DESIGN AND DEVELOP FUTURISTIC TELEMEDICINE USING ARTIFICIAL INTELLIGENCE

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FINAL YEAR DESIGN PROJECT REPORT

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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DHAKA, BANGLADESH
July 2024

APPROVAL

This Project titled **"DESIGN AND DEVELOP FUTURISTIC TELEMEDICINE USING ARTIFICIAL INTELLIGENCE"**, submitted by **Mafuj Ahammad Pranto** and **Homaira Tousif Surovi** 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 15 July 2024.

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We hereby declare that, this project has been done by us under the supervision of **Mr. Abdus Sattar, Assistant Professor & Coordinator M.Sc ,& Coordinator M.Sc , Department of Computer Science and Engineering, 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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ACKNOWLEDGEMENT

First, we express our heartiest thanks and gratefulness to almighty for His divine blessing making it possible for us to complete the final year project successfully.

We are grateful and wish our profound indebtedness to **Mr. Abdus Sattar, Assistant Professor & Coordinator M.Sc, & Coordinator M.Sc,** Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Web development using ASP.NET Core*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts, and correcting them at all stages have made it possible to complete this project.

We would like to express our heartiest gratitude to the **Head of the Department of CSE**, for his kind help in finishing our project and also to other faculty members and the staff of the Department of CSE, Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discussion while completing the course work.

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

ABSTRACT

In our country the medical sector has made impressive improvements, although the medical sector is faced with many intractable challenges, one of the most serious issues is we do not get a proper medical service when we need it most. A major drawback of our healthcare sector is the insufficient number of hospitals and doctors. According to WORLD HEALTH STATISTICS 2020 there are 6.7 physicians per 10000 (2020-2023) people in Bangladesh. So, we can say that we have very less resources then we required. Our Telemedicine Platform is a user-centric one stop solution designed to bridge the gap between healthcare services and individuals. This project aims to provide an all-round telemedicine experience by providing various features, including online consultations, medical test sample collection from home, e-report delivery, blood donation facilitation, emergency medical support, and an AI-powered chatbot for medical queries. Also, our platform will allow you to save all your medical data and reports. Throughout this project our aim is to reduce hospital dependency as much as possible and digitalize our hospitals. It's not necessary to visit hospital to take healthcare services, many problems can be solved using video consultation. If we look over our government hospitals, there are no online facilities available. If our government hospitals integrate with our platform than it will be very easy to provide online healthcare in a minimal price. In this digital world, we can take many healthcare services online if we want, so it is possible to improve the quality of health care to a great extent. We will integrate our platform with hospitals and diagnostics so that they can operate there services in online as well as physical. By moving into online telemedicine platforms our healthcare organizations will be able to spread their care in more and more people.

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CHAPTER 1
INTRODUCTION

1.1 Overview

Our Futuristic Telemedicine project "CareOnspot - A Virtual Healthcare Hub." CareOnSpot is your quick and easy way to get medical help in Bangladesh where it is crucial. Over time, the use of technology in every field is on the birch, but in healthcare, it is used relatively less. If we look at our government hospitals, there are no digital health care facilities. Where most of our people are dependent on government hospitals. Keeping in mind the existing problems in our healthcare sector, we have brought our project "Care on spot". It contains various features like, Emergency medical van or ambulance call. This feature also includes calling a doctor at users' doorstep during emergency. We will provide a service for online doctor consultations. By this feature consulting a doctor is no longer a challenging task for our users. Medical tests are not easy work. Getting medical tests done at a diagnostic center is a lengthy process. Keeping the hassle in mind we will collect medical test samples from home and deliver the E-report on our website. We will deliver medicines at home at a lower price. Our wish is to make health care in the reach of all. We will also include health insurance policy so that users can get financial support during emergency medical conditions. We will use an intelligent chatbot using AI that will suggest users to consult a type a specialist doctor with information about the disease and in some case it I would suggest first aid for some disease. Overall, our project is a one stop solution for health care. Our motive is to bring healthcare to the rich of all.

1.2 Background and Present State

Background: The use of telemedicine in healthcare has given a significant advance to digital healthcare. The use of telemedicine has made it much easier to provide medical care to any remote patient. The use of telecommunication technology has bridged the gap between patients and healthcare providers and brought health care within the reach of everyone. This needs to be evaluated especially in countries like Bangladesh, where healthcare accessibility is a major concern. In recent years, Bangladesh's healthcare system has seen considerable efforts to improve the accessibility and quality of services through the use of digital platforms. Several telemedicine platforms have been launched to address the challenges of healthcare delivery, especially in rural and remote areas. These platforms offer various services including online consultation, medical advice, prescription services and emergency assistance. The primary goal is to overcome the barriers of distance, limited infrastructure and lack of healthcare professionals.

Present State: In recent years, Bangladesh's healthcare system has seen considerable efforts to improve accessibility and service quality through initiatives to promote the use of digital platforms. Several telemedicine platforms have been launched to address the challenges of healthcare delivery, especially in rural and remote areas. These platforms offer various services including online consultation, medical advice, prescription services and emergency assistance Currently, various telemedicine services are operating in Bangladesh, each focusing on different aspects of healthcare delivery Popular platforms such as DocTime, e-Pharma and MedeEasy have gained traction, offering services that include virtual consultations with doctors, drug delivery and access to health information. Private hospitals like Evercare hospital Bangladesh and Square Hospitals have also incorporated telemedicine into their service offerings, especially for online consultations and emergency services. Apart from these, there are many other organizations that provide emergency services and many private hospitals and diagnostics are taking steps to make their services online.

1.3 Problem Statement

Compared to the developed world, the healthcare sector of our country is still lagging far behind. We do not have enough hospitals and doctors. Getting healthcare services in many government hospitals is getting harder and harder and the quality of services is decreasing day by day. Expense in private hospitals is out of reach for many. It often takes us all day to do a simple medical test. It takes a long time to get a report. And during emergency medical conditions it is exceedingly difficult to get support on time. In our government hospitals, there are no online facilities available. We aim to solve these existing problems of our healthcare sector. Our primary target is to digitalize our government hospital through our telemedicine platform and provide a hassle-free healthcare service. Hours and hours are being wasted to consult a doctor. With the use of information technology, it is now possible to deliver these services to a person sitting at home. Our country is very less in resources, we have to ensure proper application and proper utilization of these resources.

1.4 Objectives

Our motivation for this project is to use technology smartly to make sure healthcare services are available to everyone and used in the best way. People in rural areas face challenges in accessing immediate medical assistance during emergencies due to the scarcity of healthcare facilities. Our motivation for creating this telemedicine platform also is driven by the lack of medical support, especially emergency healthcare, and the insufficient number of hospitals in rural Bangladesh. Medical support and health care facilities in our country are very few than our requirement. Some time it takes all day to consult a doctor in government hospitals and when it comes to medical tests it takes a day to collect sample and another day

to deliver the report. On the other side private hospitals are beyond the reach of many. So, we are here to make health care easy and to provide emergency medical service for all no matter where he/she is. Our objectives are-

- Ensuring health services for all, no matter where they live.
- Make sure that when someone has a medical emergency, they can get help quickly through our service and call ambulances and doctor at home.
- Let people consult doctors online easily, so they can get advice without going to the hospital.
- Deliver medicines to people's homes.
- Facilitate blood donation by users.
- Make it easy for people to do medical tests by collecting samples from home.
- Use technology smartly to make sure healthcare services are available to everyone and used in the best way.

1.5 Scope and Limitations

Already there are some websites and apps serving good in this sector. But in our case, we are trying to make a reliable platform that will help to improve our government healthcare services. Mobile phones are now accessible to 85-97% of the global population, with the number of smartphones predicted to reach 3 billion by 2021. This has led to the development of mobile health (mHealth), a new field of medicine that aims to provide high-quality healthcare services. Despite the widespread availability and ubiquity of smartphones, mHealth has not been effectively implemented in developed countries, particularly in underdeveloped countries. Bangladesh, like other industrialized and developing economies, faces challenges in providing affordable and accessible healthcare due to limited resources and a large population. Despite having 607 government hospitals and 5023 private hospitals, Bangladesh has a major deficit of health personnel and operating rooms. The government is implementing eHealth to provide affordable, egalitarian, and high-quality healthcare. The Bangladeshi government has partnered with development partners, corporate groups, and NGOs to enhance the quality, effectiveness, and safety of eHealth services. Here is the scope of the projects are given below-

- Identify areas with limited access to medical facilities.
- Currently, websites that exist in Bangladesh are not providing emergency medical support, which is one of our key features.

- Medical Test Requests and Sample Collection from home to streamline the diagnostic process and improve accessibility to testing facilities.
- Establish a centralized network for blood donation, allowing users to register as donors, request blood donations, and create a supportive community to address blood shortages.
- Since health insurance is not prevalent in our country, we have introduced this service so that a seriously ill user does not get denied treatment for lack of money.
- Consulting a doctor online will be a key aspect of our platform. People don't need to waste a full day just to visit a doctor for consultation.
- Our government hospitals don't have any online platform and our aim to integrate our platform with government hospitals.
- Integration of AI Chatbot will help in finding and connecting with specialized doctors. We will collect data on names of various diseases and their symptoms. Our chat bot will give you an idea of what kind of specialist doctor to consult based on the symptoms of the disease.

Our project have a lots of scope in our country but also it have some Limitations. They are-

Technology Infrastructure: Telemedicine services require reliable internet access and technology infrastructure. Internet connectivity is still inadequate in many rural and remote areas of Bangladesh. Lack of reliable Internet access can hinder effective use of telemedicine platforms.

Digital Literacy: A significant portion of our population lives in rural areas and these alone lack digital literacy. Effective use of telemedicine platforms requires the ability to use digital platforms. To solve this problem we are trying to give everyone some basic training and keep our platform as user friendly as possible.

Healthcare Provider Adoption: The success of telemedicine depends on the willingness of healthcare providers to adopt and use these technologies. Gaining the trust and conviction of healthcare providers and those working in the sector is a daunting task.

Regulatory and legal issues: Telemedicine involves the transmission of sensitive patient information, raising concerns about privacy, security, and regulatory compliance. Ensuring that the platform complies with national and international healthcare regulations and standards is a complex and ongoing process.

Quality of care: Although telemedicine can significantly improve the quality of healthcare, there are concerns about the quality of care delivered remotely. Physical examinations and certain diagnostic tests can be difficult to administer in practice, potentially affecting the accuracy of diagnosis and the effectiveness of treatment.

User trust and engagement: Building trust among users about the reliability of telemedicine services is crucial Past experience and low user confidence in new technologies can be a major problem.

Emergency Response Limitations: Although telemedicine can provide initial consultation, it may be less effective in emergency situations that require immediate physical intervention. Ensuring rapid response and coordination with emergency medical services is essential but challenging.

1.6 Report Organization

Chapter 1, In this chapter we discuss the introduction of our project. We also added Problem Statement, scope of the project and outcome of the project.

Chapter 2, Here we discussed the literature review of the project. We defined the different platforms to make the related work and also we did comparative analysis.

Chapter 3, this chapter includes the overall system design, requirements analysis, functional and non-functional requirements of the system .

Chapter 4, here we discuss the implementation and testing of our project. We added the UI design of our project and the presend front-end. Also we performed a feature testing or manual testing.

Chapter 5,in this chapter we discussed about the impact on social and environmental and ethical aspects.

Chapter 6, In this chapter we discussed the overall conclusion and the limitation of the project.

1.7 Summary

The introduction chapter provides an overview of our telemedicine project “CareOnSpot”, highlighting the current challenges in Bangladesh's healthcare sector. The project aims to integrate information and communication technology to make healthcare services more accessible. The lack of digital healthcare facilities in government hospitals and the difficulties faced by individuals in obtaining prompt medical services serve as the primary motivations for the project.

The problem statement highlights the gaps in healthcare sector compared to developed nations, identifying the shortage of hospitals and doctors, decreasing quality of services in government hospitals, and the financial inaccessibility of private healthcare. The hassle duration for simple medical tests and the struggle to receive timely reports, and the challenges in emergency medical conditions. These issues of our healthcare sector are addressed by the project.

The project outcomes aim to revolutionize healthcare delivery, increase accessibility, provide efficient online consultations, establish a supportive blood donation community, and optimize the use of resources in the healthcare system.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The entire world is now dependent on technology. Considering the way in which everyone is dependent on technology day by day, we must try to bring the health service sector under technology as well. Countries in the developed world have already made significant strides in digitizing health care services. Healthcare is changing rapidly, with telemedicine taking the lead in making healthcare more accessible and efficient. This project could be a breakthrough platform that seeks to revolutionize medical care in response to the growing demand for improved healthcare services. Our "CareOnSpot" is a telemedicine website designed to offer a comprehensive suite of services, including emergency medical van dispatch, home visits by doctors, medicine deliveries, collection of medical test samples, and the introduction of an AI chatbot for specialist doctor recommendations.

2.2 Related Works

Telemedicine has already become quite popular in our country. Some companies have already started providing this service. Various telemedicine services are operational in Bangladesh, each focusing on different aspects of healthcare delivery. Among them DocTime, E-pharma, Medeasy etc. are more popular. In recent time Doctordekhao is also doing good in this sector. They are focusing on doctor online consultation. Moreover, some private hospitals are giving preference to online consultancy and emergency services. Private hospitals like Evercare Hospital Bangladesh have also incorporated telemedicine into their service offerings, particularly for online consultations and emergency services.. Since I will be doing the web application project, I discussed about with DocTime, Medeasy, E-Pharma, Doctordekhao, Evercare Hospital.

Doctime: DocTime is an online medical service provider, at an affordable price. DocTime is a healthcare website that provides services like online doctor consultation, medical test from home, order medicine from home etc[3].

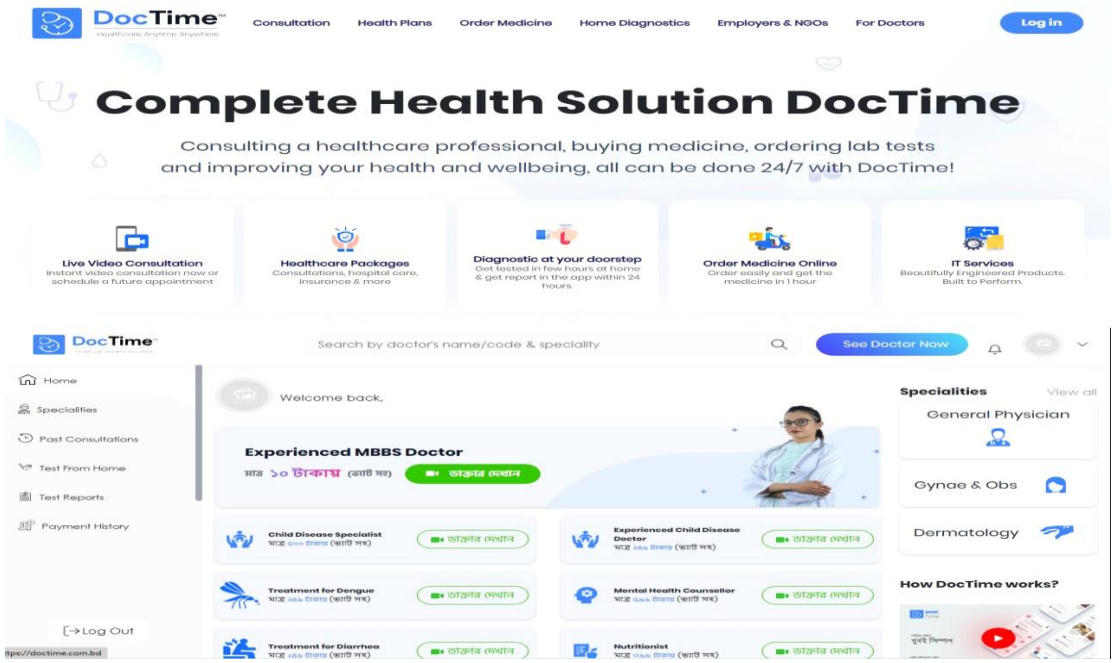

Figure 2.2.1: DocTime

MedEasy: MedEasy is a digital healthcare platform in Bangladesh. It provides doctor video consultation and medicine home delivery all over Bangladesh[4].

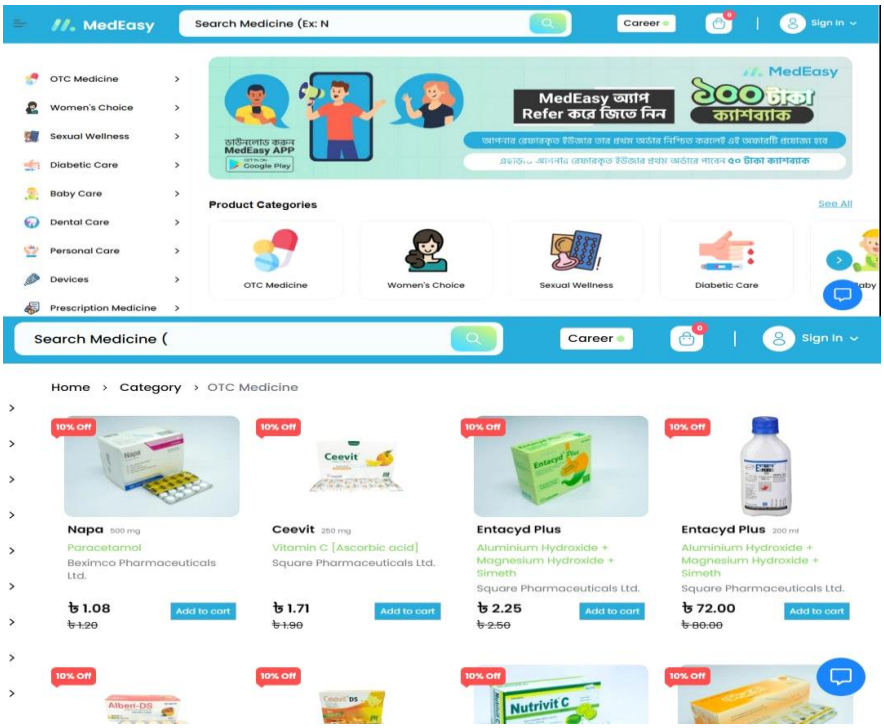

Figure 2.2.2: MedEasy

EPharma: ePharma is an online Healthcare Solutions where thy not only provide a wide range of medicines, but also offer a wide choice of healthcare products including wellness products, vitamins, diet/fitness supplements, herbal products, pain relievers, diabetic care kits, baby/mother care products, beauty care products and surgical supplies[5].

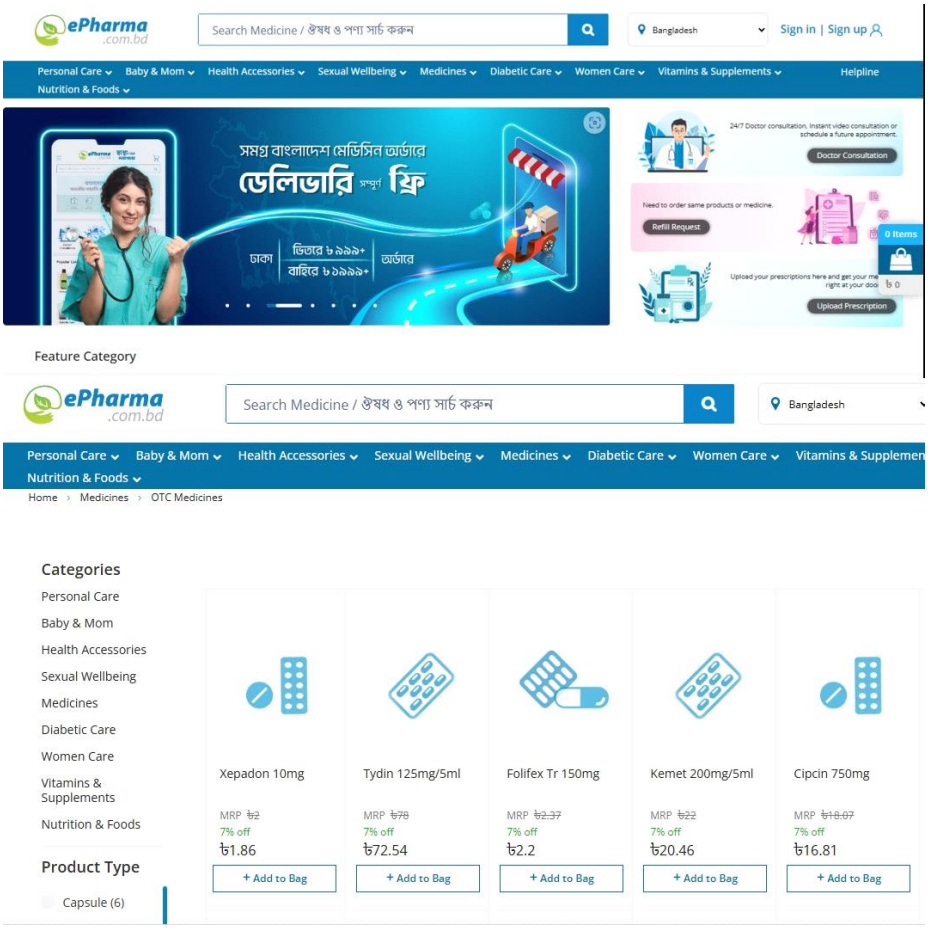

Figure 2.2.3: ePharma

Doctordekhao: doctordekhao is an online Healthcare platform where thy provide online consultation of doctors, health tips and blogs about dieses and ther possible treatement. They have a good user interface and they have used fully Bangla in their language web-site and they have a fully responsive website[8].

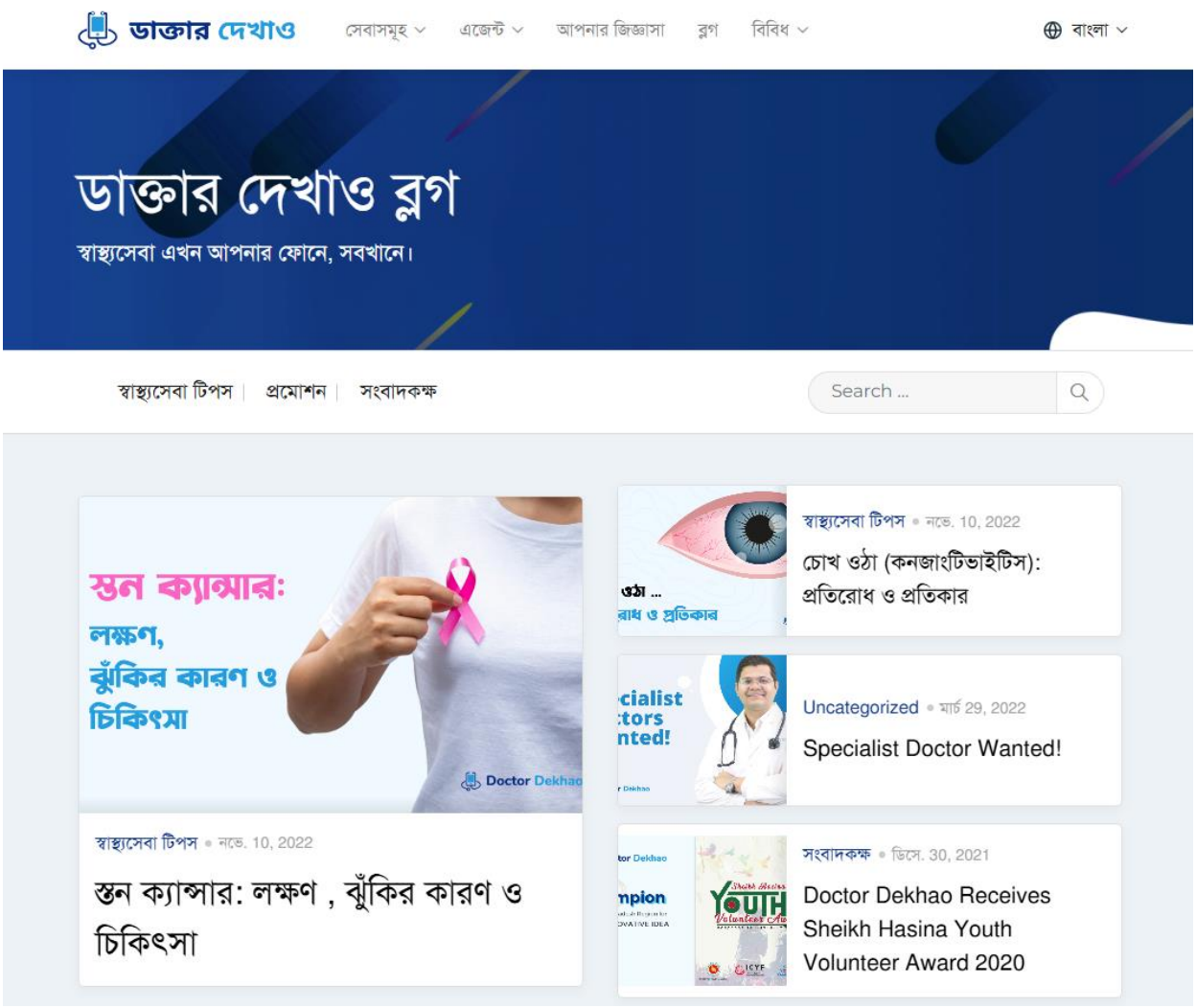

Figure 2.2.4: doctordekhao

Ever Care Hospital: Ever Care Hospital is a repotted private hospital in Bangladesh. They provide services like online doctor consultation, medical test from home and e-report delivery. They also provide support during emergency and also they delivers medicine at patients home[9].

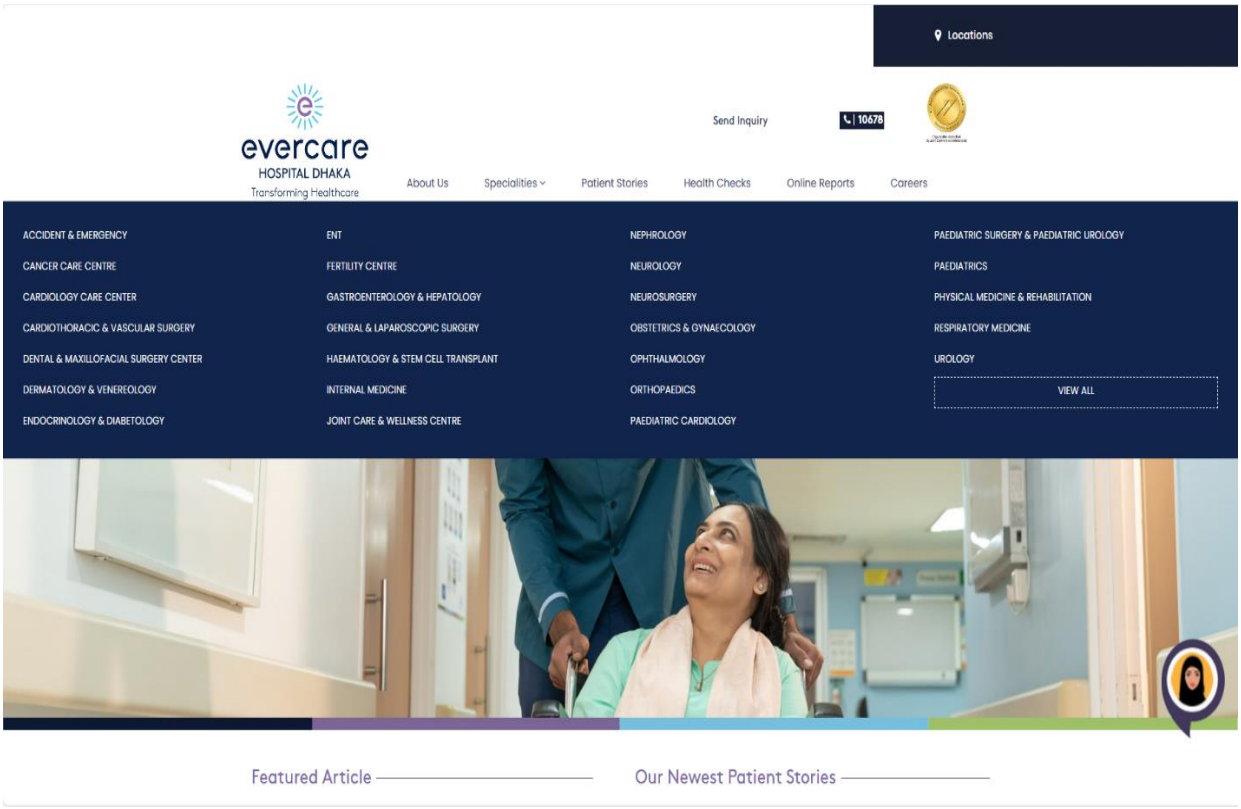

Figure 2.2.5: Ever care Hospital

2.3 Comparison between existing works

We already have many similar websites that are playing a role in the healthcare sector. But in many cases, they are lagging. “DocTime” is a big player in the online health service sector in Bangladesh[3]. But they have limited their services into online consultation and medicine delivery only. Doctime had a feature to collect test sample from home, but the service in not as good there other services .Moreover, Medeasy provides online healthcare services[4]. But their main attraction is medicine delivery. Also, there is a web site named “Epharma”, they serve online consultation and medicine delivery[5]. If we compare them, in our project we are providing all kinds of medical services on one platform. Our project is a one stop solution for the healthcare sector. We will provide options for health insurance and blood donations. Till now there is no platform offering blood donations. We have also some additional features that will push our medical care sector.

TABLE 1. COMPARATIVE ANALYSIS WITH PREVIOUS WORK

SL No	Existing Websites	Key features	Platform Availability	UI	Additional Features (Our Project)
1.	DocTime	Online consultation, medicine delivery, Test sample collection ,E-report delivery.	Web, iOS, Android	User friendly	-
2.	MedEasy	Online consultation, medicine delivery	Web, iOS, Android	User friendly	-
3.	E-pharma	Online consultation, medicine delivery	Web, iOS, Android	Not user friendly	-
4.	Doctordekhao	Online consultation	Web, iOS, Android	User friendly	-
5.	Ever Care Hospital	Online consultation, medicine delivery, Test sample collection ,E-report delivery.	Web	Not user friendly	-
6.	CareOnSpot (Our Project)	Online consultation, emergency medical van request, blood donor search, medical test requests, AI chatbot for doctor suggestions	Web	user friendly	1. Emergency medical van request. 2. blood donor search. 3. AI chatbot for doctor suggestions

From the above table 1 we can differentiate our project features. We are adding some additional features and also our future goal is to make this project available for all platforms.

2.4 Open Issues

Our project aims to identify and address significant gaps in our country's current health care sector that prevent access to quality medical services. The gap analysis for "CareOnSpot" shows significant disparity between the health care standards in Bangladesh, the current status and the desired outcomes for achieving the goals of the telemedicine platform. This

analysis focuses on various aspects such as accessibility, service integration, quality of care and technological advances. These gaps include shortage of hospitals and healthcare professionals, insufficient no of diagnostic centers, challenges of coordinating blood donation, and inability to provide services in emergencies. Our objective is to prevent all these gaps and try to reduce hospital dependency. Moreover, the existing telemedicine websites are only focusing on doctor consultation and drug delivery. But by introducing our "CareOnSpot" our aim is to integrate digital services in our government hospitals to ensure the development of service and a platform for all health care services.

2.5 Summary

In this chapter, we discussed the existing projects comparable to our project. We found the differences of all other projects and found ways to solve them through our project. Looking at the above projects, there is no organization that provides services to a patient in an emergency. And in our country, there is no online service in government hospitals. In this chapter we discussed the problems of existing platforms. We found that most of the telehealth service providers are not focusing to make healthcare accessible. Most of them focusing on selling medicine and other products. Our government sector is also lagging behind in improving telemedicine. So, our primary aim is to bring our government hospitals under online service and arrange all appropriate donations in emergencies.

CHAPTER 3

REQUIREMENT ANALYSIS AND DESIGN SPECIFICATION

3.1 Overview

The third chapter of this report focuses on the Requirement Analysis, System Design, Input Output Analysis, and Project Management and Financial Analysis for the "CareOnSpot" telemedicine project. This chapter provides a better understanding of how the project will be executed, the identified requirements, and the design considerations.

3.2 System Design

We are working on a telemedicine project named “CareOnSpot”. The proposed methodology emphasizes the use of HTML, CSS, Bootstrap, and JavaScript for the frontend, with .NET MVC for backend development. It is a one stop solution for all kinds of healthcare services. Our key fractures are:

- **User Registration and Authentication:** Users can register with the system securely.

- **Dashboard:** Provides a centralized view for users with quick access to essential features and information.
- **Emergency Medical Van Request:** Users can request emergency medical van support
- **Online Consultation:** Users can schedule and conduct online consultations with doctors, featuring secure video conferencing and chat.
- **Medical Test Request:** Users can request medical tests with sample collection from home, seamlessly integrated with diagnostic labs.
- **Blood Donation:** Users can register as blood donors and request blood donations, fostering a supportive community.
- **Chatbot:** AI-powered chatbot for general medical queries, recommending specialized doctors based on user input.

The following figure 3.3.1 shows the system design of the project.

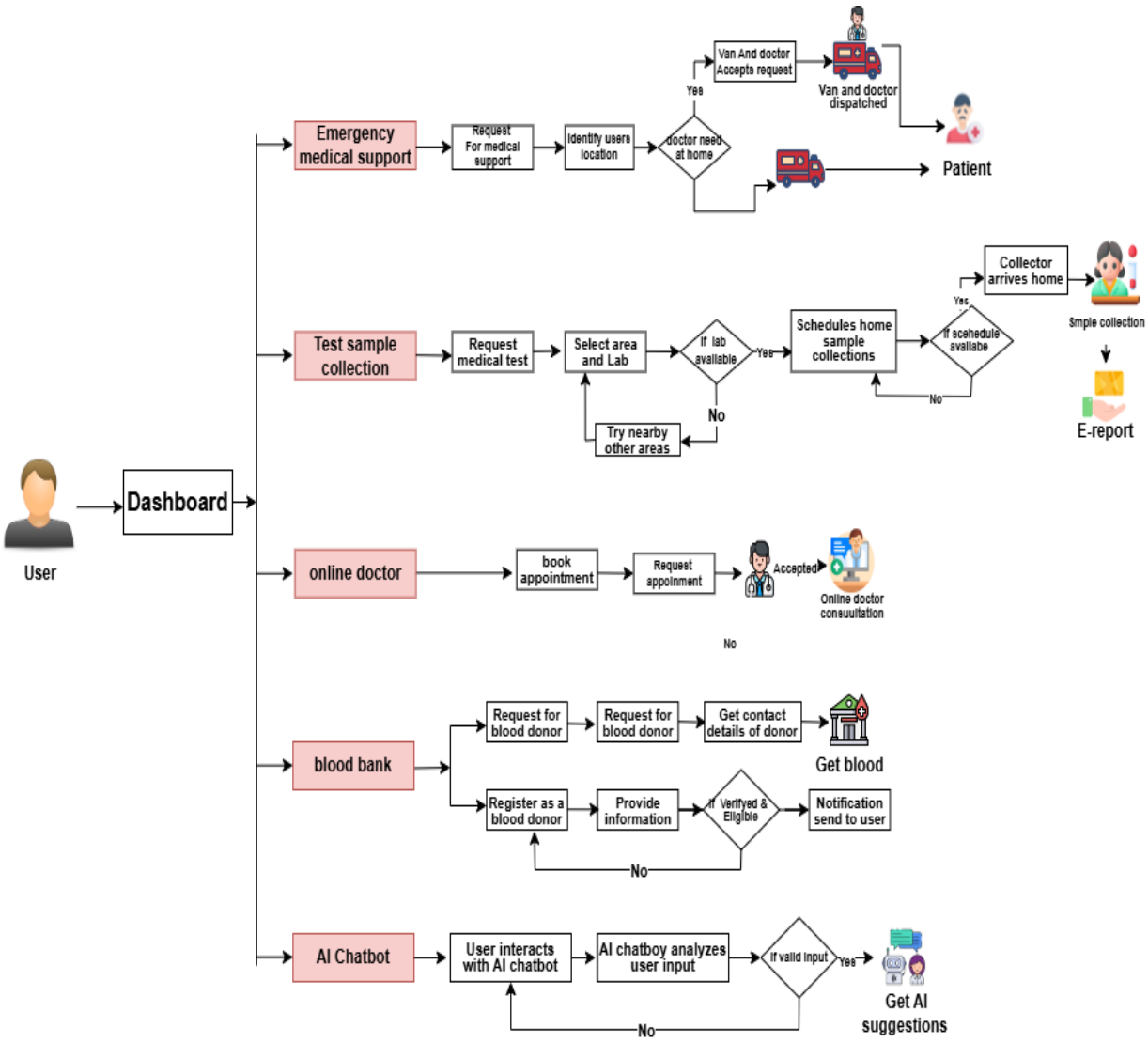

Figure 3.3.1: System design

The following figure 3.3.2 shows the sequence diagram of the project.

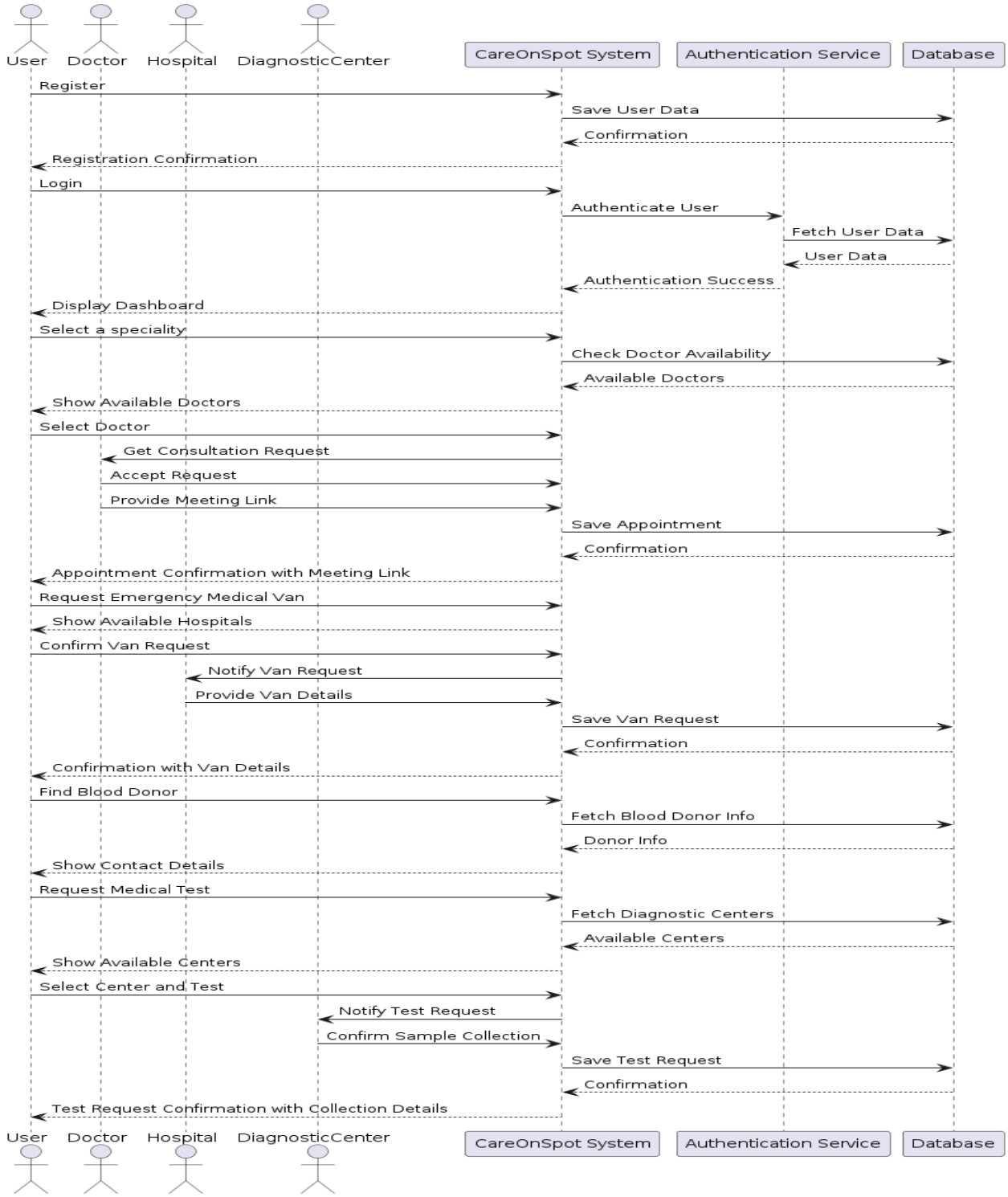

Figure 3.3.2: Sequence diagram

The following figure 3.3.3 shows the use case modeling diagram for CareOnSpot. This diagram illustrate the use cases of this project. Here user will register and launch to the dashboard. Here user will find our services and use our services like online doctor consultation, medicaltest, emergency service etc. If user wants to consult a doctor he will find a list of specialty and then the will find his doctors and then make a request.

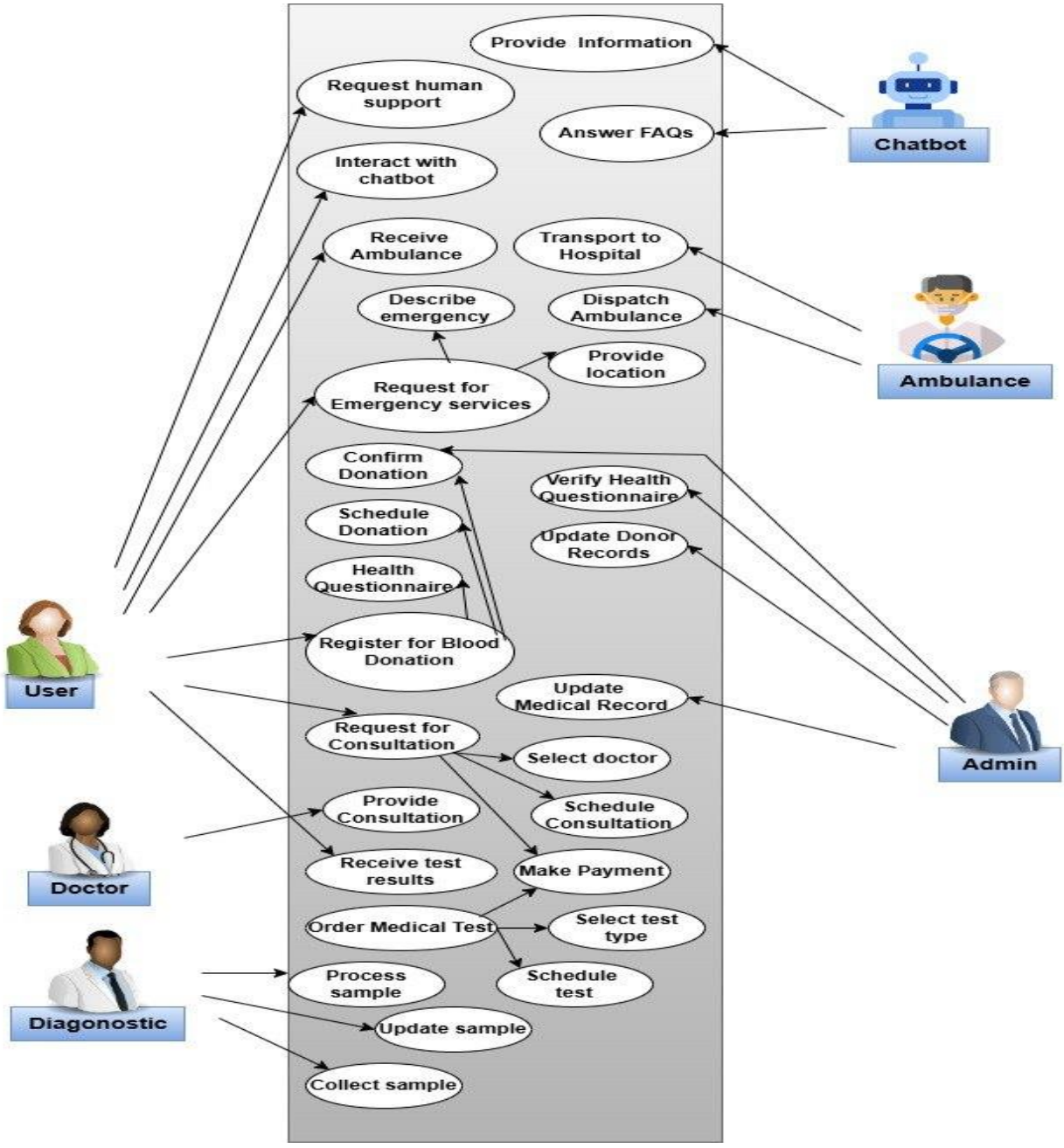

Figure 3.3.3: Use Case diagram

The following figure 3.3.4 shows the ER diagram of the project. The Entity-Relationship (ER) diagram illustrates the relationships between different entities in the telemedicine system.

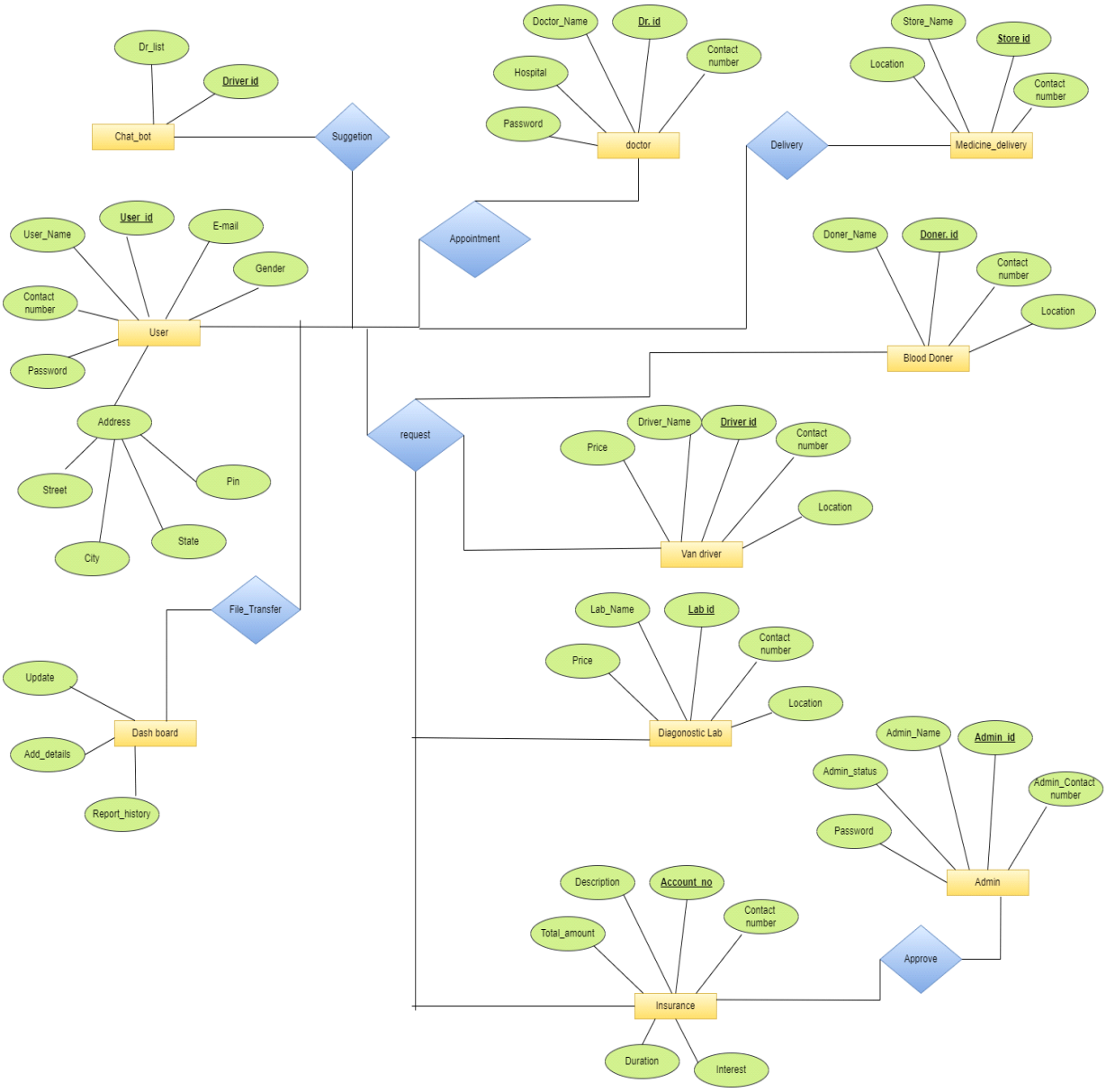

Figure 3.3.4: ER diagram

The following figure 3.3.5 shows the Use case diagram and Activity of users. In the left side the use case diagram for the User in the telemedicine system outlines the various interactions and functionalities available to users. In the right hand side The activity diagram for the User represents the sequential flow of activities when a user interacts with the telemedicine system.

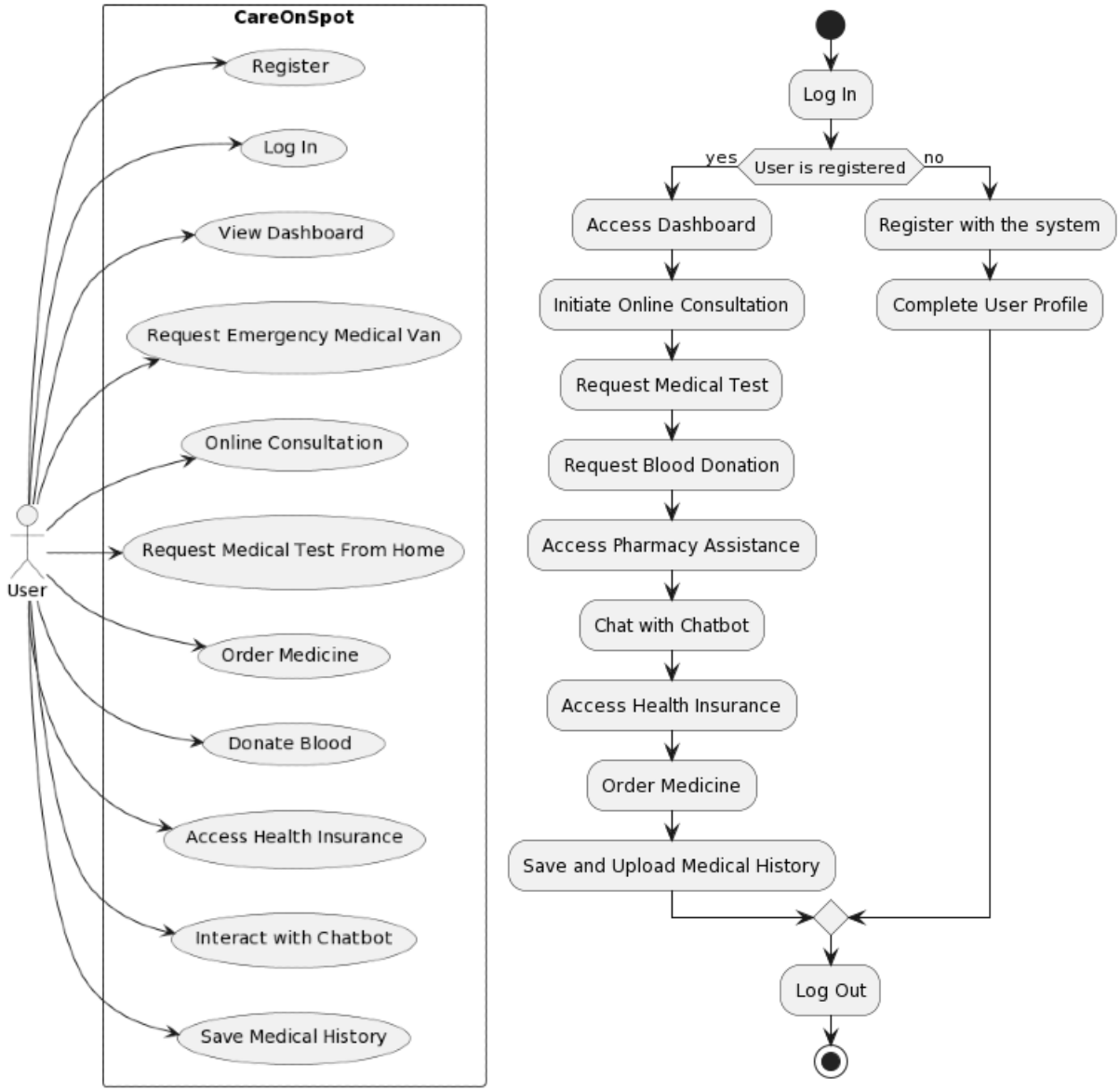

Figure 3.3.5: Use case and activity diagram of users

Here is the database design of our system, this design shows the relations between entities of the project.

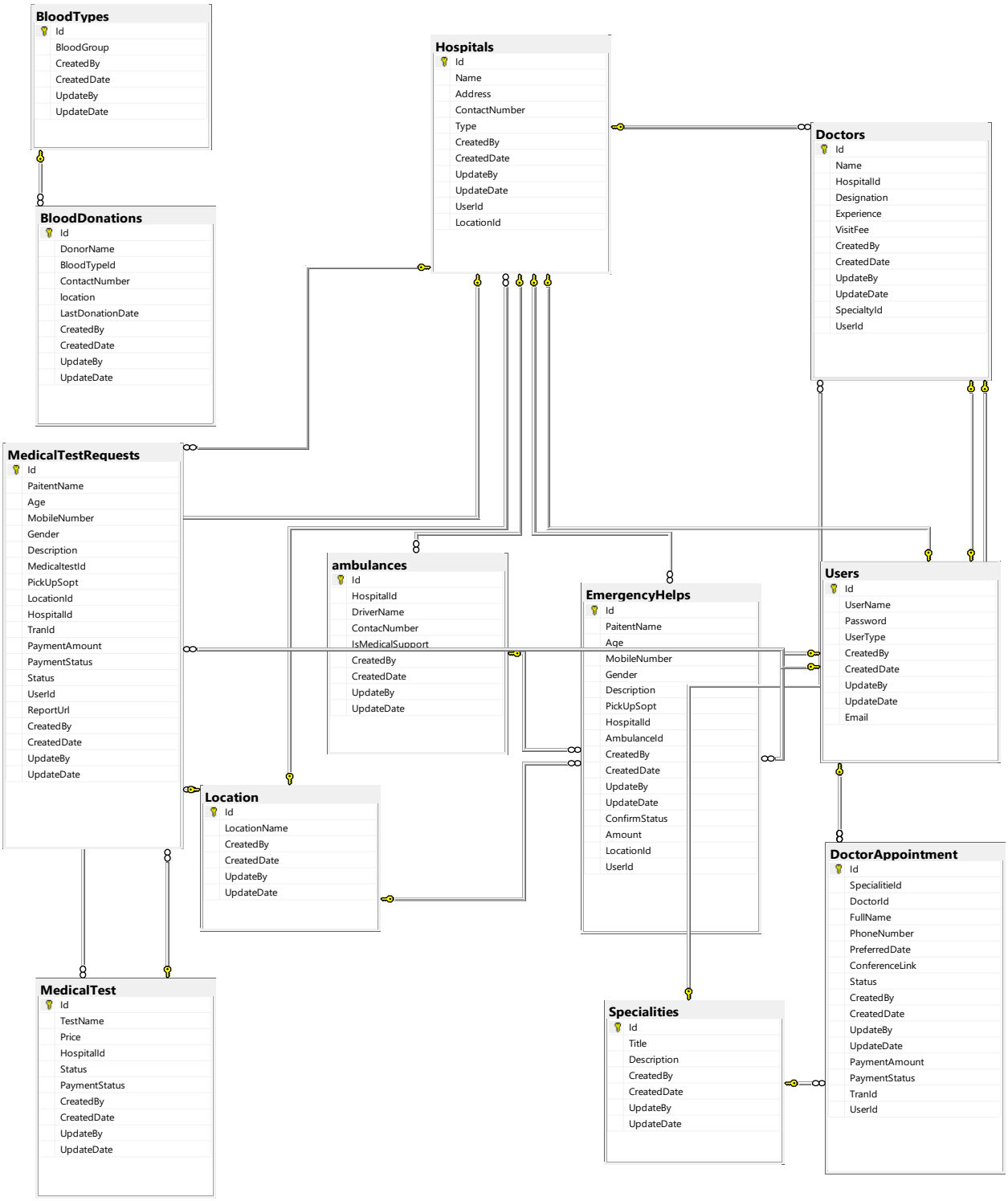

Figure 3.3.6: Database design

3.3 Software Requirement

The 'CareOnSpot' telemedicine project aims to fill the healthcare sectors gap in Bangladesh. Ensuring a complete telemedicine platform by addressing the identified challenges.

Requirement Analysis for "CareOnSpot" Telemedicine Project:

Functional Requirements:

- User registration with valid credentials.
- Two-factor authentication for enhanced security.
- Emergency van request feature on the platform.
- User-friendly interface for scheduling appointments.
- Secure video conferencing and chat features.
- integration with diagnostic labs.
- Home sample collection scheduling.
- Blood donation requests and appointments.
- Integration with local pharmacies for timely deliveries.
- User enrollment in health insurance plans.
- Utilize AI-powered chatbot for general medical queries and recommend specialized doctors.

Non-Functional Requirements:

- Ensure low latency in emergency services.
- Quick response times for online consultations.
- 24/7 availability of emergency services.
- Ability to handle a growing number of users.
- Reliable server infrastructure.
- Data encryption for user privacy.
- Regular security assessments.

- Mobile application compatibility with major operating systems.
- Intuitive design for users of all ages.

TABLE 2: INPUT OUTPUT ANALYSIS TABLE.

Feature	Input	Output
User Registration and Authentication	User details (name, email, etc.),	Registered user profile.
Dashboard	User login with username and password	Personalized dashboard, key information display.
Emergency Medical Van Request	User's emergency request, location and description about the emergency.	Dispatch confirmation and add doctor with van if needed.
Online Consultation	User's consultation request, select schedule, select doctor.	Scheduled consultation, prescription, consultation summary.
Medical Test Request	User's test request, sample collection details, detailed address.	Scheduled test, sample collection confirmation.
Blood Donation	User's blood donation request, blood type.	Blood donations contact details, donor confirmation.
Chatbot	User queries, symptoms	Recommended doctors, general medical advice.

3.4 Project Management and Financial Analysis

This section explores the project's management tasks in a sequential order and emphasizing financial analysis. “CareOnSpot” aims to save time and resources for user to take healthcare in our country and enhance customer satisfaction.

Project Management

- **Project Objectives:**

    A. To create an online platform for get healthcare facilities online and Hope to bring the government healthcare sector under the umbrella of an online platform

    B. Use technology smartly to make sure healthcare services are available to everyone and used in the best way.

    C. Make sure that when someone has a medical emergency, they can get help quickly through our service and call ambulances and doctor at home

- **Project Timeline:**

    A. Phase 1: Project Planning and Research (2-3 weeks)

    B. Phase 2: Design and Prototyping (3-4 weeks)

    C. Phase 3: Front-End Development (8-12 weeks)

    D. Phase 4: Back-End Development (10-14 weeks)

    E. Phase 5: Testing and Quality Assurance (2-4 weeks)

    F. Phase 6: Deployment and Launch (2-3 weeks)

    G. Phase 7: Marketing and Promotion (Ongoing)

    H. Phase 8: Continuous Improvement (Ongoing)

- **Resource Planning:**

    A. Equipment and Tools:

    - Development and Testing Servers
    - High-performance Computers for Development Team
    - Design Software (e.g., Adobe XD, Figma)
    - IDE (e.g., Visual Studio)

- Version Control System (e.g., Git)

B. Software and Technologies:

- Front-End Technologies (e.g., HTML, CSS, Bootstrap CSS, JavaScript)
- Back-End Technologies (e.g., C#, ASP.NET Core)
- Database Management System (e.g., MySQL)
- Server Hosting (e.g., AWS)
- Payment Gateway Integration (e.g., PayPal, Stripe, Bkash, Nagad)
- Security Software and SSL Certificates

C. Training and Skill Development:

- Ensure the development team is proficient in web development, security and database management.
- Provide additional training on specific technologies and tools as required for project implementation.

- **Risk Management:**

SWOT analysis involves assessing the Strengths, Weaknesses, Opportunities and Threats of a project. Here's a SWOT analysis for CareOnSpot:

A. Strengths:

- It integrates all health care services such as online consultation, an emergency medical van request, scheduling of medical tests, and blood donation under one umbrella.
- It is neat, clean, and easy to navigate and access.
- User-friendly interface and intuitive design.
- Take government healthcare facilities from home.

B. Weaknesses:

- High initial development costs for advanced features.
- Potential challenges in user adoption and platform migration.
- Technical complexities in integrating multiple services.

- Dependence on external service providers for certain functionalities like medical test, emergency service etc.

- Concerns regarding data security.

C. Opportunities:

- Market expansion into untapped regions and demographics.

- Potential partnerships with local diagnostics ,ambulance drivers,hospitals.

- Adoption of emerging technologies like AI for enhanced user experience and peoples are getting attracted in telemedicine .

D. Threats:

- Risk of market saturation.

- Cybersecurity risks and data privacy concerns.

- Economic downturns impact spending on health care and, consequently affect demand for Digital Health Services.

- Gaining the trust and conviction of healthcare providers and those working in the sector is a daunting task.

- Telemedicine services require reliable internet access and technology infrastructure. Internet connectivity is still inadequate in many rural and remote areas of Bangladesh

- Although telemedicine can significantly improve the quality of healthcare, there are concerns about the quality of care delivered remotely.

Financial Analysis

Below is a general table with estimated costs for different tasks and components of Our project based on the requirements.

TABLE 3: ESTIMATED COST ANALYSIS THROUGHOUT THE DEVELOPMENT

Task	**Priority**	**Hours to Complete**	**Duration (weeks)**	**Resources Required**	**Budget Allocation (Taka)**
Project Planning and Research	High	60	2-3	Business Analyst	7,000
Design and Prototyping	High	80	3-4	UX/UI Designer	8,000
Front-End Development	High	240	8-12	Frontend Developers	50,000
Back-End Development	High	250	10-14	Backend Developers	60,000
Database Setup and Integration	High	20	1-2	Database Administrators	15,000
Testing and Quality Assurance	High	80	2-4	QA Engineers	20,000
Deployment and Launch	High	34	2-3	DevOps Engineer, Deployment Specialist	25,000

maintenance	Low	Ongoing	Ongoing	Development Team	200,000/year
Total Estimated Cost					3,85,000

Above is an estimated cost for now and over the time with the development progress the cost may vary.

3.6 Summary

Here in this chapter, we discussed our overall system design and requirements analysis. Firstly, a brief description and then the requirements of our project. We discussed functional requirements like, User registration with valid credentials, Two-factor authentication for enhanced security, Emergency van request feature on the platform, On-the-spot doctor availability etc. And non-functional requirements like Ensure low latency in emergency services, Quick response times for online consultations, 24/7 availability of emergency services, Ability to handle a growing number of users, Reliable server infrastructure etc. Then the system design diagram and sequence diagram. After that I attached our system UI with description.

CHAPTER 4
IMPLEMENTATION

4.1 Overview

Chapter 4 provides an in-depth overview of the implementation phase of "CareOnSpot - Virtual Health Care Hub". This chapter details the processes involved in translating the design specifications into a functional system. "CareOnSpot" is a virtual health care hub. It will offer various health care facilities in one platform. The aim is to help all kinds of to get medical help. The design must be interactive for cross platform use. The front-end of CareOnSpot is developed using HTML,CSS , Bootstrap and JavaScript. The design is simple and easy to use. We tried to make the design as much as simple so that everyone can use easily and it looks attractive also. We have prioritized simplicity and ease of use in the design to make it accessible to everyone, regardless of their technical proficiency. The user interface is clean and intuitive, with attractive visual elements that enhance the overall user experience, making navigation and interaction seamless and enjoyable.

4.2 Prototype Design

Our UI design:

Starting Page and Dashboard:

Our starting page is presenting a menu or options of this application. There are eight options which will go to three distinct categories. And after logging in or signup user will launch to dashboard. There the user will find the key features and offers for them.

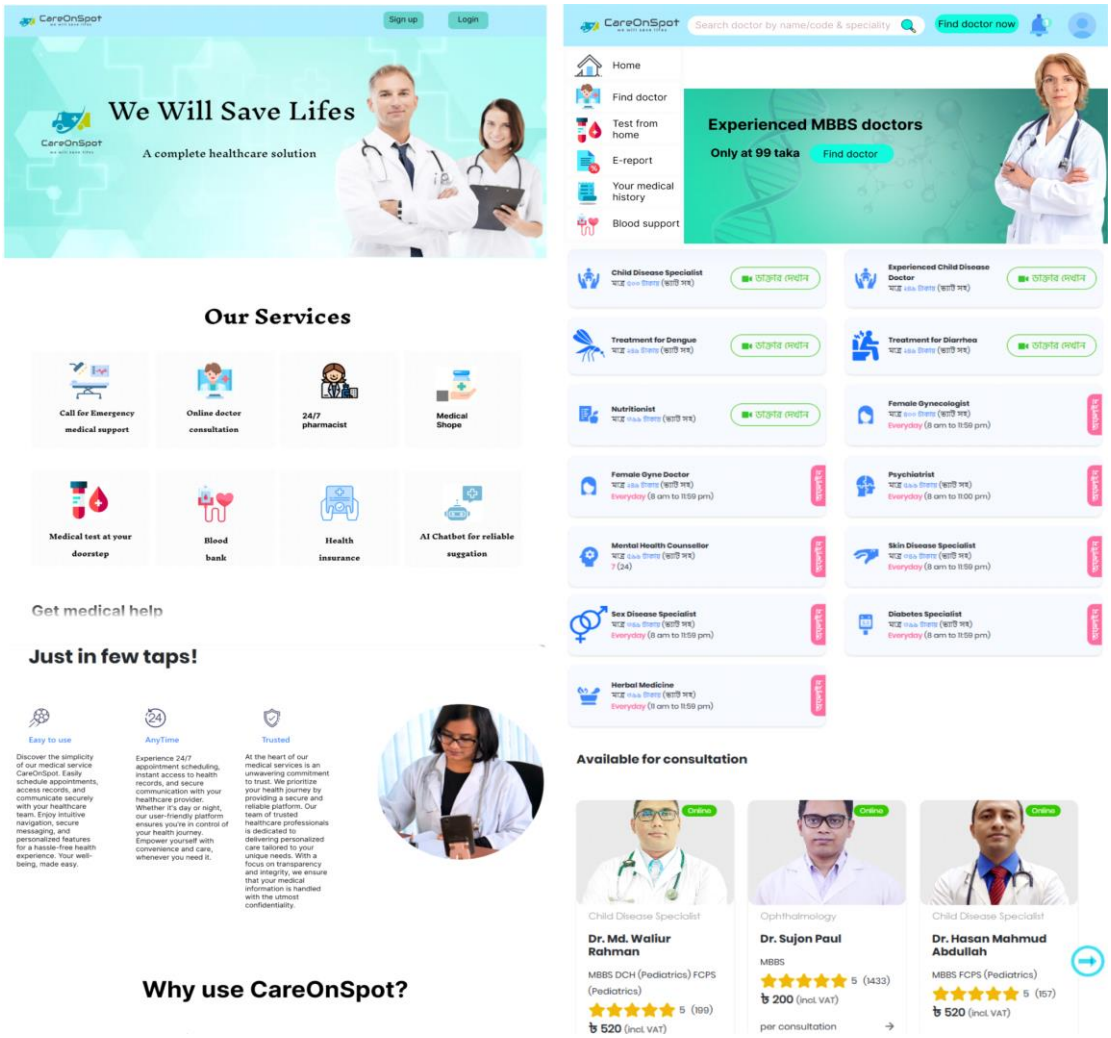

Figure 4.2.1: Launching page and dashboard

Online consultation page:

Here users will see different categories or lists of specialized doctors. The user will select his category according to his problem and he will find a specialized doctor for him.

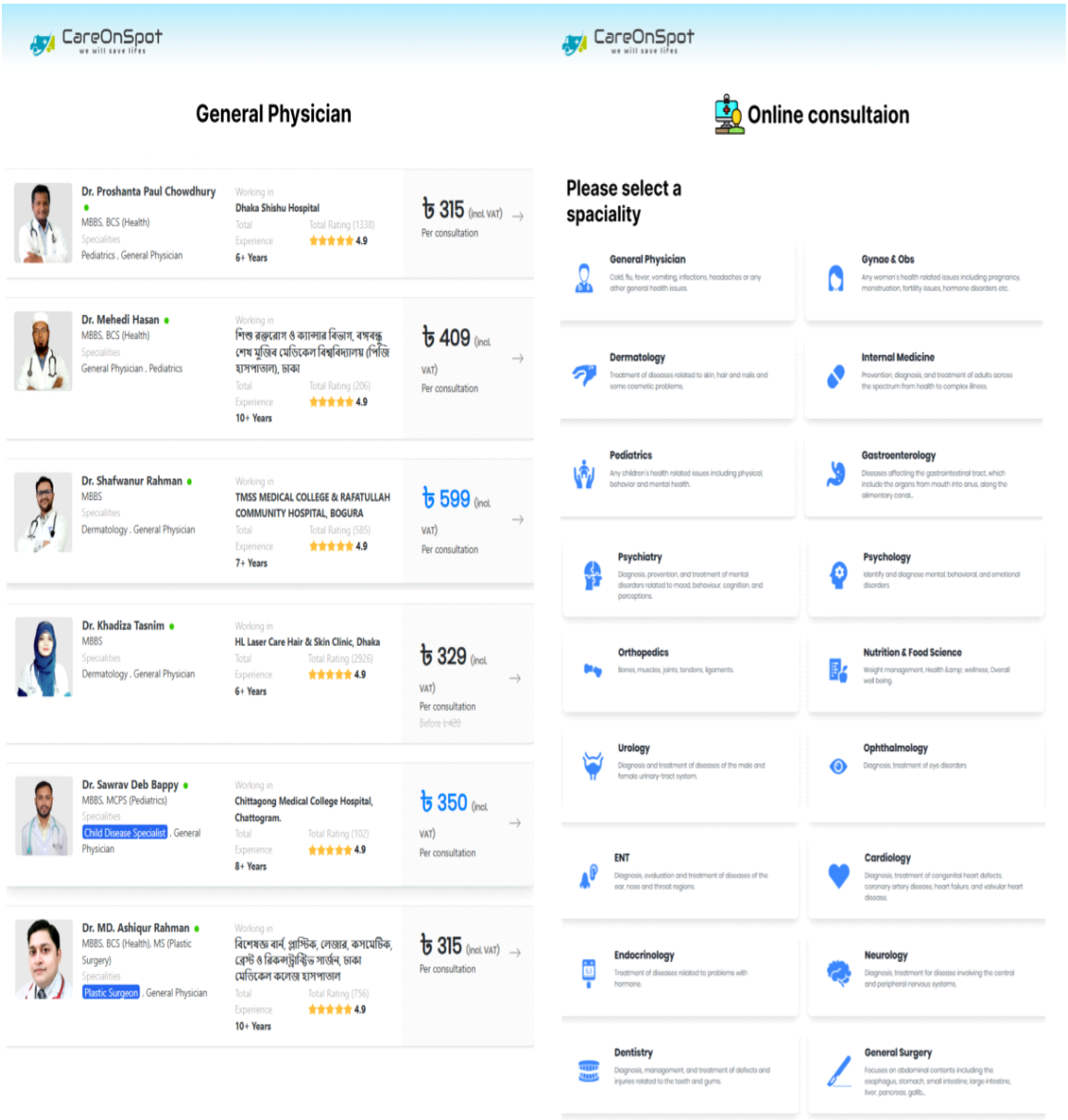

Figure 4.2.2: Online consultation page

Emergency help:

Here using this feature users will be able to find help during emergency. In the page user will see a form where he will put his address and location. Also, if he needs a doctor, he needs to fill in a description.

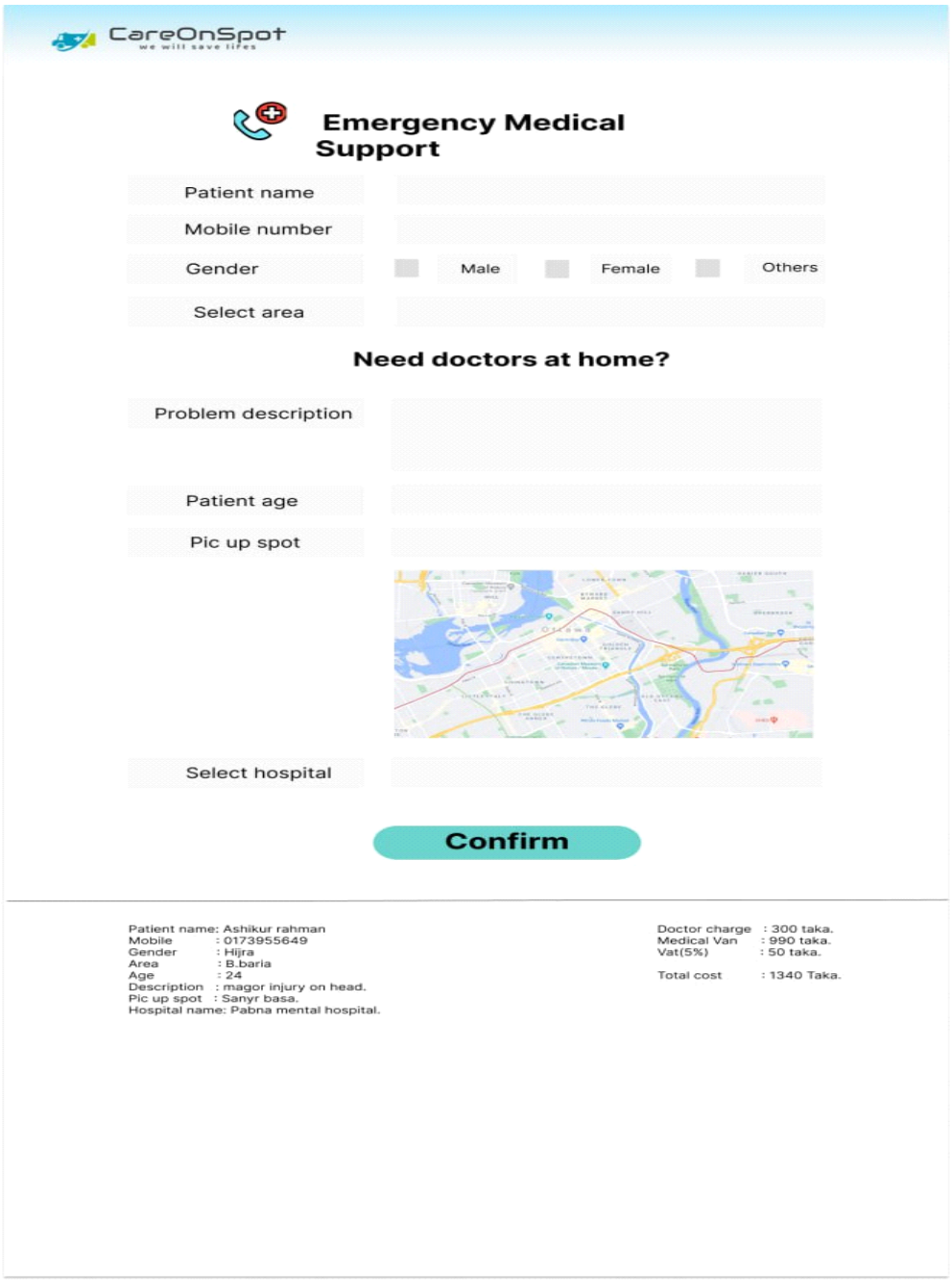

Figure 4.2.3: Emergency help page

Medical test:

In this feature user will see a page to enter his location if he/she finds lab near the location, user will see another page. There they will select labs and test names they need to do. They will put their address and schedule.

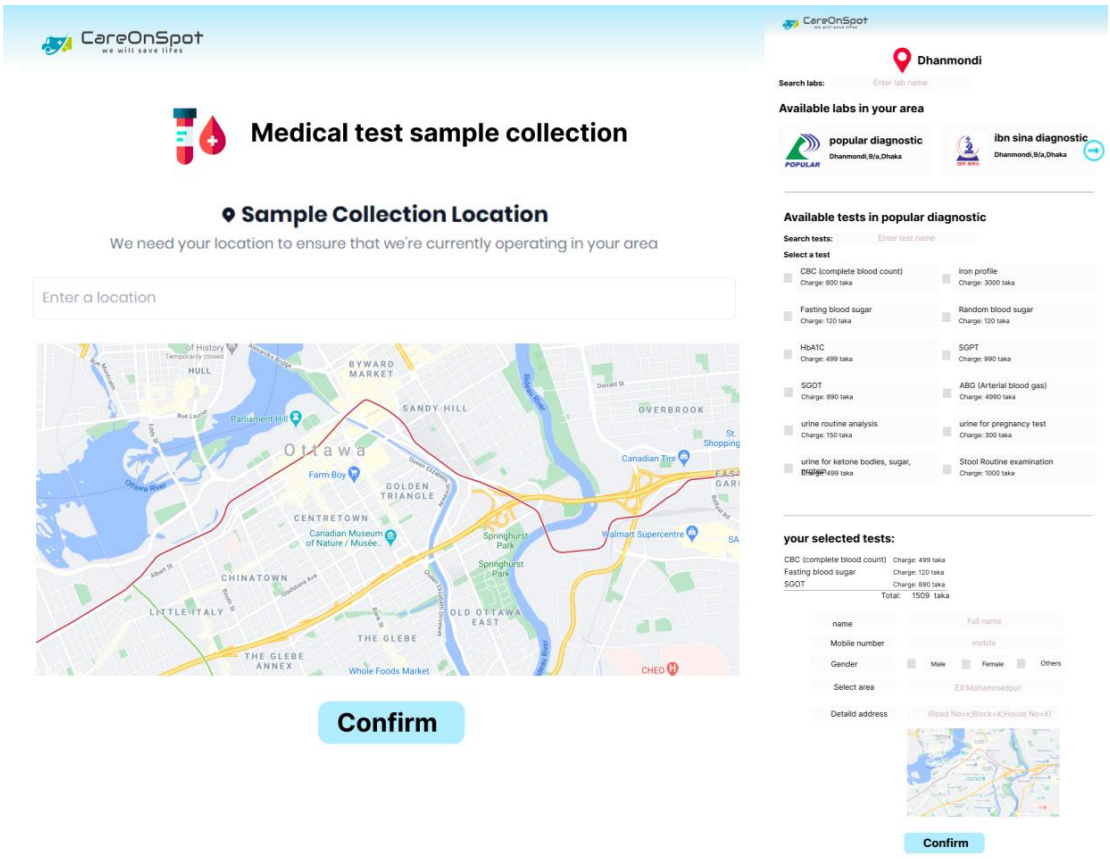

Figure 4.2.4: Medical test page

Blood bank:

In this page, users will find a form to register them as a blood donor and see them as available.

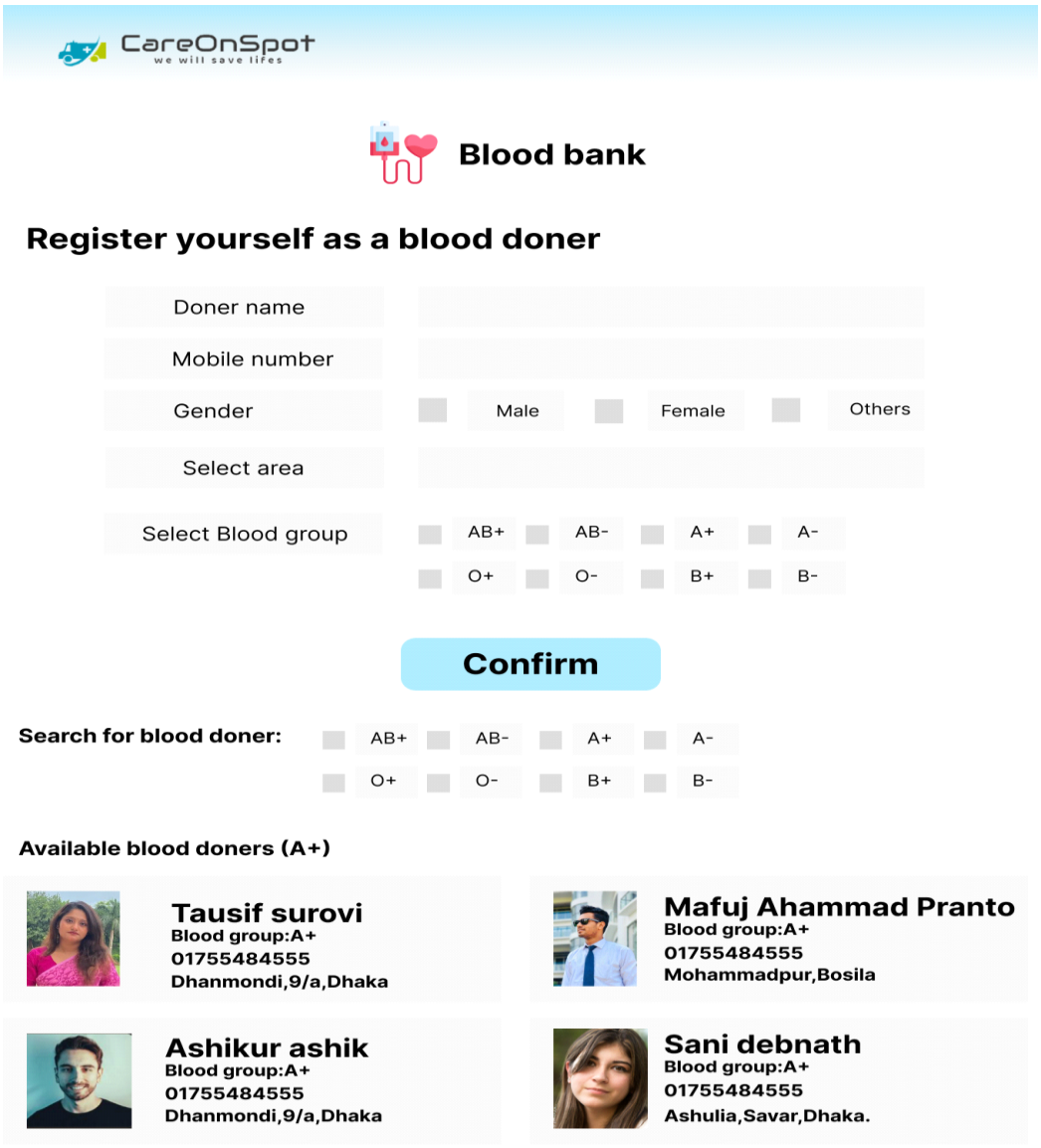

Figure 4.2.5: Blood donation page

Implementation of Front-end Design

The front-end design of "CareOnSpot" focuses on making an easy to use telehealth platform making healthcare sector accessible for all. Our front-end have a simple UI so that anyone can navigate easily and every features workflow is also User friendly and simple.

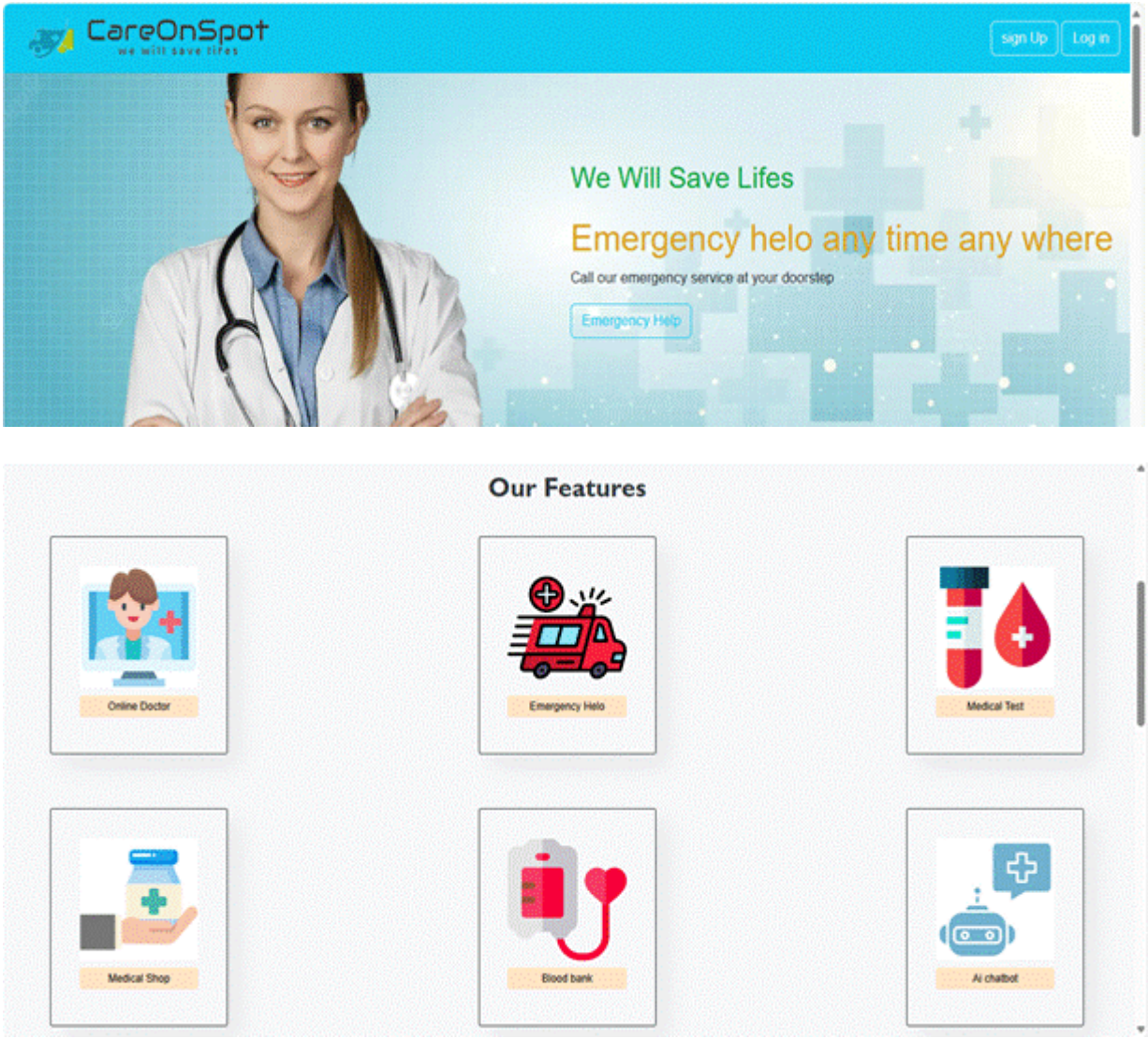

Figure 4.2.6: Landing page design.

This is the Sign-Up page for Users. Here users will register them self and after a Loging in with a valid email and password the will land to User dashboard.

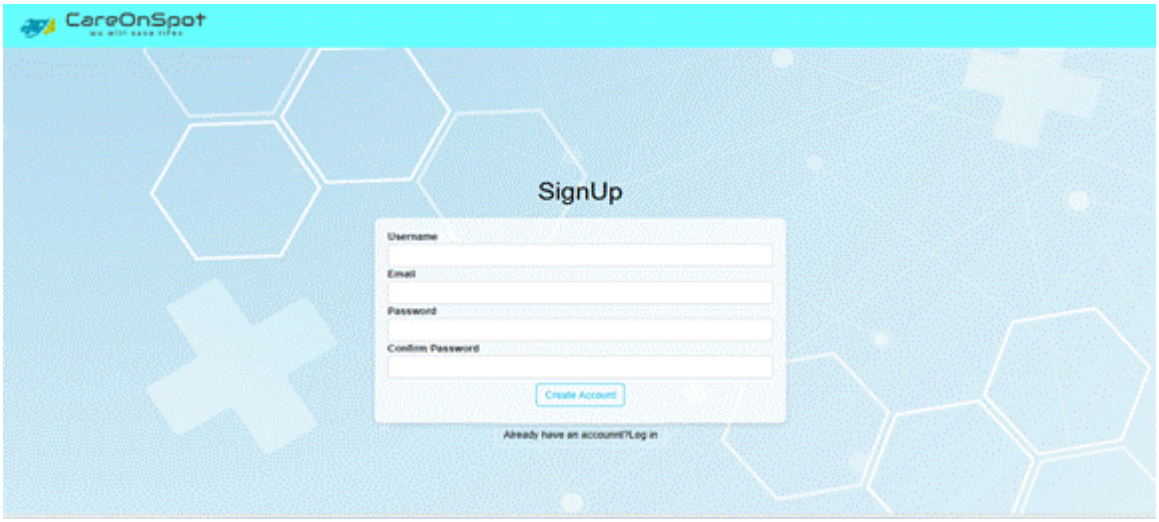

Figure 4.2.7: SignUp page design.

Here Is the User dashboard where users will find our various services. In this page the will find six option, the are Online consultation, Emergency help, online medical test, Blood Donation, medical Shop support and AI chatbot for better understanding of specialist doctors.

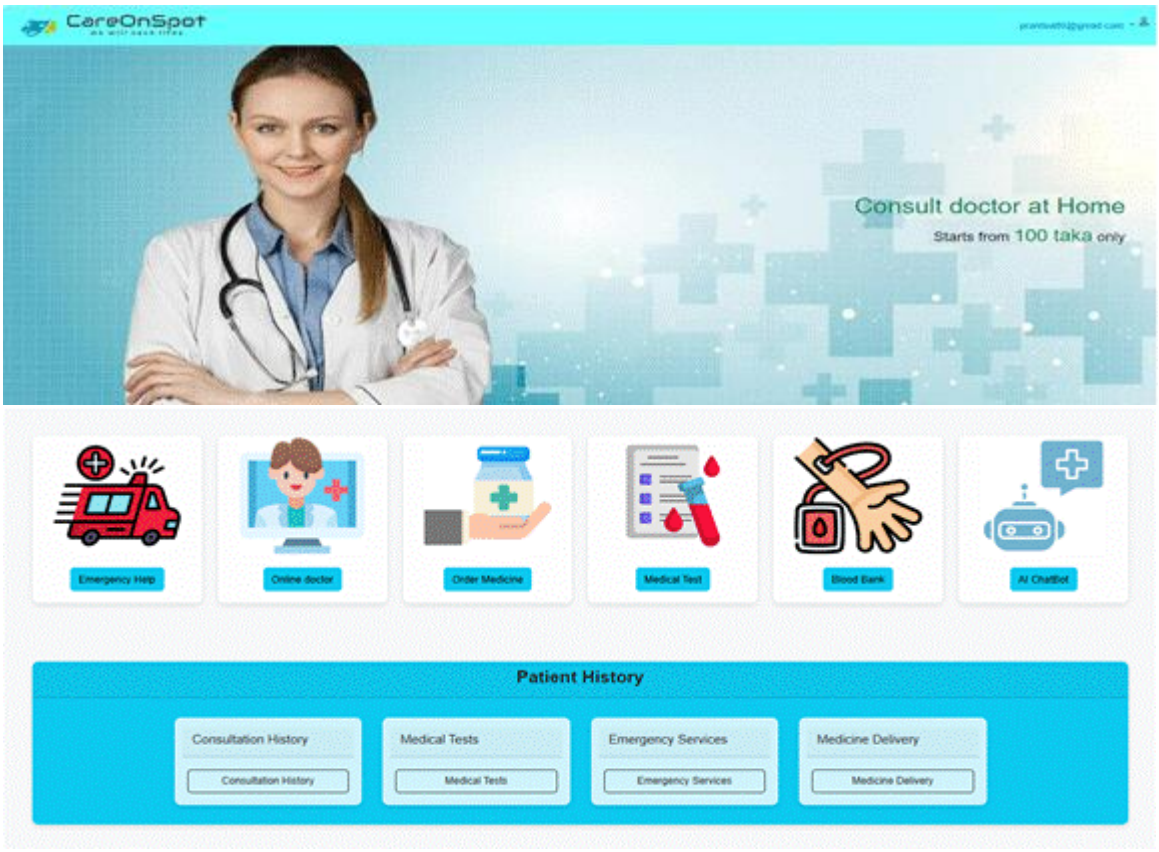

Figure 4.2.8: User dashboard design.

This is the Admin Dashboard. If the role is admin then land in this page. Here admin can create ,update , delete and read they add doctor, blood doner , diagnostics name, van driver, medical shop and user. Admin have the role to control all actors of the applicatoion.

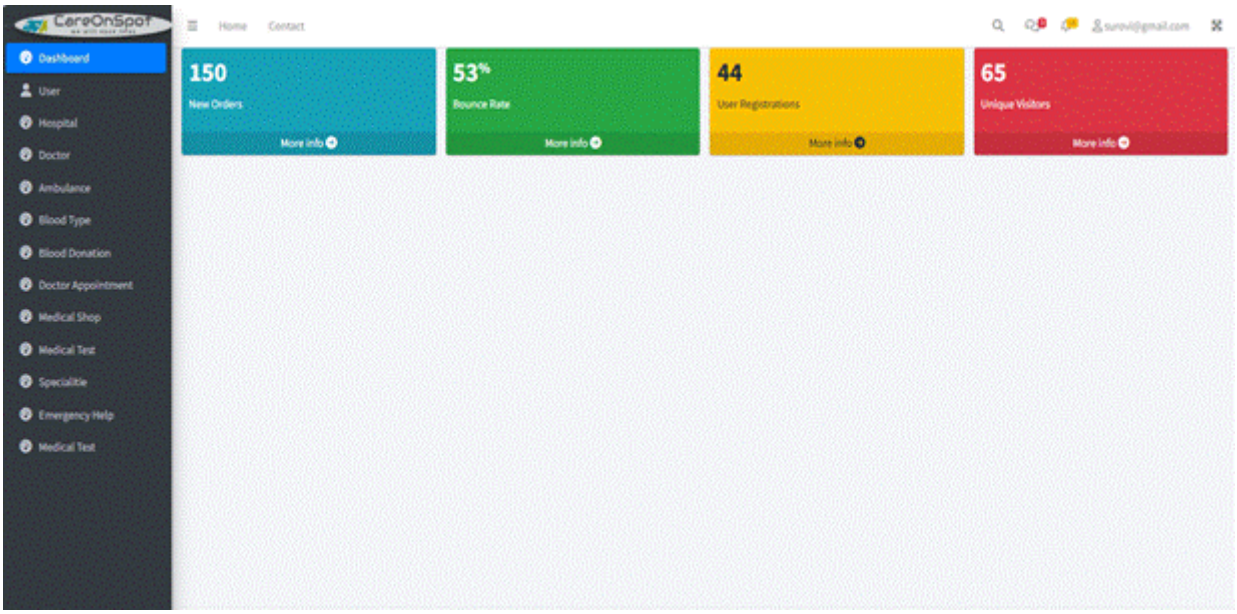

Figure 4.2.9: Admin dashboard page design

4.3 System Testing

Here is the testing report for CareOnSpot, where we performed a feature testing to test all the functionalities are working properly or not. Bellow the report shows the result of testing:

TABLE 4: TASTING TABLE

Test ID	Test Scenario	Test Case Description	Test Steps	Expected Result	Actual Result	Pass/ Fail
01	User Registration	Verify that a new user can register successfully.	1. Navigate to the registration page. 2. Enter valid user details. 3. Click the "Register" button.	User registration confirmation message displayed.	User registration confirmation message displayed.	**Pass**
02	User Login	Verify that a registered user can log in.	1. Navigate to the login page. 2. Enter valid credentials. 3. Click the "Login" button.	User is directed to the dashboard.	User is directed to the dashboard.	**Pass**
03	User Login with invalid Username or password	Verify that a registered user can not log in without valid username or password	1. Navigate to the login page. 2. Enter valid credentials. 3. Click the "Login" button.	Invalid username password warning	Invalid username password warning	**Pass**

04	View Dashboard	Verify that a logged-in user can access the dashboard.	1. Log in as a user. 2. Observe the dashboard page.	Dashboard is displayed with relevant user information.	Dashboard is displayed with relevant user information.	**Pass**
05	Schedule Consultation	Verify that a user can schedule an online consultation.	1. Log in as a user. 2. Select a specialty. 3. Choose an available doctor. 4. Submit a consultation request.	Appointment confirmation with meeting link is displayed.	Appointment confirmation with meeting link is displayed.	**Pass**
06	Accept Consultation Request	Verify that a doctor can accept a consultation request.	1. Log in as a doctor. 2. View consultation requests. 3. Accept a request. 4. Provide a meeting link.	User receives appointment confirmation with meeting link.	User receives appointment confirmation with meeting link.	**Pass**
07	Request Emergency Medical Van	Verify that a user can request an emergency medical van.	1. Log in as a user. 2. Request an emergency medical van. 3. Confirm the request.	Confirmation with van details is displayed to the user.	Confirmation with van details is displayed to the user.	**Pass**

08	Hospital Provides Van Details	Verify that a hospital can provide details for an emergency medical van request.	1. Log in as a hospital. 2. View van requests. 3. Provide van details.	User receives van details confirmation.	User receives van details confirmation.	**Pass**
09	Find Blood Donor	Verify that a user can search and find blood donor details.	1. Log in as a user. 2. Search for a blood donor.	Contact details of blood donors are displayed.	Contact details of blood donors are displayed.	**Pass**
10	Request Medical Test	Verify that a user can request a medical test.	1. Log in as a user. 2. Select a diagnostic center. 3. Choose a test. 4. Submit the request.	Test request confirmation with collection details is displayed.	Test request confirmation with collection details is displayed.	**Pass**
11	Diagnostic Center Confirms Collection	Verify that a diagnostic center can confirm sample collection for a medical test request.	1. Log in as a diagnostic center. 2. View test requests. 3. Confirm sample collection.	User receives confirmation with sample collection details.	User receives confirmation with sample collection details.	**Pass**

12	Chatbot Interaction	Verify that a user can interact with the chatbot for assistance.	1. Log in as a user. 2. Open chatbot interface. 3. Enter a query.	Chatbot provides relevant responses to the user's query.	Chatbot provides relevant responses to the user's query.	**Pass**

4.4 Summary

Here in this chapter is all about the implementation and the testing of the platform. Here we discussed the prototype of the project and the present state of the project. This chapter Highlights of successful implementations, such as feature completions, system stability, and user acceptance.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on Life

Using our online healthcare platform CareOnSpot will have a positive impact on our society and individual lives. At present, getting services from our government hospitals is very costly and time consuming. This platform of ours will bring all the health services in the hands of everyone. By associating all public or private interest service organizations with us, we will make health services easy and ensure proper utilization of all our resources. CareOnSpot significantly improves personal health management by providing an accessible, easy-to-use and online healthcare service. Our platform users can easily book appointments and request medical tests and seek emergency assistance for their needs. This accessibility is particularly beneficial for people with mobility issues, chronic illnesses or living in remote areas. Additionally, the integration of AI-powered chatbot support ensures that users receive timely and accurate health information, thereby promoting proactive health management and improving overall quality of life.

5.2 Impact on Society & Environment

CareOnSpot can have many positive impacts on our society. By making healthcare largely online, the system will reduce additional burden on hospitals. The platform fosters a collaborative healthcare environment by connecting users with doctors, diagnostic centers and blood donors. By providing online facilities to government hospitals everyone form any where can consult a doctor without physical visit and it will save cost of our people. In Bangladesh where economy is struggling everyone can not afford medical service some , so our platform will help those peoples. Environmentally, CareOnSpot reduces the need for physical travel for consultations and tests, thereby reducing carbon emissions. Additionally, the use of digital records reduces the use of paper, contributing to environmental sustainability. the system promotes fairness by providing equal access to healthcare services, regardless of the user's geographical location or socioeconomic status.

5.3Ethical Aspects

Ethical considerations are paramount in the design and implementation of CareOnSpot. The platform ensures privacy and data security of sensitive patient information through strong encryption and access controls. Our system makes healthcare services open to all, regardless of user's geographic location or socio-economic status. Our platform will make healthcare services easy and reliable for everyone. It will reduce the pressure on government hospitals and improve the quality of service

5.4 Sustainability Plan

Sustainability of CareOnSpot depend on regarding continuous innovation, engaging its users, and strategic partnerships. It will, therefore, embrace the latest technologies in emerging themes like advanced AI and machine learning to enhance the quality of service delivery and user experience. The feedback from the users would be used in updating and bringing out improved systems so that it stays responsive to the users' needs. It is also going to have strategic partnerships with health providers, insurance companies, and government health programs, tending to provide the clinic financial sustainability and expansion of services. Newly Added: There will also be other education and training for users and healthcare providers, so the proper use of the platform will develop among them, and its adoption will be long-lasting.

5.5 Summary

In this chapter we have discussed the impact of CareOnSpot in our life. CareOnSpot have Large positive effects on the management of health for every human, society's health system, and the environment are acquired by CareOnSpot. By design, it has married ethical considerations for ensuring privacy for each user and entrenching equability in possibilities toward health facilities. Its sustainability design involves continuous improvement, user experience design, and strategic collaborations that ensure the platform's long-term existence and adaptiveness to future healthcare needs. The comprehensive approach adopted by CareOnSpot makes it a game-changing tool in the realm of digital health, having the potential to significantly improve the quality and accessibility of health care delivery.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Conclusions

CareOnSpot is a virtual healthcare platform where people from all walks of life can avail healthcare services. This project is basically made with the aim of controlling the extra human pressure of our country's government hospitals and providing medical consultation services that do not need to go to the hospital physically to be delivered to everyone at home. Many of our treatments are dependent on various medical tests, so we have this platform where medical test samples can be collected from home and tested online. To solve this problem we have chatbot which will suggest doctor error specialty based on the problem. Our platform will also provide assistance in emergency situations. One thing, we are hopeful that by using this platform, healthcare services will become much easier in government hospitals or private hospitals.

This platform of ours will mainly strive for the deployment of government hospitals and the full utilization of all the resources we have. If people are inclined towards online consultation, then the pressure on the hospital will be reduced to a great extent and there will be a radical change in the management of the hospital. Our mission is to provide a seamless healthcare system for all. Our core focus is around government hospitals but private hospitals will also be associated with us in many ways and take the healthcare sector to a unique height.

6.2 Further Suggested Works

Integration of AI and Machine Learning: A notable feature of our platform is our chatbot. Currently we have implemented our chatbot using “Botpress”. Later we will further strengthen it by implementing different models of machine learning and AI. Currently it is only recommended by specialized doctors, but in the future it will be possible to diagnose and treat diseases through it .

Video Consultation: Will include high-definition, secure video conferencing capabilities to facilitate remote doctor-patient consultations. Currently our platform is dependent on other platforms for video consultation, but we want to overcome this situation and integrate our own video calling facility.

Research and Development: Continued research and development are essential to keep CareOnSpot at the forefront of digital healthcare innovation.

Sustainable Practices: To make the project sustainable we need to maintain the data security of users and also we need to go through a continuous upgradation process.

6.3 Limitations

Technology Infrastructure: Telemedicine services require reliable internet access and technology infrastructure. Internet connectivity is still inadequate in many rural and remote areas of Bangladesh. Lack of reliable Internet access can hinder effective use of telemedicine platforms.

Digital Literacy: A significant portion of our population lives in rural areas and these alone lack digital literacy. Effective use of telemedicine platforms requires the ability to use digital platforms. To solve this problem we are trying to give everyone some basic training and keep our platform as user friendly as possible.

Healthcare Provider Adoption: The success of telemedicine depends on the willingness of healthcare providers to adopt and use these technologies. Gaining the trust and conviction of healthcare providers and those working in the sector is a daunting task.

Regulatory and legal issues: Telemedicine involves the transmission of sensitive patient information, raising concerns about privacy, security, and regulatory compliance. Ensuring that the platform complies with national and international healthcare regulations and standards is a complex and ongoing process.

Quality of care: Although telemedicine can significantly improve the quality of healthcare, there are concerns about the quality of care delivered remotely. Physical examinations and certain diagnostic tests can be difficult to administer in practice, potentially affecting the accuracy of diagnosis and the effectiveness of treatment.

User trust and engagement: Building trust among users about the reliability of telemedicine services is crucial Past experience and low user confidence in new technologies can be a major problem.

Emergency Response Limitations: Although telemedicine can provide initial consultation, it may be less effective in emergency situations that require immediate physical intervention. Ensuring rapid response and coordination with emergency medical services is essential but challenging.

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Appendix A

Course Outcomes, Complex Engineering Problems (EP) and Complex Engineering Activities (EA) Addressing

Title: DESIGN AND DEVELOP FUTURISTIC TELEMEDICINE USING ARTIFICIAL INTELLIGENCE

Student ID: 201-15-14172,201-15-13926

CO Description for FYDP

CO	CO Descriptions	PO
Phase -I		
CO1	Integrate recently gained and previously acquired knowledge to identify a **web based travel management** problem for the Final Year Design Project (FYDP)	**PO1**
CO2	Analyze different aspects of the goals in designing a solution for this FYDP	**PO2**
CO3	Explore diverse problem domains through a literature review, delineate the issues, and establish this goals for the FYDP	**PO4**
CO4	Perform economic evaluation and cost estimation and employ suitable project management procedures throughout the development life cycle of the FYDP	**PO11**
Phase -II		
CO5	Design and develop technical solutions and system components or processes that meet specified requirements, ensuring compliance with public health and safety standards, as well as considering cultural, socioeconomic, and environmental factors in this FYDP	**PO3**
CO6	Choose and apply appropriate methodologies, resources, and contemporary engineering and IT technologies to address complex engineering processes, encompassing prediction and modeling, while adhering to relevant constraints in this FYDP	**PO5**
CO7	Analyze societal, health, safety, legal, and cultural considerations, along with associated responsibilities, in the context of professional engineering practice and the resolution of this problem, employing logical reasoning guided by contextual understanding.	**PO6**
CO8	Comprehend and evaluate the enduring sustainability and impact of professional engineering endeavors in addressing intricate engineering challenges within social and environmental frameworks.	**PO7**
CO9	Implement ethical principles and adhere to professional standards and norms in this FYDP	**PO8**

CO10	Capable of operating proficiently both individually and as a team member or leader across diverse teams and interdisciplinary settings in this FYDP.	**PO9**
CO11	Proficiently communicate with the engineering community and broader society regarding complex engineering endeavors, including the ability to comprehend and generate comprehensive reports and design documentation, as well as provide and receive clear instructions throughout this FYDP.	**PO10**
CO12	Acknowledge the importance of self-directed and life-long learning within the evolving landscape of technology, and possess the readiness and capability to engage in lifelong learning endeavors.	**PO12**

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP), and Attainment of Complex Engineering Activities (EA)

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP):

SN	EP Definition	Attainment	CO	Justification (with Knowledge Profile)	References
1.	**EP1: Depth of Knowledge required**	Yes	CO1, CO2, CO3, CO5, CO6, CO7 and CO8	The project covers **Engineering Fundamentals (K3)** requires data collection of various diseases and their symptoms. Our chat bot will give you an idea of what kind of specialist doctor to consult based on the symptoms of the disease and we have to know the programming for this project by using. The project tackles **Specialist Knowledge (K4)** by integrating front-end and back-end design, interaction design, and user experience (UX), utilizing HTML, CSS, bootstrap, java script for the front end, and Asp.net for the back end ,data base design using Mysql demonstrating expertise in web-based telemedicine management system development.	**Page no:** [14], **Section:** [3.2] **Page no:** [24], **Section:** [3.4]
				The project applies **engineering practice & design (K5)** by integrating design requirements like user interface, security, scalability, customization, compatibility, accessibility, and reliability, ensuring a	**Page no:**

				robust and user-friendly telemedicine aligned with design principles. The project addresses **engineering practice & technology (K6)** by HTML, CSS, Bootstrap, Java Script , Asp.net , MySQL MVC framework and Composer.	[14-22], **Section:** [3.2, 3.3] **Page no:** [24,34-36], **Section:** [3.4, 4.2]
				The project covers **research literature K8** by reviewing the existing projects comparable to our project. We found the differences of all other projects and found ways to solve them through our project.	**Page no:** [13], **Section:** [2.5]
2.	**EP2: Range of Conflicting Requirements**	Yes	CO2, and CO7	The project confronts **EP-2** by addressing challenges we found that most of the telehealth service providers are not focusing to make healthcare accessible. Most of them focusing on selling medicine and other products. Our project aims to identify and address significant gaps in our country's current health care sector that prevent access to quality medical services. The gap analysis for "CareOnSpot" shows significant disparity between the health care standards in Bangladesh, the current status and the desired outcomes for achieving the goals of the telemedicine platform.	**Page no:** [12,13] **Section:** [2.4, 2.5]

3.	**EP3: Depth of analysis required**	Yes	CO2, and CO6	The project tackles **EP-3** by prioritizing solutions like user friendly front-end design for enhanced user experience and selecting C# for streamlined back-end development , addressing challenges such as user interaction optimization, platform accessibility, and scalability to provide a superior web-based telemedicine system.	**Page no:** [28-36], **Section:** [4.2]
4.	**EP4: Familiarity of Issues**	Yes	CO8	The project fulfills **EP-4** by integrating our project aims to identify and address significant gaps in our country's current health care sector that prevent access to quality medical services. So we need to analysis our medical health system.	**Page no:** [13], **Section:** [2.5]
5.	**EP5: Extends of application codes**	Yes	CO5	We visited many medical sites to understand how they provide their feature. These things will guide us for our project analysis.	**Page no:** [11-12], **Section:** [2.3]
6.	**EP6: Extends of stakeholders involved and conflicting requirements**	No	CO8	N/A	N/A

7.	**EP7: Interdependence**	Yes	CO5	The project meets CEP, **EP-7** by addressing high-level problems Our project comprises several subsystems that depend on each other. These including task such as performance in database implementation, registration, log in and developing a front-end and back-end application.	**Page no:** [20,34-36], **Section:** [3.3,4.2]

Addressing CO11 with Complex Engineering Activities (EA) [Some or all of the following]:

SN	EA Definition	Attainment	CO	Justification	References
1.	**EA1: Range of resources**	Yes	CO11	The development of this system leverages a skilled team across domains, meticulous financial resource allocation for infrastructure, marketing, and development, and utilizes tools like adobe Xd, Visual Studio , Figma and various programming languages like C#, JavaScript, version controller Git, frameworks, and databases for effective execution.	**Page no:** [23-27], **Section:** [3.4]

2.	**EA2: Level of interaction**	No		N/A	N/A
3.	**EA3: Innovation**	No		N/A	N/A
4.	**EA4: Consequences for society and the environment**	Yes		This project emphasizes social impact will have a positive impact on our society and individual lives. By making healthcare largely online, the system will reduce additional burden on hospitals. The platform fosters a collaborative healthcare environment by connecting users with doctors, diagnostic centers and blood donors. This project is a game-changing tool in the realm of digital health, having the potential to significantly improve the quality and accessibility of health care delivery.	**Page no:** [41,42], **Section:** [5.1, 5.2,5.5]

5.	**EA-5: Familiarity**	Yes		The Comparative Analysis "DocTime" is a big player in the online health service sector in Bangladesh. But they have limited their services into online consultation and medicine delivery only. Doctime had a feature to collect test sample from home, but the service in not as good there other services. Moreover, Medeasy provides online healthcare services. But their main attraction is medicine delivery. Also, there is a web site named "Epharma", they serve online consultation and medicine delivery. If we compare them, in our project we are providing all kinds of medical services on one platform.	**Page no:** [11], **Section:** [2.3]

Addressing CO (4, 9, 10, and 12):

SN	COs	Attainment	Justification	References
1	CO4	Yes	The project captures CO4 by integrating financial management practices, including budgeting, resource allocation, cost management, and risk mitigation, functional requirements like, User registration with valid credentials, Two-factor authentication for enhanced security, Emergency van request feature on the platform, On-the-spot doctor availability etc. And non-functional requirements like Ensure low latency in emergency services, Quick response times for online consultations, 24/7 availability of emergency services areas while maintaining quality.	**Page no:** [23-27], **Section:** [3.4]
2	CO9	Yes	The project upholds ethical practices by ensures privacy and data security of sensitive patient information through	**Page no:**

			strong encryption and access controls. Our system makes healthcare services open to all, regardless of user's geographic location or socio-economic status.	[41], **Section:** [5.3]
3	CO10	No	N/A	N/A
4	CO12	Yes	The project's implementation phase emphasizes lifelong learning through manual testing protocols and ensuring ongoing improvement and adaptation to emerging tech trends, with results analysis refining the platform for enhanced effectiveness.	**Page no:** [37-40], **Section:** [4.3]

DESIGN AND DEVELOP FUTURISTIC TELEMEDICINE

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