consultation options, making it easier for users to connect with healthcare providers from anywhere.

Chapter 7

7. Requirement Analysis

The requirement analysis phase is crucial to understanding what the system should do and how it should perform to meet the needs of its users.

Analysis

The system is designed to solve existing challenges in the healthcare industry related to accessibility and consultation delays. Through analysis, the following insights were derived:

- Users prefer remote consultation for minor illnesses.
- Doctors benefit from an organized and scheduled system.
- Patients require clarity in doctor profiles, fees, and available time slots.
- Trust is built through verified content, secure payments, and transparent communication.

Feasibility Study

1. Technical Feasibility:

- Utilizes popular and well-supported technologies (HTML, CSS, JavaScript, Node.js, MongoDB)
- Easily integrated with APIs (Zoom for video calls, Payment gateways)
- Hosted on scalable platforms

2. Operational Feasibility:

- Easy to use for both tech-savvy and non-tech-savvy users
- Doctors and patients can manage appointments conveniently
- Reduces in-person visit requirements for minor consultations

3. Economic Feasibility:

- Low development and maintenance costs
- No need for physical infrastructure

- Potential monetization through subscription-based features or consultation charges

4. Legal Feasibility:

- Can comply with health data regulations (like HIPAA, if expanded globally)
- Requires secure data handling and consent management

Hardware & Software Requirements

Hardware Requirements:

For End Users (Patients & Doctors):

- Smartphone, Tablet, or PC
- Stable Internet Connection
- Webcam and Microphone (for video consultation)

For Admin/Hosting:

- 8GB RAM minimum (for smooth performance)
- SSD Storage (for fast data retrieval)
- Processor : Intel i3.
- RAM : Recommended 2GB
- Hard Disk : Not Applicable

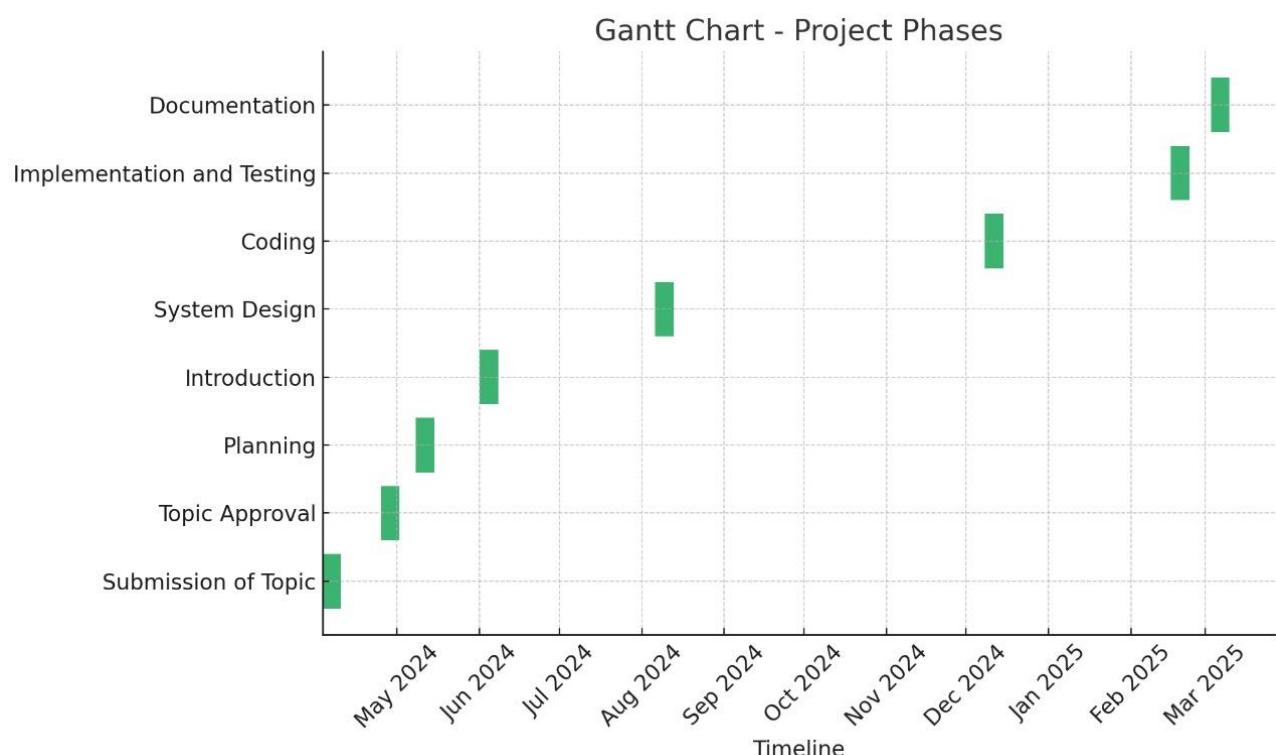
Software Requirements:

- Frontend: HTML, CSS, JavaScript
- Backend: Node.js, Express.js
- Database: MongoDB
- Video Conferencing: Zoom Integration
- Tools & Platforms: VS Code, Postman, MongoDB Atlas, Zoom Developer Portal
- Browsers: Chrome, Firefox, Safari (Latest Versions)

Chapter 8

8. ESTIMATION AND PLANNING

Gantt Chart



Chapter 9

9. METHODOLOGY

9.1 Spiral Model

For the development of the **HealthCare+** platform, the **Spiral Model** was chosen due to its flexibility, iterative nature, and ability to handle high-risk and complex systems. This model combines elements of both the **Waterfall Model** and **Prototyping Model**, making it ideal for a dynamic healthcare solution that requires continuous refinement based on user feedback and changing needs.

Each cycle (loop) of the spiral represents a distinct phase in the development lifecycle, allowing continuous evolution of the system.

9.2 Objective of Spiral Model in HealthCare+

Each loop in the spiral corresponds to a specific phase in the development of **HealthCare+** and is designed to handle uncertainty, changing requirements, and continuous feedback.

1. Determining Objectives, Alternatives, and Constraints:

In the initial phase, the core requirements of the system were gathered:

- Providing online appointment booking and video consultation
- Ensuring secure payments and easy-to-navigate interface
- Identifying technology stack: HTML, CSS, JavaScript, Node.js, MongoDB
- Constraints like development time, data privacy, and technical feasibility were also analyzed.

2. Risk Analysis and Evaluation of Alternatives:

This phase focused on identifying risks such as:

- Video integration reliability (Zoom API)
- Ensuring data privacy and security
- Technical risks related to backend scalability

Alternate solutions and mitigation strategies were considered, such as fallback video platforms and secure API implementation for sensitive user data.

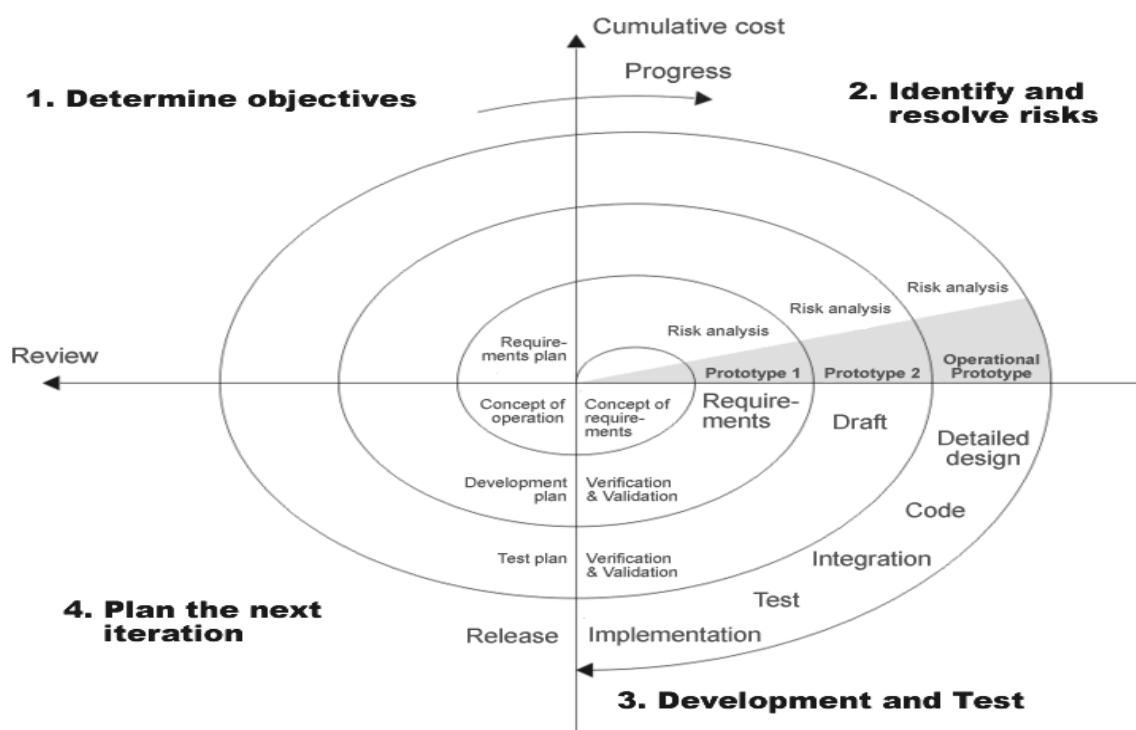
3. Engineering (Design and Development):

The system was developed in incremental phases:

- Initial version included user login, and appointment booking
- Later iterations included video call integration, secure payment system, health blog features, and admin dashboard
- Thorough testing followed each development cycle

Phases of Spiral Model Applied to HealthCare+:

- **Plan:** Defined features like doctor listings, appointment scheduling, and video call system. Requirements were gathered from research and user surveys.
- **Risk Analysis:** Addressed concerns such as network dependency, user data security, and system scalability. Risk mitigation strategies like encrypted databases and scalable cloud services were proposed.
- **Engineering:** System modules were developed using the MERN stack (MongoDB, Express.js, React, Node.js) with iterative refinement.



Chapter 10

10. Operating Tools and Development Environment

The development of HealthCare+ required a modern tech stack that ensured smooth user experience, robust backend processing, and secure handling of sensitive health-related data.

Below is a comprehensive breakdown of all tools and technologies used in the project:

Frontend Development Tools

1. HTML5

- HTML5 was used to create the structure and layout of the web pages, such as the homepage, doctor listings, booking form, and payment page.
- It provided semantic elements like `<header>`, `<footer>`, and `<section>` for better readability and accessibility.
- Multimedia support in HTML5 helped in integrating videos and blog articles without third-party plugins.
- HTML5 supports responsive web design, essential for making the platform mobile-friendly.
- Cross-browser compatibility ensured consistent performance across browsers like Chrome, Firefox, and Safari.

2. CSS

- CSS3 was used to style the user interface, including colors, spacing, fonts, and layout alignment.
- Enabled media queries to make the web application responsive across devices (mobile, tablet, desktop).
- Used for animations and transitions to enhance interactivity, such as button effects and pop-up modals.
- CSS Grid and Flexbox layouts allowed the site to be visually structured and adaptable.
- Organized styling using external stylesheets to maintain code clarity and reduce redundancy.

3. JavaScript

- JavaScript enabled real-time interactions such as showing available doctors based on symptoms, dynamically updating appointment slots, and form validation.
- Helped fetch data from APIs (e.g., doctor data from MongoDB, Zoom links, etc.) without reloading pages.
- Used for client-side logic like appointment calendar interaction and input validations.
- JavaScript frameworks or libraries (if any, like jQuery or vanilla JS) simplified certain tasks like DOM manipulation.
- Supported asynchronous communication (AJAX, fetch API) to enhance user experience by avoiding full page reloads.

Backend Development Tools

4. Node.js

- Node.js served as the runtime environment for executing backend code written in JavaScript.
- Its non-blocking, event-driven architecture allowed efficient handling of multiple user requests at once—ideal for high traffic in healthcare systems.
- Supported third-party packages via npm for authentication, payments, and email services.
- Enabled real-time operations like generating and sending Zoom meeting links upon successful bookings.
- Worked well with MongoDB and helped build RESTful APIs quickly and securely.

5. Express.js

- A minimalist backend framework that simplified routing for different modules such as user authentication, appointment management, and doctor listings.
- Allowed the use of middleware functions to handle tasks like request validation, error handling, and security.
- Managed the REST API endpoints efficiently—making it easier for the frontend to communicate with the backend.

- Offered high customization and modularity, which allowed adding features incrementally during each spiral cycle.
- Simplified integration with MongoDB and other external APIs (Zoom, payment gateways).

◆ Database Technologies

6. MongoDB

- A NoSQL, document-oriented database used to store data in flexible JSON-like formats.
- Collections were created for users (patients/doctors), appointments, payments, and blogs.
- Enabled fast read/write operations, which improved performance under user load.
- Schema-less nature made it easy to adapt to changing requirements during iterative development.
- Supported indexing and data aggregation, which helped in filtering

Operating Environment

8. Operating Systems (Windows, macOS, Linux)

- Supported all development tools and technologies used.
- Enabled running MongoDB, Node.js, and VS Code without compatibility issues.
- Provided built-in tools like PowerShell or Bash for executing scripts and commands.
- Linux/Ubuntu preferred for hosting and production environment due to its stability and performance.
- Compatibility ensured a seamless development experience across different team members' devices.

9.

Browsers (Chrome, Firefox, Safari)

- Regularly tested the platform across browsers to ensure cross-browser compatibility.
- Utilized built-in developer tools for inspecting UI, console errors, and network behavior.
- Verified that responsive design and interactive elements work uniformly on each browser.
- Used in manual and automated testing for real-time performance checks.
- Allowed features like WebRTC (used in video calling) to function consistently across platforms.

Chapter 11

SYSTEM DESIGN

4.1 Activity Diagrams.

An **activity diagram** is a type of **UML (Unified Modeling Language)** diagram that visually represents the **workflow** or **activities** involved in a process or system. It's commonly used in software development, business process modeling, and system analysis.

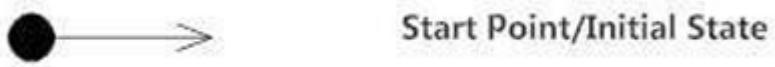
Purpose:

To show **how tasks flow** from one to another, **decision points**, **parallel processes**, and how the process **starts and ends**.

Key Elements:

Initial State or Start Point:

- A small filled circle followed by an arrow represents the initial action state or the start for any activity diagram.
- For activity diagram using swim lanes, make sure the start point is placed in the top left corner of the first column.



Activity or Action State:

- An action state represents the non-interruptible action of objects.
- You can draw an action state in Smart Draw using a rectangle with rounded corners.

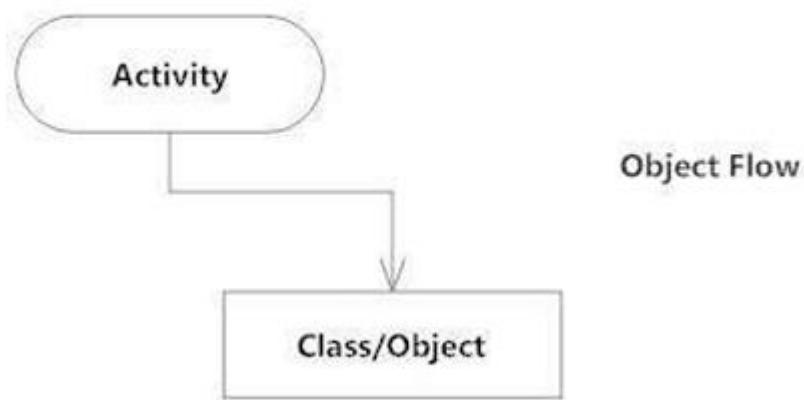


Action flow:

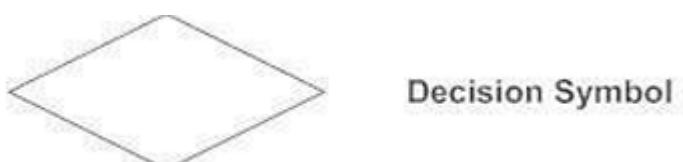
- Action flows, also called edges and paths, illustrate the transitions from one action state to another.
- They are usually drawn with an arrowed line.

 Action Flow
Object Flow:

- Object flow refers to the creation and modification of objects by activities.
- An object flow arrow from an action to an object means that the action creates or influences the object.
- An object flow arrow from an object to an action indicates that the action state uses the object.

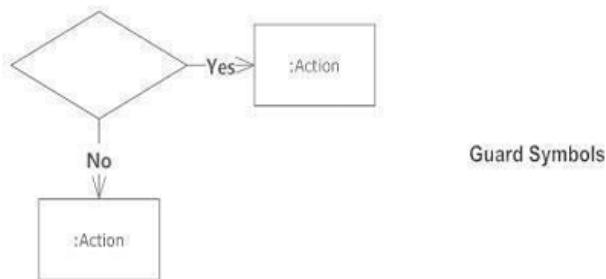
**Decisions and Branching:**

- A diamond represents a decision with alternate paths.
- When an activity requires a decision prior to moving on to the next activity, add a diamond between the two activities.
- The outgoing alternates should be labelled with a condition or guard expression.
- You can also label one of the paths “else”.

**Guards:**

- In UML, guards are a statement written next to a decision diamond that must be true before moving next to the next activity.
- These are not essential, but are useful when a specific answer, such as “Yes, three labels

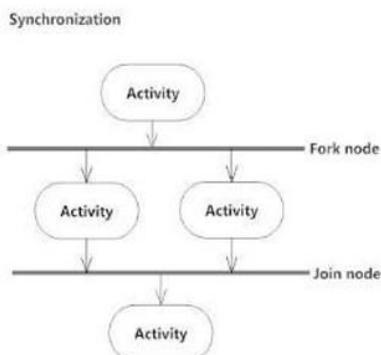
are printed” is needed before moving forward.



Guard Symbols

Synchronization:

- A fork node is used to split a single incoming flow into multiple concurrent flows.
- It is represented as a straight, slightly thicker line in an activity diagram.
- A join node joins multiple concurrent flows back into a single outgoing flow.
- A fork and join mode used together are often referred to as synchronization.



Final State or End Point:

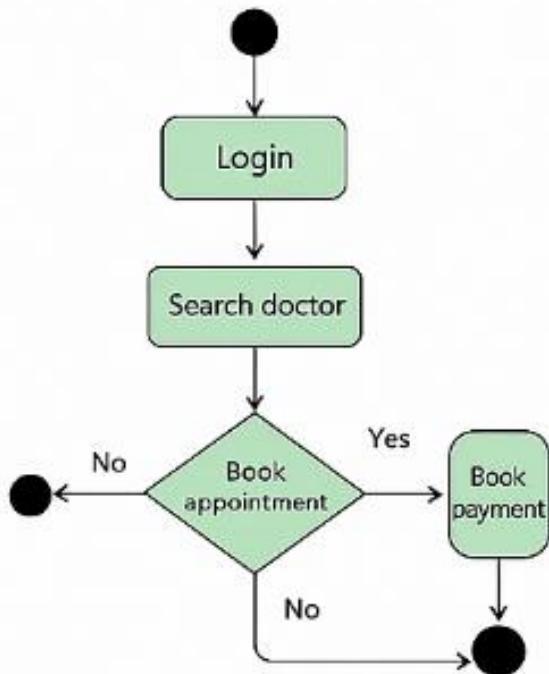
- An arrow pointing to a filled circle nested inside another circle represents the final action state.



End Point Symbol

Activity Diagram Of HealthCare+

Activity Diagram



4.2 ENTITY RELATIONSHIP DIAGRAM

✓ What is an Entity Relationship Diagram (ERD)?

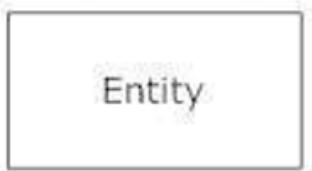
- An ERD shows the relationships of entity sets stored in a DB.
- An entity in this context is a component of data. In other words, ER diagrams illustrate the logical structure of databases.
- At first glance an entity relationship diagram looks very much like a flowchart.
- It is the specialized symbols, and the meanings of those symbols, that make it unique.

Common Entity Relationship Diagram Symbols:

- An ER diagram is a means of visualizing how the information a system produces is relating.
- There are five main components of an ERD:

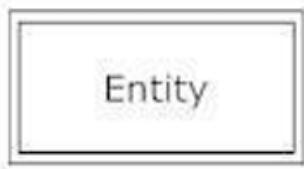
Entities:

- An entity is represented by rectangle. An entity is an object or concept about which you want to store information.



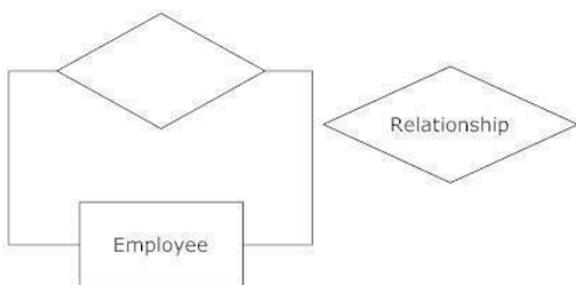
Weak Entities:

- A weak entity is an entity that must be defined by a foreign key relationship with another entity as it cannot be uniquely identified by itself.



✓ Actions:

- Actions which are represented by diamond shapes, show how two entities share information in the database.
- In some cases, entities can be self-linked.
- For example, employees can supervise other employees.

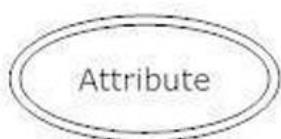


Attributes:

- Attribute which are represented by ovals.
- A key attribute is the unique, distinguishing characteristic of the entity.
- For example, an employee's social security number might be the employee's key attribute.



A **multivalued** attribute can have more than one value. For example, an employee entity can have multiple skill values.



A **derived attribute** is based on another attribute. For example, an employee's monthly salary is based on the employee's annual salary.

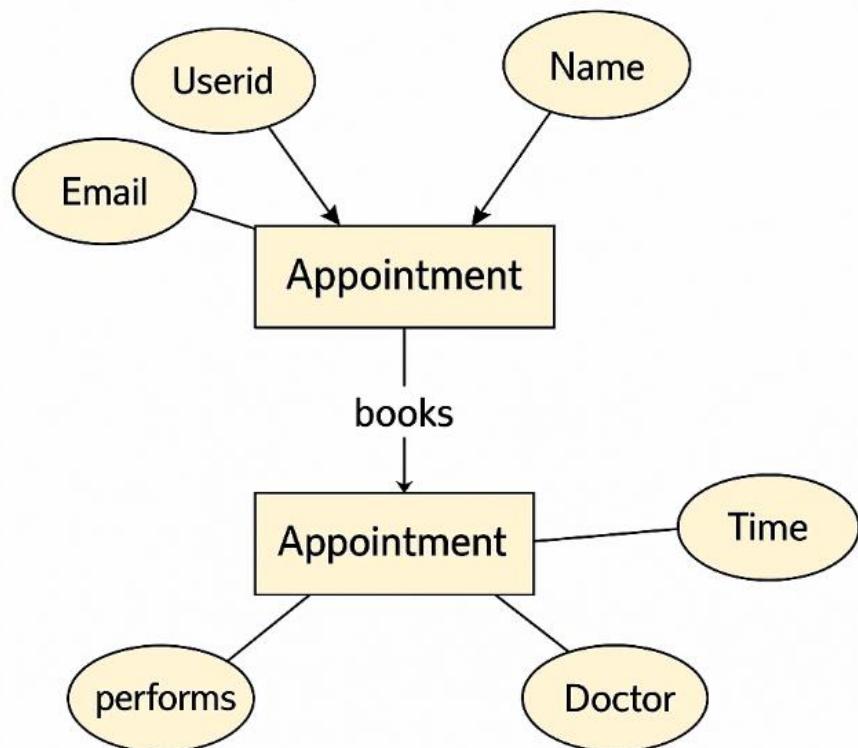


Connecting lines:

- Solid lines that connect attributes to show the relationships of entities in the diagram.

Entity Relationship Diagram HealthCare+

ER Diagram



4.3 SEQUENCE DIAGRAMS: -

✓ What is a Sequence Diagram?

- Sequence diagrams describe interactions among classes in terms of an exchange of messages over time. They're also called event diagrams.
- A sequence diagram is a good way to visualize and validate various runtime scenarios.
- These can help to predict how a system will behave and to discover responsibilities a class may need to have in the process of modelling a new system.

✓ Basic Sequence Diagram Notations: -

✓ Class Roles or Participants:

- Class roles describe the way an object will behave in context. Use the UML object symbol to illustrate

class roles, but don't list object attributes.



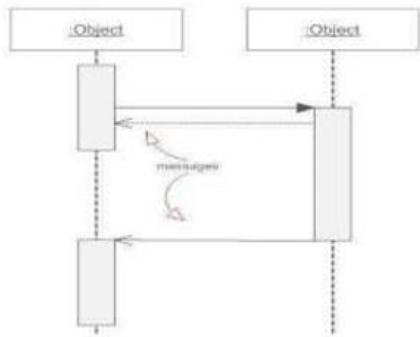
Activation or Execution Occurrence:

- Activation boxes represent the time an object needs to complete a task.
- When an object is busy executing a process or waiting for a reply message, use a thin gray rectangle placed vertically on its lifeline



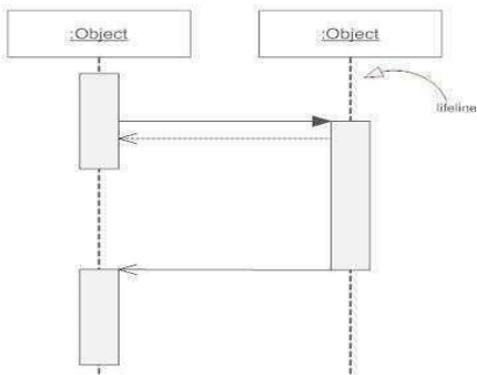
Messages:

- Messages are arrows that represent communication between objects.
- Use half-arrowed lines to represent asynchronous messages.
- Asynchronous messages are sent from an object that will not wait for a response from the receiver before continuing its tasks.



Lifelines:

- Lifelines are vertical dashed lines that indicate the object's presence overtime.



Loops:

- A repetition or loop within a sequence diagram is depicted as a rectangle. Place the condition for exiting the loop at the bottom left corner in square brackets [].

Types of Messages in Sequence Diagrams: -

o Synchronous Message:

- A synchronous message requires a response before the interaction can continue.
- It's usually drawn using a line with a solid arrowhead pointing from one object to another.



Synchronous

Asynchronous Message:

- Asynchronous messages don't need a reply for interaction to continue.
- Like synchronous messages, they are drawn with an arrow connecting two lifelines; however, the arrowhead is usually open and there's no return message depicted.



Simple, also used for asynchronous
Asynchronous

o Reply or Return Message:

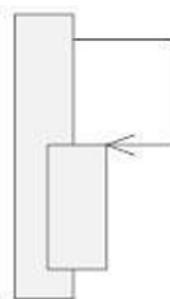
- A reply message is drawn with a dotted line and an open arrowhead pointing back to the original lifeline.



Reply or return message

Self-Message:

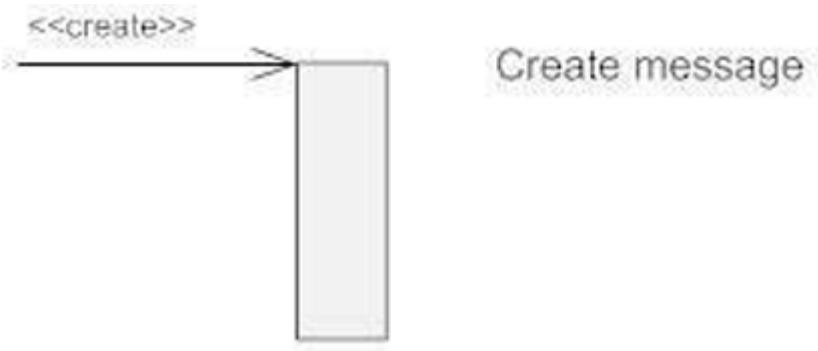
- A message an object sends to itself, usually shown as a U-shaped arrow pointing back to itself.



Self message

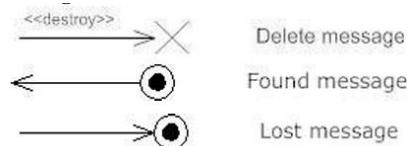
Create Message:

- This is a message that creates a new object. Similar to a return message, it's depicted with a dashed line and an open arrowhead that points to rectangle representing the object created.



o Delete Message:

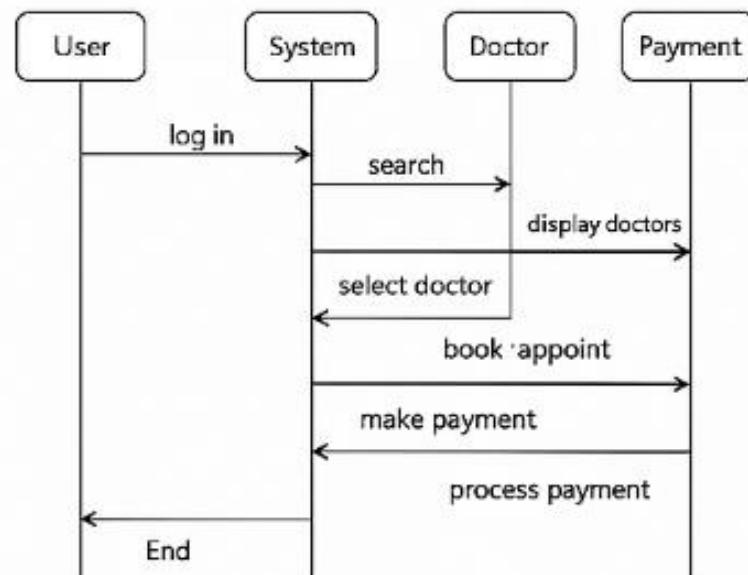
- This is a message that destroys an object. It can be shown by an arrow with an x at the end.
- Found/Lost Message:



- A message sent from/to an unknown recipient, show by an arrow from an endpoint to a line

Sequence Diagrams HealthCare+

Sequence Diagram



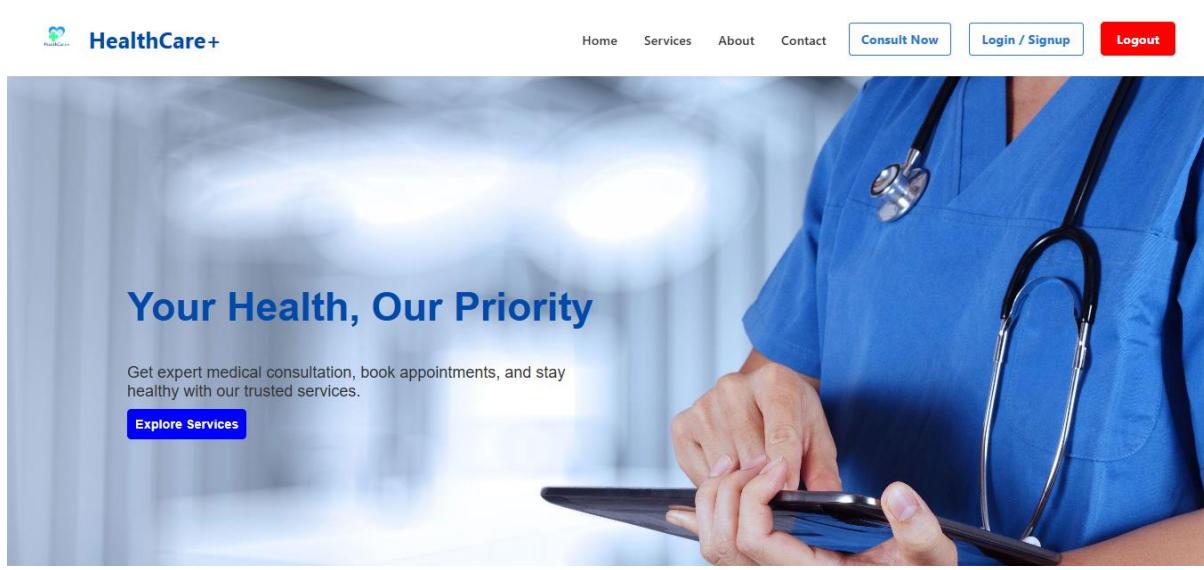
Chapter 12

12.Implementation

12.1 Screenshots

Homepage

The image showcases the homepage of the "HealthCare+" website, an online platform dedicated to providing medical consultation and appointment booking services. At the top, the navigation bar features the platform's name and menu options such as Home, Services, About, Contact, and a prominently placed "Login / Signup" button for user access. The main section of the page includes a professional background image of a healthcare worker with a stethoscope, symbolizing trust and care. The bold headline "Your Health, Our Priority" emphasizes the platform's commitment to user well-being. Beneath it, a short description highlights the core services offered—expert consultations and appointment scheduling. A bright blue "Explore Services" button invites users to begin their journey on the platform, making the website both informative and user-friendly.



About Section

The image highlights the "About HealthCare+" section of the website, offering a concise overview of the platform's mission and capabilities. It describes HealthCare+ as a reliable online service for medical consultations, doctor appointments, and expert guidance, emphasizing convenience and professionalism. Below the description, four key statistics are presented in visually distinct boxes to reinforce the platform's credibility: over 500 happy

patients, 100+ expert doctors, 150+ successful surgeries, and 24/7 online support. This section effectively builds trust by showcasing the platform's reach, experience, and commitment to patient care.

The screenshot shows the 'About' section of the HealthCare+ website. At the top, there is a heading 'About HealthCare+'. Below it is a brief description: 'HealthCare+ is your trusted platform for online consultations, doctor appointments, and medical guidance. We bring healthcare to your fingertips with expert professionals and reliable care.' Below the description are four white cards with rounded corners, each containing a statistic and a subtitle. The first card says '500+' Happy Patients. The second says '100+' Expert Doctors. The third says '150+' Successful Surgeries. The fourth says '24/7' Online Support. The entire section has a light blue background.

Feedback

The image displays the "What Our Patients Say" section of the HealthCare+ website, highlighting user testimonials that reflect positive experiences with the platform. Each review is presented within a neatly designed card, featuring a short message of appreciation from patients along with their names and star ratings. Users such as Aishwarya Patil, Priyanka Karale, and Raj Malhotra commend the service for its quick and smooth consultation process, polite and punctual doctors, and the ease of receiving online prescriptions. This testimonial section builds trust and credibility by showcasing real feedback, emphasizing the platform's effectiveness and user satisfaction.

The screenshot shows the 'What Our Patients Say' section of the HealthCare+ website. It features four testimonial cards. The first card is for Aishwarya Patil, who says: "Consultation process was quick and smooth. Loved the experience!" and is rated 5 stars. The second card is for Priyanka Karale, who says: "Very polite doctors and timely reminders. Thank you!" and is rated 5 stars. The third card is for Raj Malhotra, who says: "I was able to get an online prescription instantly. Superb!" and is rated 5 stars. The fourth card is partially visible, showing a rating of 5 stars and the name Tan. Each card has a small circular arrow icon at the bottom right corner.

Health Articles

The image presents the “Latest Health Articles” section of the HealthCare+ website, aimed at educating users with expert health tips and information. This section features three highlighted articles, each visually represented by an image and a brief description. The first article, “5 Tips for a Healthy Heart,” offers simple advice on maintaining heart health and preventing cardiovascular issues. The second article, “Best Skincare Routine by Dermatologists,” provides expert-approved tips for achieving healthy, glowing skin. The third, “Preventive Health Checkups: Why They Matter,” emphasizes the importance of early health screenings and staying proactive about one’s well-being. Each article includes a “Read More” link, encouraging users to explore topics in greater detail. This section reinforces the platform’s commitment to promoting health awareness and preventive care.

The screenshot shows the HealthCare+ website's "Latest Health Articles" page. At the top, there is a navigation bar with links for Home, Services, About, Contact, Consult Now (in a blue box), Login / Signup (in a white box), and Logout (in a red box). Below the navigation is a header with the text "Latest Health Articles" and a subtext "Get expert tips and stay informed about your health". There are three articles displayed in cards:

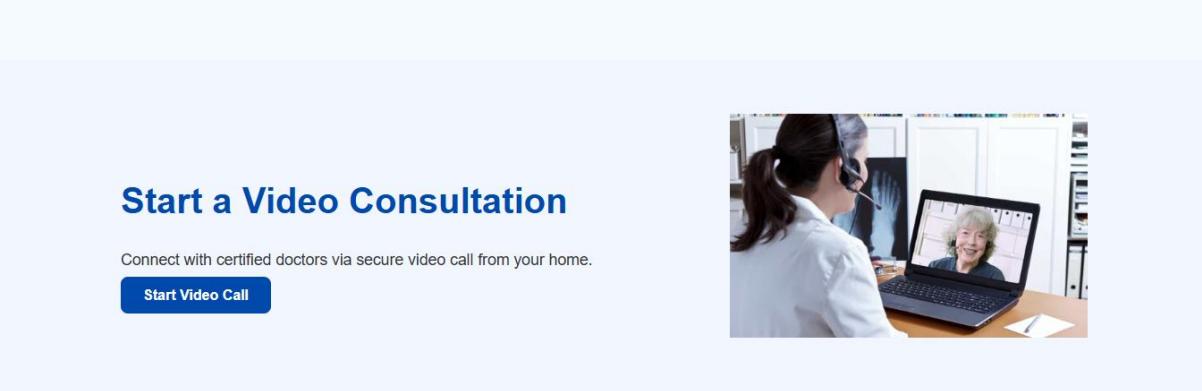
- 5 Tips for a Healthy Heart**: Features a heart-shaped arrangement of various fruits and vegetables. Description: "Learn simple ways to take care of your heart and prevent cardiovascular diseases." Read More link.
- Best Skincare Routine by Dermatologists**: Features skincare products like bottles and a face mask. Description: "Know the dermatologist-recommended tips for glowing and healthy skin." Read More link.
- Preventive Health Checkups: Why They Matter**: Features a doctor's hands using a stethoscope on a patient. Description: "Know what tests to do and when – prevention is better than cure!" Read More link.

The screenshot shows the HealthCare+ website's "Top 10 Health & Motivational Tips" section. At the top, there is a navigation bar with links for Home, Services, Health Tips, and Consult Now (in a blue box). Below the navigation is a header with the text "Top 10 Health & Motivational Tips". There are three visible cards in a grid:

- 1. Eat a Balanced Diet**: Features a hand holding a plate of various fruits and vegetables. Description: "Consume a variety of fruits, vegetables, and whole grains to maintain good health." Read More link.
- 2. Exercise Regularly**: Features two people jogging on a path. Description: "Stay active for at least 30 minutes a day to keep your body fit and healthy." Read More link.
- 3. Stay Hydrated**: Features a glass of water. Description: "Drink at least 8 glasses of water daily to keep your body functioning properly." Read More link.

Start Consultation

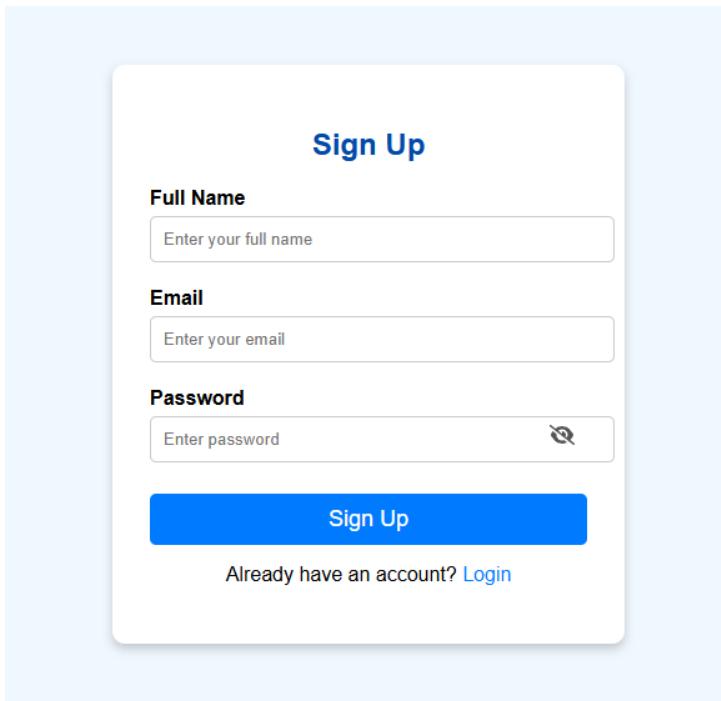
The image promotes the "Start a Video Consultation" feature of the HealthCare+ platform. It visually illustrates a virtual interaction between a doctor and a patient, emphasizing the ease and convenience of accessing medical advice from home. The accompanying text encourages users to connect with certified doctors through a secure video call, enhancing accessibility to professional healthcare without the need to visit a clinic. A prominent "Start Video Call" button reinforces the platform's user-friendliness and readiness for instant service, making telemedicine both approachable and efficient.



The screenshot shows a web interface for starting a video consultation. At the top, there is a large blue button labeled "Start a Video Consultation". Below it, a sub-headline reads "Connect with certified doctors via secure video call from your home." Underneath this, a blue rectangular button contains the text "Start Video Call". To the right of the text area, there is a small thumbnail image showing a female doctor wearing a headset and a patient's face on a laptop screen, illustrating the video call feature.

Sign Up Page

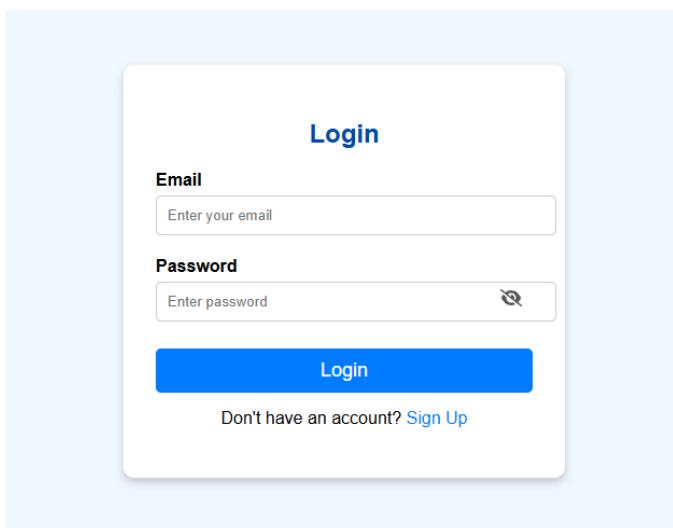
The image displays the **Sign Up** form of the HealthCare+ system, providing a clean and intuitive interface for new users to register on the platform. The form includes fields for entering a full name, email address, and password, ensuring that essential user details are captured for account creation. A visible toggle for showing or hiding the password enhances security and user experience. At the bottom, a clear call-to-action "Sign Up" button is provided, along with a link for existing users to log in, promoting seamless navigation between account creation and access.



The image shows the Sign Up interface of the HealthCare+ platform. It features a white card with rounded corners on a light blue background. At the top center is the title "Sign Up" in bold blue font. Below it are three input fields: "Full Name" with a placeholder "Enter your full name", "Email" with a placeholder "Enter your email", and "Password" with a placeholder "Enter password" and a visibility toggle icon. At the bottom is a large blue button labeled "Sign Up". Below the button is a link "Already have an account? [Login](#)".

Login interface

The image shows the Login interface of the HealthCare+ platform. It features a simple and user-friendly layout with input fields for entering the user's email and password. A password visibility toggle is included to enhance usability, allowing users to view or hide their input. The form has a prominent Login button for accessing the system, and a helpful link below directs users without an account to the Sign-Up page. This login screen ensures a smooth and secure entry point for returning users.



The image shows the Login interface of the HealthCare+ platform. It features a white card with rounded corners on a light blue background. At the top center is the title "Login" in bold blue font. Below it are two input fields: "Email" with a placeholder "Enter your email" and "Password" with a placeholder "Enter password" and a visibility toggle icon. At the bottom is a large blue button labeled "Login". Below the button is a link "Don't have an account? [Sign Up](#)".

Doctors section

This image presents the "Meet Our Doctors" section of the HealthCare+ platform, showcasing the expertise and experience of key medical professionals.

The screenshot shows the 'Meet Our Doctors' page. At the top, there is a navigation bar with the HealthCare+ logo, Home, Services, About, Contact, a 'Consult Now' button, a 'Login / Signup' button, and a 'Logout' button. Below the navigation is a title 'Meet Our Doctors' and a subtitle 'Trusted, Experienced, and Caring Professionals'. Three doctor profiles are displayed in cards:

- Dr. Sneha Patil** (Cardiologist) - 12+ Years Experience
- Dr. Raj Malhotra** (Dermatologist) - 10+ Years Experience
- Dr. Aishwarya Singh** (Gynecologist) - 8+ Years Experience

A 'View All Doctors' button is located at the bottom of the card area.

The screenshot shows the 'Consult with Expert Doctors' section. At the top, there is a navigation bar with the HealthCare+ logo, Home, Services, and a 'Consult Now' button. Below the navigation is a title 'Consult with Expert Doctors'. Eight doctor profiles are displayed in a grid:

Doctor Profile	Name	Specialty	Experience	Action
	Dr. A Sharma	Cardiologist	12+ Years Experience	Book Appointment
	Dr. R Mehta	Dermatologist	10+ Years Experience	Book Appointment
	Dr. S Kumar	General Physician	8+ Years Experience	Book Appointment
	Dr. P Verma	Gynaecologist	15+ Years Experience	Book Appointment
	Dr. D Patel			
	Dr. E Chaturvedi			
	Dr. F Kulkarni			
	Dr. G Joshi			

Appointment Booking Page

This is the **Appointment Booking Page** of HealthCare+, where users can schedule a consultation by entering their **name**, **email**, selecting a **doctor**, choosing a **date** and **time**, and

then clicking the "**Book Appointment**" button. The form is simple, user-friendly, and designed for quick and easy appointment booking.

The form is titled "Book Your Appointment". It contains the following fields:

- Full Name: [Input field]
- Email: [Input field]
- Select Doctor: [Dropdown menu with placeholder "Select a doctor"]
- Select Date: [Input field with placeholder "dd-mm-yyyy"]
- Select Time: [Input field with placeholder "HH : MM AM"]

A large blue "Book Appointment" button is located at the bottom of the form.

HealthCare+ landing page

This is the HealthCare+ landing page, promoting online doctor consultations starting at ₹199. It highlights features like private audio calls, 12+ doctors online, verified professionals, digital prescriptions, and free follow-ups. A clear “Consult Now” button invites users to begin their consultation instantly.

The landing page has the following elements:

- Logo: HealthCare+
- Navigation: Home, Services, About, Contact
- Text: "Skip the travel!", "Take Online Doctor Consultation", "Private consultation + Audio call – Starts at just ₹199", "Verified Doctors", "Free Followup", "+12 Doctors are online"
- Image: A large image of a doctor in a white coat and blue shirt, waving from a smartphone screen.
- Buttons: "Consult Now"

FAQs section

This FAQs section explains how the online consultation works — users choose a health concern, pick a doctor, and start a video call. It also addresses common questions about doctor qualifications, consultation privacy, prescriptions, and missed appointments.

The screenshot shows a light blue header with the word "FAQs" in bold. Below it is a white card with five expandable sections, each with a question and a blue plus sign to its right. The questions are: "How does online consultation work?", "Are the doctors qualified?", "Is my consultation private?", "Will I get a prescription?", and "What if I miss my appointment?".

How does online consultation work?
You simply choose your health concern, select a doctor, and start your video consultation from your phone or computer.

Are the doctors qualified?

Is my consultation private?

Will I get a prescription?

What if I miss my appointment?

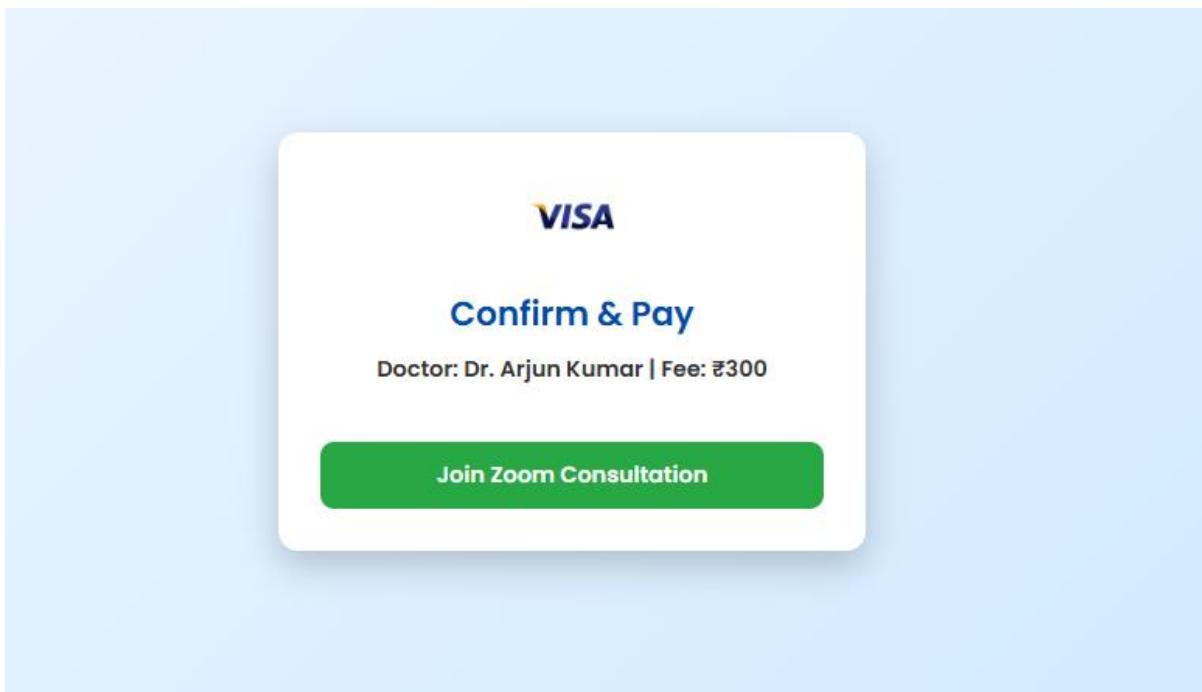
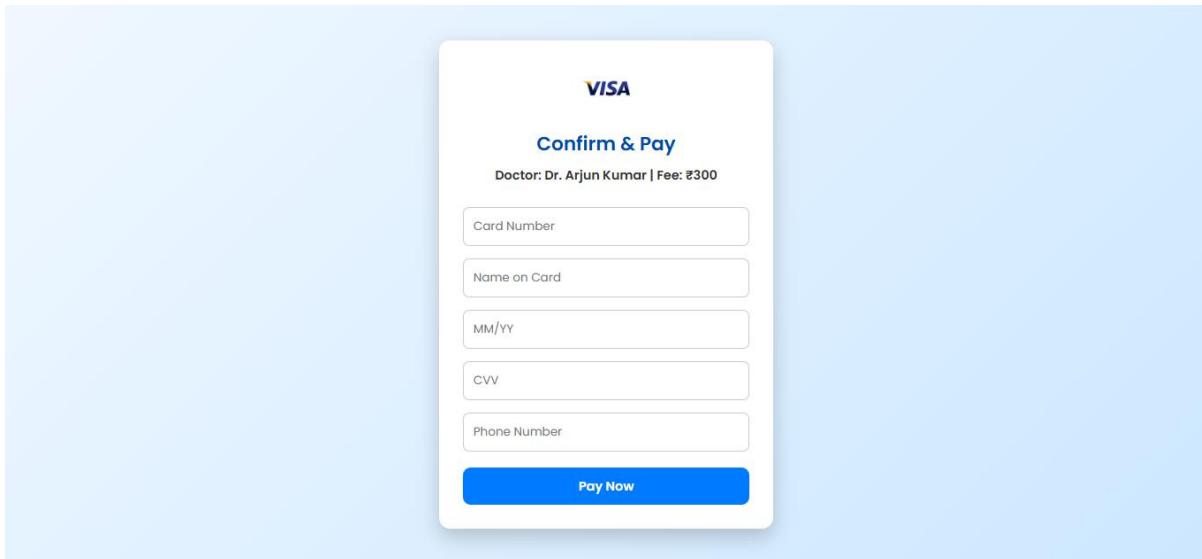
Consult With A Doctor

This page allows users to consult with a doctor by entering their health symptoms and phone number. After filling in the details, users can click "Start Consultation" to begin the process of getting medical help online.

The screenshot shows a light gray background with a central white rectangular form. At the top is a title "Consult with Doctor". Below it is a text input field labeled "Tell us your symptom or health problem" containing the text "fever". Underneath is another text input field labeled "Enter your phone number" containing the text "9653208379". Below these is a large blue button labeled "Start Consultation". At the bottom of the form, there is contact information for "Dr. Arjun Kumar" (General Physician) and a "Consultation Fee: ₹300", followed by a green "Book Now" button.

Payment section

Pay ₹300 securely by entering your card and phone details, then click "Pay Now" to confirm your consultation.



Contact Us Section

This is the Contact page of HealthCare+, designed to help users get in touch with our support team quickly and easily. It features a simple and user-friendly contact form where users can submit their name, email, subject, and message. Whether it's a query, feedback, or support request, users can expect a prompt response. The page also includes essential contact details like our support email, helpline number, and physical address. A Google Maps integration helps users locate our clinic or office, making offline visits convenient. The clean design and responsive layout ensure a smooth experience across all devices.

The screenshot shows the 'Contact Us' page of the HealthCare+ website. At the top, there is a navigation bar with links for Home, Services, About, Contact, a blue 'Consult Now' button, a 'Login / Signup' button, and a red 'Logout' button. Below the navigation is a section titled 'Contact Us' with a sub-instruction: 'We'd love to hear from you! Please fill out the form below.' The contact form consists of four input fields: 'Name' (placeholder: Enter Your Name), 'Email' (placeholder: Enter Your Email), 'Phone' (placeholder: Enter Your Phone), and 'Message' (placeholder: How can I help you...?). Below the form is a large blue 'Send Message' button. At the bottom of the form area, there are two small lines of text: 'Phone: +91 9653208370' and 'Email: healthcareplus@gmail.com'.

Chapter 13

13. Testing

The process of testing was conducted using unit testing, integration testing, and operational testing.

13.1 Unit Testing (Developer)

Unit Testing is a level of the software testing process where individual units/components of a software/system are tested. The purpose is to validate that each unit of the software performs as designed.

A unit is the smallest testable part of software. It usually has one or a few inputs and usually a single output. In procedural programming a unit may be an individual program, function, procedure, etc. In object-oriented programming, the smallest unit is a method, which may belong to a base/super class, abstract class or derived/child class. (Some treat a module of an application as a unit. This is to be discouraged as there will probably be many individual units within that module.)

Unit testing frameworks, drivers, stubs and mock or fake objects are used to assist in unit testing.

Method

Unit testing is performed by using the White Box Testing method.

When is it performed?

Unit testing is the first level of testing and is performed prior to Integration Testing.

Who performs it?

Unit Testing is normally performed by software developers themselves or their peers. In rare cases it may also be performed by independent software testers.

Tasks

- Unit Test Plan :- Prepare, Review, Rework, Baseline
- Unit Test Cases/Scripts :-Prepare, Review, Rework, Baseline
- Unit Test :- Perform

Benefits

- Unit testing increases confidence in changing/maintaining code. If good unit tests are written and if they are run every time any code is changed, the likelihood of any defects due to the change being promptly caught is very high. If unit testing is not in place, the most one can do is hope for the best and wait till the test results at higher levels of testing are out. Also, if codes are already made less interdependent to make unit testing possible, the unintended impact of changes to any code is less.
- Codes are more reusable. In order to make unit testing possible, codes need to be modular. This means that codes are easier to reuse.
- Development is faster. How? If you do not have unit testing in place, you write your code and perform that fuzzy ‘developer test’ (You set some breakpoints, fire up the GUI, provide a few inputs that hopefully hit your code and hope that you are all set.) In case you have unit testing in place, you write the test, code and run the tests. Writing tests takes time but the time is compensated by the time it takes to run the tests. The test runs take very less time: You need not fire up the GUI and provide all those inputs. And, of course, unit tests are more reliable than ‘developer tests’. Development is faster in the long run too. How? The effort required to find and fix defects found during unit testing is peanuts in comparison to those found during system testing or acceptance testing.
- The cost of fixing a defect detected during unit testing is lesser in comparison to that of defects detected at higher levels. Compare the cost (time, effort, destruction, humiliation) of a defect detected during acceptance testing or say when the software is live.
- Debugging is easy. When a test fails, only the latest changes need to be debugged. With testing at higher levels, changes made over the span of several days/weeks/months need to be debugged.
- Codes are more reliable. Why? I think there is no need to explain this to a sane person.

13.2 System testing (Test Manager)

System Testing is a level of the software testing process where a complete, integrated system/software is tested.

The purpose of this test is to evaluate the system’s compliance with the specified requirements.

Here we had tested the entire application. The reference document for this process was the requirements document and the goal was to see that if the application meets the requirements.

13.3 Operational testing

It was performed on the realistic data to demonstrate that the application is working satisfactorily. Testing here was done to focus on the external behavior of the system; internal logic of the program is not emphasized.

Test Cases:

Testing is crucial to ensure the system performs accurately, efficiently, and securely under different conditions. The following test cases validate key components of the HealthCare+ platform.

Test Case 1: User Registration

Test Case ID	TC_001
Test Title	Patient Registration
Description	To verify if a user can successfully register as a patient
Input	Name, Email, Password, Phone
Expected Result	Account is created, user is redirected to login page
Actual Result	Pass/Fail (after testing)
Remarks	Validate email format and check for duplicates

Test Case 2: User Login

Test Case ID	TC_002
Test Title	Patient Login
Description	To ensure valid users can log in
Input	Registered Email, Password
Expected Result	User is redirected to dashboard
Actual Result	Pass/Fail
Remarks	Check for incorrect password or unregistered email

Test Case 3: Book Appointment

Test Case ID	TC_003
Test Title	Book Doctor Appointment
Description	To check if users can select a doctor and time slot to book an appointment
Input	Selected Doctor, Date, Time
Expected Result	Appointment is saved, confirmation is shown
Actual Result	Pass/Fail
Remarks	Ensure overlapping appointments are not allowed

Test Case 4: Zoom Link Generation

Test Case ID	TC_004
Test Title	Generate Zoom Meeting Link
Description	To validate if a Zoom link is generated after appointment confirmation
Input	Appointment details
Expected Result	Unique Zoom link is created and sent to patient and doctor
Actual Result	Pass/Fail
Remarks	Verify link expiration time and access control

Test Case 5: Payment Processing

Test Case ID	TC_005
Test Title	Consultation Fee Payment
Description	To check if payment is processed successfully
Input	Card/UPI details
Expected Result	Payment succeeds
Actual Result	Pass/Fail
Remarks	Test for success, failure, and timeout scenarios

Test Case 9: Blog Page Access

Test Case ID	TC_009
Test Title	View Health Blogs
Description	Check if blogs are accessible without login
Input	Navigate to blog section
Expected Result	List of blogs is visible
Actual Result	Pass/Fail
Remarks	Confirm public access without errors

Maintenance

- **Software maintenance** in software engineering is the modification of a software product after delivery to correct faults, to improve performance or other attributes.
- A common perception of maintenance is that it merely involves fixing defects. However, one study indicated that the majority, over 80%, of the maintenance effort is used for non-corrective actions. This perception is perpetuated by users submitting problem reports that in reality are functionality enhancements to the system.
- The key software maintenance issues are both managerial and technical. Key management issues are:
 - ✓ Alignment with customer priorities,
 - ✓ Staffing, which organization does maintenance,
 - ✓ Estimating costs.
- Key technical issues are:
 - ✓ Limited understanding,
 - ✓ Impact analysis,
 - ✓ Testing,
 - ✓ Maintainability .

Chapter 14

14. LIMITATION & ENHANCEMENT

Limitations:

1. **No Real-Time Chat:** Only video consultations are available; lacks live text chat feature.
2. **Limited Doctor Availability:** System depends on doctors manually updating availability.
3. **No Mobile App:** The platform is web-only; no dedicated mobile application.
4. **Basic UI:** The current interface is functional but could be improved for better user experience.
5. **No Multi-language Support:** Only available in one language, limiting accessibility.

Future Enhancements:

1. **Live Chat & Chatbot:** Add real-time messaging and a chatbot for quick FAQs.
2. **Mobile App Development:** Launch Android/iOS versions for better reach.
3. **Doctor Dashboard:** Allow doctors to manage appointments, availability, and view reports.
4. **E-Prescription Module:** Enable doctors to share prescriptions digitally post-consultation.
5. **Multi-language Support:** Add support for regional languages to increase accessibility.
6. **Reminder System:** Email/SMS reminders for upcoming appointments.

Chapter 15

15. Reference

<https://www.practo.com/>

<https://www.webmd.com/>

<https://www.healthline.com/>

<https://www.zocdoc.com/>

<https://www.synergyprivatehealth.com/>

<https://www.mavenclinic.com/>