An Undergraduate Internship Report on Doctor Appointment and Prescription System

By

MD. ABU NOMAN

Student ID: **1721777**

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Supervisor:

Raihan Bin Rafique

Internship Supervisor & Lecturer

Department of Computer Science & Engineering

Independent University Bangladesh

May 12, 2022

Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

This is to attest that the report was done by me, Md. Abu Noman (ID: 1721777), and that it was submitted in partial fulfillment of the requirements for a Bachelor's Degree in Computer Science and Engineering from Independent University, Bangladesh (IUB). It was finished under the supervision of Raihan Bin Rafique. I also attest that all of my work is genuine and is based on what I have learned and implemented during my internship. All information sources used in this project and report have been properly acknowledged. I also assert that neither this project nor any part of it has been submitted elsewhere for any degree of recognition.

Md. Abu Noman

_____ _____

Signature *Date*

12 May, 2022

Md. Abu Noman

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Name

Acknowledgement

The internship I did with Enzaime Ltd. was an amazing opportunity for me to learn and grow professionally. As a result, I consider myself really fortunate to have been given the opportunity to be a part of it. I'm also glad for the opportunity to meet so many amazing people and professionals who guided me through my internship and helped me complete this report.

At the very beginning, I'd like to thank Almighty Allah for all of His blessings, which enabled me to deliver all the hard work and patience to successfully complete this report. Then I would like to convey my gratefulness to Raihan Bin Rafique, Lecturer, Department of Computer Science Engineering, Independent University, Bangladesh, for his valuable guidance and support, compassion, time, insightful comments, and thoughtful advice on various aspects of my internship and the preparation of this report. I've chosen this moment to gratefully acknowledge his contribution.

Keeping in mind the foregoing, I'd like to take this opportunity to express my gratitude and special thanks to the CTO of Enzaime Ltd, Md. Asikur Islam, who, despite being extremely busy with his duties, took time out to hear, guide, and keep me on the right track, allowing me to carry out my project at their esteemed organization and extending during the training.

I would like to express gratitude to Tawhidul Islam Khan & Alif Hossain Sourob, Senior Developer, for participating in useful decisions, providing necessary advice and guidance, and organizing all facilities to make this internship journey easier.

Finally, I would like to express my deepest gratitude to my family for supporting me through this crucial period of my internship and always staying by my side. This internship experience I gathered is a huge step forward in my professional development. The best way for me to attain career goals is to make the most effective use of the skills and knowledge I've earned, and I'll continue to enhance them.

Letter of Transmittal

May 12, 2022
Raihan Bin Rafique
Lecturer
Department of Computer Science and Engineering,
Independent University, Bangladesh
Subject: Submission of final Internship Report, Spring 2022.

Dear Sir,
I am submitting my Internship Report, which is part of my Bachelor of Science in Computer Science degree, with the utmost admiration and respect towards you. Working under your close supervision is indeed a huge accomplishment. This report is based on Doctor Appointment & Prescription System . Which I was assigned to develop during my internship.

I was fortunate to get an opportunity to work in Enzaime Ltd. as an intern for the IT Department under the supervision of Md. Asikur Islam, CTO of Enzaime Ltd. This project provided me both academic as well as practical experience. My internship provided me with a wealth of new experiences because it was my first time working in a real business setting and under the supervision of a team.

I'd like to express my heartfelt gratitude for all of your advice and assistance. I hope and pray that this report meets all of your requirements and exceeds your expectations. If you would be so kind as to get this report and share your valuable opinion, I am grateful to you for dedicating your valuable time, expertise, guidance and support. I have tried my best to complete the report appropriately as much as possible. I would be available to explain any kind of queries related with my report anytime.

I, therefore, pray and hope that you would like and grant my report and give me an access to go a long run.

Thank you.

Sincerely,
Md. Abu Noman
ID: 1721777

Evaluation Committee

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Signature

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Name

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Supervisor

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Internal Examiner / Panel Member

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External Examiner / Organizational Supervisor

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Head of the Department / Convener

Abstract

This report is based on my three-month work experience with Enzaime Ltd.. I worked as an intern as a web developer in the company's current project. I had to work under the project ”Doctor Appointment & Prescription System”. The main objective of the System is to connect Doctors and Patients quickly and easily from any location over the internet. Patient can easily use the system for getting an Appointment from Doctor, and the doctor can prescribe medicines to the patient based on their medical condition.

In order to explain my work, I discussed the project's goals, its scope, as well as the details of the project management plan in building the website and deploying it. After that I've described the methodology I used to complete the website, from planning to requirement gathering, building, testing, and deployment. Before starting a project, it is necessary to analyze the outcome, draw graphical explanations of the website, consider the results, and finally obtain the analysis from the website. So I have discussed the detailed work description, system design, analysis, product features, input, and output in the body of the project. Then I have discussed the result and analysis based on those test results. Aside from explaining the project, I elaborated on my internship experience at Enzaime Ltd., the problems I have faced during this internship, and the solutions to those problems.

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Chapter 1

Introduction

An internship allows us to gain experience in the field of work that we wish to pursue. This not only gives us an advantage over other applicants when applying for jobs, but it also helps us prepare for what to expect in their area and boosts our confidence in work. I am currently studying in Independent University, Bangladesh (IUB), and my Major is CSE. In my University, we have to complete a course which is called Internship Program (CSE499), the course is mandatory. I think that this course is very important for all the students as they get a chance to implement what they have learnt throughout the university life.

1.1 Overview/Background of the Work:

Almost every business has shifted its service to the online sector because of the ongoing COVID situation. In the current situation of Covid-19, people are forced to stay inside their homes for their safety. There are many people who are not being able to visit doctors. They are afraid to go out as there are many covid-19 patients in Hospitals. Many non-covid patients might need to consult with a doctor urgently but are also scared to go to a hospital because of the current situation. Thinking about all these issues, we have decided to build a web-based application, Doctor Appointment and Prescription System, by which patients can consult with a doctor through online without any hassle. Patients can search for a Doctor and ask for his/her appointment as well as for prescription. This application further shows the history of a particular patient so that the Doctor can prescribe on the basis of the history of the patient. The main objective of this application is to connect doctors and patients quickly and easily from any location over the internet. Patients can easily use this application by registering themselves, and the doctor can prescribe medicines to the patient based on their medical condition. It also saves a lot of time for both patient and doctor as they both can stay at home.

1.2 Objectives:

- Develop a web-based application.
- User Friendly system and easy to navigate.
- Easy Sign-up and Login Process.
- A system where patient can easily consult with doctor.
- Patients can Apply for Doctor appointments easily.
- Doctors can view Patients List, Doctors List, Appointments List.
- Doctors can Generate prescriptions to see the Patient's Condition.
- People from all over the country can use the system.

1.3 Scopes:

This project is a creation for managing the Patients queries of an existing website. This will be a web-based system. The user interface will be designed as a part of the project which will be minimal and easy to understand for the users. There will be a separate user interface for the Patients and Doctors, where they can manage the queries. The system will be made responsive so that it can be operated from both smartphone and desktop view. Some of the features of this system are:

- For the Patient user there will be sections like-Profile, Appointment,
log out, etc.

- For the Doctor user there will be sections like View Appointments List, Patients List, Doctors List, Create Prescription, Download Prescription as PDF etc.

- Doctors will be able to Approve Appointments/Cancel Appointments.

- After seeing the Patient's Condition/view the Patient Illness History, the doctor will create a prescription for the Patient.

- All the information about the Patients, Appointments, Doctors & Prescriptions will be stored in the system database.

Chapter 2

Literature Review

The report's literature review is based on the ideas, theories, and methodologies used to make the application. The purpose of the literature review is to identify the need for additional research (justifying your research). Identify the relationship of works in the context of its contribution to the topic and other works. Place your own research within the context of existing literature, making a case for why further study is needed.

The undergraduate CSE program of our university is designed in such a way so that we, the students, can learn the theory and implement what we have understood from the courses. Most of our core courses have both theory and labs. In the lab classes, we are given some projects relevant to the theoretical topics. As a student of CSE major, these course projects have made me able to implement the basics of coding skills that I learned from the courses and gradually improve them.

Throughout the undergraduate CSE program of our university is designed in such a way so that we, the students can learn the theory and implement what we have understood from the courses. From 'Hello World' to solving complex mathematical equations were the basics of understanding how real-world applications work in general. To have the opportunity to do that and find the relevance of the project with some of the courses that are taught throughout the 4 year undergraduate course in IUB was simply exemplary.

2.1 Relationship with Undergraduate Studies:

My project for the internship includes front-end designing and back-end coding and database integration and managing the project, all of which I have learned from the core courses of my major. Some courses which are directly related to my project are Data Structure (CSE 203), Algorithm (CSE 211), Database Management (CSE303), System Analysis and Design (CSE307), Web Application and Internet (CSE309), Software Engineering (CSE451).

1. **(CSE 203) & Algorithm (CSE 211):** The building blocks of understanding how a project data can be handled.

2. **Database Management (CSE303):** In this course, I have learned the things that are needed to be done when beginning a project. How to draw rich picture, write Six Element Analysis, Problem analysis, and solve the problems. I learned about ERD, where we can understand the connections between the Entities of our system. I also learned about SQL in this course. SQL is the most common language used by Database.

3. **System Analysis and Design (CSE307):** From the course have learned about Functional and Non-Functional requirements in a System. I have learned about UML diagrams and

how to draw them correctly. I have also known about SDLC which is very important when starting a new Project.

4. **Web Application and Internet (CSE309):** This is one of the most important course. I have learned how to build a website from scratch. This course has taught me the fundamental of HTML, CSS, Bootstrap, JavaScript. All these languages are useful when implementing a website.

5. **Software Engineering (CSE451):** Many topics were taught in this course. For me, I think the topic that will be useful for my internship project is Software testing and SDLC. Software testing is a way to test the whole system in an organized manner and find out if there is any fault.

2.2 Related works:

In this current COVID-19 pandemic, getting out has become completely unsafe. Therefore, seeking medical care in a hospital or doctor's chamber has become more difficult. However, other diseases besides corona have not stopped even in this condition. To address this situation, different health apps come forward to provide doctor consultation services online based on digital technology so that everyone can get the necessary health care in a safe and easy way at home. Now, anyone from all over the country can take the advice of an experienced doctor from any part of the country.
Following are some top health apps for online doctor consultation services in Bangladesh.

1. **Praava Health:** Praava has been founded in 2016. They are also helping people to consult with a doctor online. When we visit the Praava website, there are many options to select from. Someone with very little knowledge might not understand properly. When we want to book an appointment with a doctor, we need to purchase a monthly plan which might be hassle for many people.

2. **iCliniq:** This is also a website by which normal people can consult with a doctor through online. When patients visit the website for the first time, they might get confused as there are many contents on their website. It might be challenging for a few to navigate through the system.

3. **Doctor Dekhao:** Doctor Dekhao offers health care in a single tap via their Android and iOS apps. The process is simple; we need to download the app on our phone and then create an account within a few taps. After that, we can make an appointment from the list of doctors and specialists and get the consultation via video calling. Besides, if we need to consult a doctor urgently, we may apply for an instant appointment. Once we are done with the video consultancy, we will get the e-prescription right into the app. On top of that Doctor, Dekhao offers medicine reminders as well as store medical reports. It comes with ten different packages starting from Tk. 100. Another best feature of Doctor Dekhao is having the service 24/7.

Chapter 3

Project Management & Financing

To start a project, every company has to create a timeframe through which every aspect of the project must be determined, planned, and executed according to this plan or schedule. This works as a guideline for the company to track the project's progress and make sure the smaller goals and deadlines have been met.

3.1 Work Breakdown Structure(WBS)

A Work breakdown structure (WBS) is a strategy for finishing a multi-step project that is complicated. It's a strategy for breaking down large projects into smaller chunks and completing them more quickly and effectively. The goal of a work breakdown structure (WBS) is to make a huge project easier to manage. Breaking it down into smaller portions allows multiple team members to work on it simultaneously, resulting in increased team productivity. We have also created a WBS for our project, as it breaks down the project into smaller parts and will help us complete the project quickly and effectively. It also makes the project well organized.

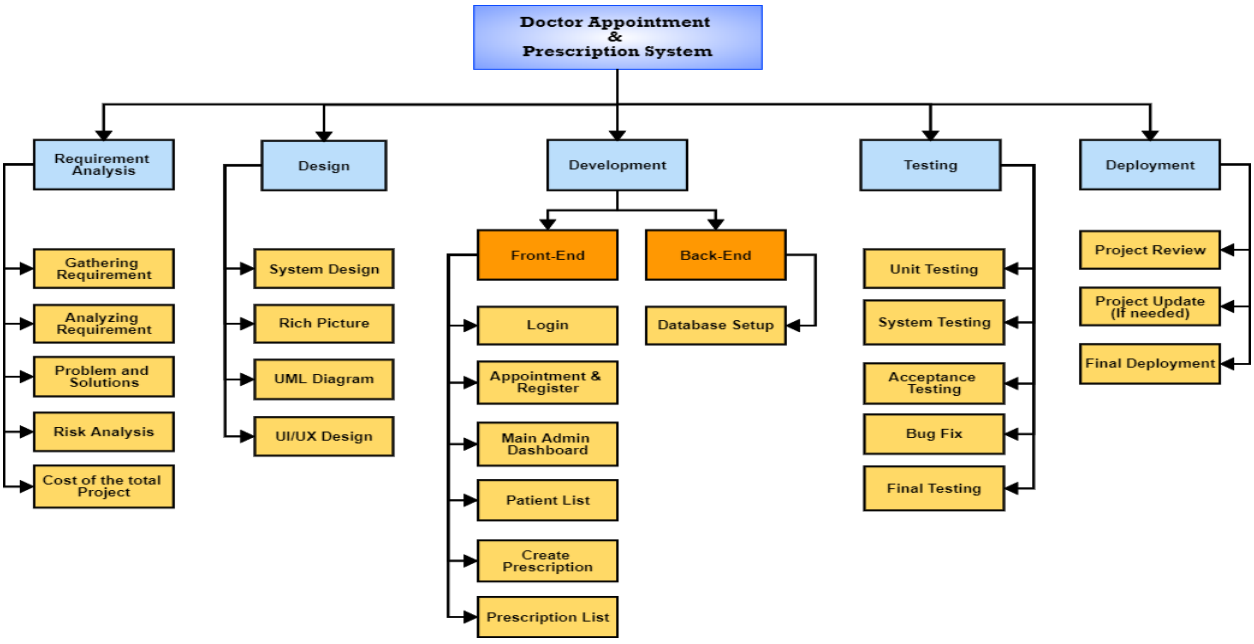

Figure 3.1: Work Breakdown Structure

3.2 Process/Activity wise Time Distribution

In my WBS, we have seen that there are five processes in the project. For each process, there is a particular time given to complete it. When the project is divided into a minor parts and given a specific time to complete it, the work will be done efficiently. If there is no time range given, the project might take a more time than required. The Process/Activity wise time distribution of my project is given below:

Table 3.1: Process/Activity wise time distribution

Activity	Days
Requirement Analysis	10
Design	5
Development	35
Testing	15
Deployment	5
Total	70

The time allocation for the 3 months project is shown on a chart using the critical path method. The critical path is the longest sequence of activities in a project plan which must be completed on time for the project to complete on due date. An activity on the critical path cannot be started until its predecessor activity is complete; if it is delayed for a day, the entire project will be delayed for a day unless the activity following the delayed activity is completed a day earlier.

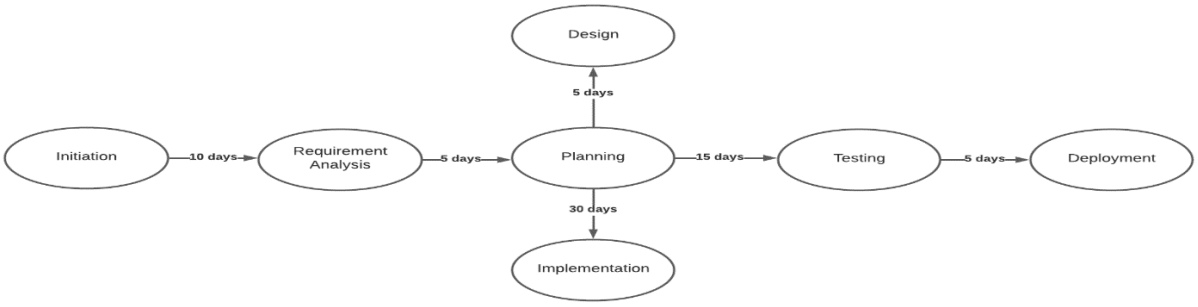

Figure 3.2: Critical Path

3.3 Gantt Chart

A Gantt chart, often used in project management, is one of the most popular and useful ways to depict activities (tasks or events) against time. A list of the activities is on the left side of the chart, and a suitable time scale can be found along the top. Each action is represented by a bar, whose location and length indicate the activity's start, duration, and end dates. A Gantt chart is necessary for managing a project because it can help to visualize the project's timeline easily. This is useful to keep tasks on track when there is a large team and multiple stakeholders when the scope changes.

A Gantt chart is plotted below based on the project activities and their distributed time.

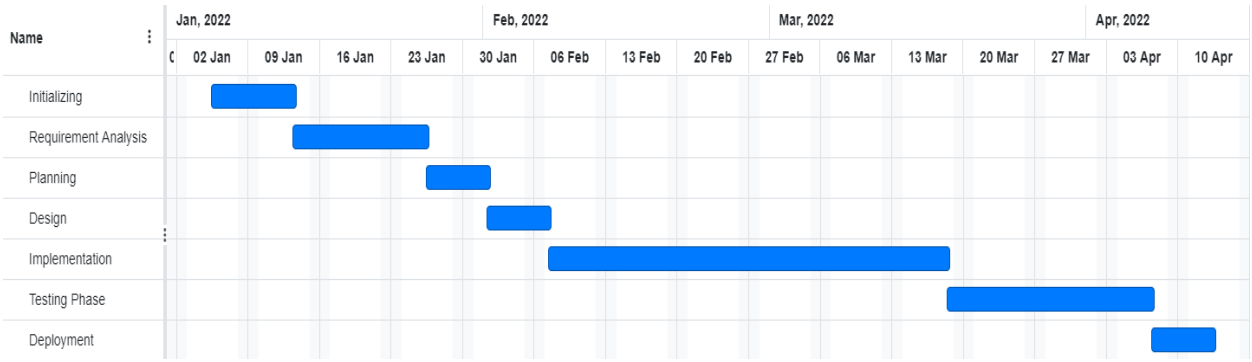

Figure 3.3: Gantt chart

3.4 Process/Activity wise Resource Allocation

For this project, the developers are considered the primary resource, followed by the computers used in the office the servers (VPS) required for the deployment of the project. Every employee of the company is considered a resource; hence everyone has assigned a particular assignment with specific deadlines, all of which collaborated to the entire project production. Following are the details of every step of the project.

1. **Initializing**: The CEO of the company presented the idea for the project during this period. Since this was an internal product, no delays occurred, and the project paperwork was started.

2. **Requirement Analysis**: In the first few weeks, the CEO and developers discussed the fundamental requirements for completing the project. For example
Computer specifications software/tech to build the application, features, and developers required.

3. **Planning**: At this stage of the development process, the developers and the CEO spent hours discussing how the project should be built, the approaches to be taken, and creating smaller goals and deadlines for them.

4. **Design**: To design the web pages of the application, few graphic designers were hired during this phase. For a better view of the bigger picture, the management team started by developing high-level and low-level diagrams for the project.

5. **Implementation**: The designs for the web pages were done at this point, and the developers began writing the code for the front end and back end of the application, while the management team monitored the deadlines.

6. **Testing**: As soon as a new feature was added, testing began. Developers, therefore, carried out the testing simultaneously. Unit testing for the application began at the end of the implementation phase.

7. **Deployment**: As the testing progressed, the team realized it was behind schedule. To deploy the application on a live server, a VPS (Virtual Private Server) and a domain were purchased.

Activity	*Days*	*Work Percentage*
Initializing	5	5%
Requirement Analysis	5	5%
Planning	5	5%
Design	5	20%
Implementation	30	40%
Testing	15	5%
Deployment	5	5%
Total	70	100%

Table 3.2: Activity wise work percentage allocation

3.5 Estimated Costing

One of the essential aspects of project management and planning is cost estimation. This is because a project is determined by at least three important constraints: scope, budget, and time. Cost estimates, of course, address the budget limitation. As a result, they are extremely important for project management. The cost was determined based on the system's functionality that the company required.

Requirements	Quantity	Amount (BDT)
Salary Payments (3 months)	1	24000
Computers (desktop)	1	30000
Printer	1	8000
Electricity Bill (3 months)	1	3600
Domain/Server/Hosting	1	1500
Desks	1	1800
Internet Bill (3 months)	1	3600
Subtotal	-	**82500**

Table 3.3: Work description-wise Estimated Costing

Chapter 4

Methodology

Successful projects are managed well. To organize a project efficiently, the manager or development team must choose the software development methodology that will work best for the project at hand. The software development process breaks down software development work into phases to improve the system's design and improve project management. This is also known as Software Development Life Cycle (SDLC). All methodologies have different strengths and weaknesses and exist for different reasons.The 7 phases of SDLC are: Planning, Analysis, Design, Development, Testing, Implementation, and Maintenance.

For this project, I have used the Agile development methodology. Various reasons made me choose to work with agile. I will describe each phase of the Agile development model and describe the importance of deployment using this model. An agile methodology is a form of the project management technique primarily used in software development. Agile approaches divide work down into small chunks with minimal planning and avoid long-term planning entirely. Iterations are brief periods of time that run anywhere from one to four weeks.

Other methodologies include:

- Waterfall
- Prototyping
- Iterative and Incremental Development
- Spiral Development
- Rapid Application Development
- Kanban methodology
- Extreme programming (XP) methodology
- Adaptive project framework (APF) methodology.
- Lean methodology.

4.1 Agile Development

The Agile software development methodology is one of the simplest and most effective processes to turn a vision for a business need into software solutions. Agile is a term used to describe software development approaches that employ continual planning, learning, improvement, team collaboration, evolutionary development, and early delivery. It encourages flexible responses to change. Agile software development emphasizes four core values:

1. Individual and team interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan

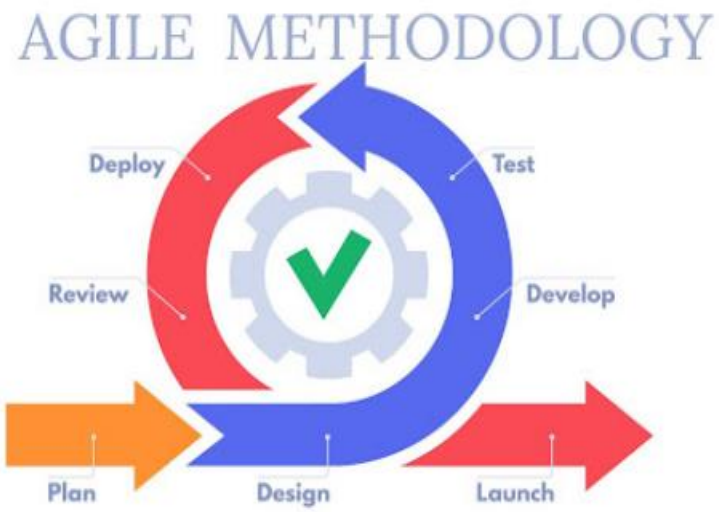

Figure 4.1: Agile Methodology

4.2 Why Agile for this project?

The primary benefit of agile software development is that it allows the software to be released in iterations. Iterative releases improve efficiency by enabling teams to find and fix defects and align expectations early on. They also allow users to realize software benefits earlier, with frequent incremental improvements. When the development process began, there was a lack of information in the requirement section of the project, which eventually got added up in the future. As new features and updates on design patterns got updated, the design team implemented them in a progressive manner, much like what the agile methodology suggests.

4.3 Agile Implementation

Agile implementation is a form of project management that works in small increments and is well suited to projects that could become irrelevant once delivered, especially useful in software development. The key to the agile plan is to provide flexibility for changes to the product as it continues to be developed.

The entire plan was decided when determining the requirements during the planning phase and how the development team divided all the work on a daily basis. Every day some of the coding section of the project would be implemented and at the end of the day, a meeting would be conducted between the development team and the management committee to make sure all functionalities that had been implemented throughout the day was valid, and up to the standards as well as the requirements, any changes suggested could be implemented accordingly.

Chapter 5

Body of the Project

5.1 Work Description

This system will be controlled and managed by the admins also Doctors. Users can log into the system with their email and password. Patient users can apply for the Doctor's Appointment, and Doctors can approve Appointments and generate prescriptions for patients. There will be an Admin dashboard where Admins(Doctor) can view Patients lists, Appointments lists, and Doctors lists.

I have handled front end and back end both. The front end is built with the Reactjs framework of JavaScript language and mainly built REST API's for the backend using the Express framework of Nodejs. Every day a target of the tasks to be completed throughout the day would have been appointed to me, and at the end of the workday, those targets needed to be fulfilled and explained properly.

5.2 Requirement Analysis

5.2.1 Rich Picture

A rich picture is a drawing of a situation that illustrates the principal elements and relationships that need to be considered in trying to intervene in order to create some improvement. It consists of pictures, text, symbols, and icons; all used to illustrate the situation graphically. It is called a rich picture because it illustrates the richness and complexity of a situation.

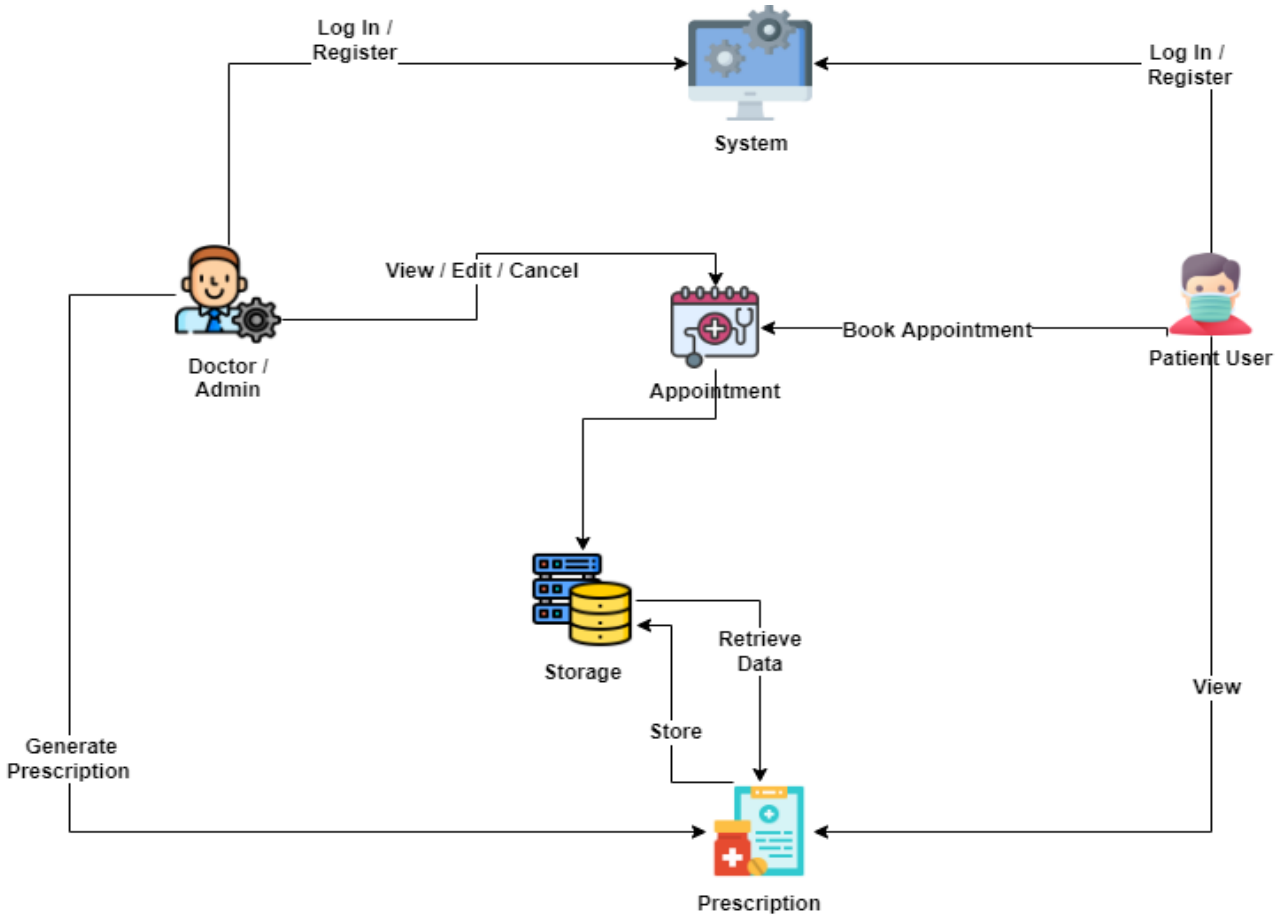

Figure 5.1: Rich Picture

This figure above illustrates the rich picture of “Doctor’s Appointment & Prescription System.” In this Rich picture, we can see how the workflow of the total system takes place.

5.2.2 Functional and Non-Functional Requirements

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks. On the other hand, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. They are contrasted with functional requirements that define specific behavior or functions. The functional and non-functional requirements of this system are stated below.

Functional Requirements:

Functional Requirement No.	Functional Requirement Description
FR 1	When the user enters information for registration and login, the application sends approval if the information is correct and redirects to the user dashboard per role.
FR 2	The system shall generate a unique username for all users.
FR 3	The system shall check new user's email unique or not. And the system only accepts unique email from new users.
FR 4	The system shall send a recovery password email to users who forget their password.
FR 5	The system shall allow users to write or edit user bio, upload user profile pictures and complete their account settings.
FR 6	The system shall allow Patient users to Book appointments.
FR 7	The system shall display the search result as user search query.
FR 8	The system shall display user Patient and Appointment Lists to Doctor .
FR 14	The system shall record all history to the database.
FR 17	The system shall store all browser cookies and search queries to give users a better user experience.
FR 20	The system shall send a confirmation email to the Patient user after the user confirms Appointment.

Non-functional Requirements:

Category	Non-functional Requirement
Usability	● The UI of this system is clean and simple. New users can get used to this software so fast. ● On any POST request (Registration, Login, Order) the database on receiving the data saves the information on the database and responds with a status of 200, else if there is a problem saving, it responds with a status of 400 or 404.
Performance	● The system will be responsive with mobile and any type of device. ● The system will respond to user requests in less than 0.1 seconds.
Information	● Users can download prescriptions.
Control	● This system will maintain user privacy. ● This system will be secure.
Service	● There will be two types of users. Doctor & Patient. ● Users can use the system from anywhere in the world. ● The system will be portable, changing OS to OS or device to device does not create any problem. ● Necessary system updates will come time to time.
Reliability	● The system will be reliable and available for OS, device, computer, or mobile. ● System updates or any kind of testing will not affect the running system.

5.3 System Analysis

Systems analysis is the process by which a person examines a system in order to assess, model, and choose a logical alternative for an information system.

5.3.1 Six Element Analysis

The six-element analysis is a method where we can know about the stakeholders, non-computing hardware used, computing hardware used, the software used, the databaseand the network needed for a particular process in the system.

Process	Human	Non-computing Hardware	Computing Hardware	Software	Database	Communication & Network
Sign Up	User (Doctor &Patient)	N/A	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB: Stores register data	Wifi or Mobile data for the internet connectivity
Sign In	User (Doctor &Patient)	N/A	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB For retrieves login data	Wifi or Mobile data for the internet connectivity
Apply for Appointment	Users (Patient)	N/A	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB: To Store Appointments Lists	Wifi or Mobile data for the internet connectivity

Create Prescription	Users (Doctor)	N/A	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB: To Store Prescription Lists	Wifi or Mobile data for the internet connectivity
View Prescription	User Check info and press print	N/A	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB: retrieves Prescription data	Wifi or Mobile data for the internet connectivity
Print Prescription	Users fill up respective forms	Printer	Laptop/ Desktop Computer, Keyboard and Mouse	VScode, Postman, MongoDB Compass, Web Browser	MongoDB: retrieves Prescription data	Wifi or Mobile data for the internet connectivity

Table 5.2.1: Six Element Analysis

5.3.2 Feasibility Analysis

Feasibility is the practical extent to which a project can be performed successfully. Feasibility study is conducted to evaluate the feasibility, which determines whether the solution considered to accomplish the requirements is practical and workable in the software. Feasibility study is carried out based on many purposes to analyze whether software products will be right in terms of development, implantation, the project's contribution to the organization, etc. There are different types of feasibility studies that are conducted, such as:

- **Technical Feasibility:** In Technical Feasibility, current resources, hardware, software, and required technology are analyzed and assessed to develop the project. Questions such as 'Is the application upgradable?' and 'Technical capabilities and skills of the developers?' are answered. For these current applications, the scalability depends on the number of

application users. Since it is a module-based application any addition of a module can easily be added or removed if required. A downside of the program is that the application has become very technical, therefore, non-technical users might have a more challenging time understanding the program entirely.

- **Operational Feasibility:** It assesses how the required software performs a series of steps to solve business problems and user requirements. This feasibility is dependent on human resources (software development team) and involves visualizing whether the software will operate after it is developed and be operative once it is installed. The major users of the application are the freelancers, one of the most critical barrier is the language barrier. The application is developed completely in English. Hence without understanding the language, it should be harder for the user to guide through the program specially in the rural parts of the country.
- **Economic Feasibility:** Economic analysis is the most frequently used method for evaluating the effectiveness of the candidate system. More commonly known as cost/benefit analysis& the procedure determines the benefits and sayings that are expected from a candidate and compares them with costs. If benefits outweigh costs & then the decision is made to design and implement the system.

  A system's financial benefit must exceed the cost of developing that system. i.e., developing a new system should be a good investment for the organization. Economic feasibility considers the following:

  1. The cost to consider a full system investigation.
  2. The cost of hardware and software for the class of application.
  3. The benefit in the form of reducing cost or fewer costly errors.
  4. The cost if nothing changes(i.e., The proposed system is not developed)

The proposed “Doctor Appointment & Prescription System” is economically feasible because

1. The system requires significantly fewer time factors.
2. The system will provide a fast and efficient automated environment instead of a slow and error-prone manual system, thus reducing both time and manpower spent in running the system.

3. The system will have a GUI interface, and very little user training is required to learn it.
4. The system will provide services to view various information for proper managerial decision-making.

- **Schedule Feasibility:** The time it takes to design and implement a solution is referred to as schedule feasibility. It calculates the length of time required to complete the project. This project must be completed within a certain amount of time. So, according to the estimates, this project is scheduled feasibly.

5.3.3 Problem Solution Analysis

Problem analysis is the process of understanding and defining the problem to be solved. Problem-solving identifies solutions that conform to the needs and constraints of the problem. Much of what is done in designing and building information systems is to solve problems, even though the system's objective may be seen as improving existing systems or taking advantage of market opportunities**.**

Throughout the development phase, I have faced many problems. I was new in MERN Stack Development(MongoDB, ExpressJS, ReactJS, NodeJS) I had no idea how it worked. At the very beginning of the Internship, I had to self study a lot about the Libraries of JavaScript. I faced many problems, and my codes were not working; the supervisor helped me a lot to fix it. There were also minor problems that I have faced such as incorrect placement.

5.4 System Design

5.4.1 UML Diagrams

A UML diagram is based on the UML (Unified Modeling Language) to visually represent a system along with its main actors, roles, actions, artifacts or classes to better understand, alter, maintain, maintain, or document information about the system. In this section, the activity diagram for all the user groups is shown; the activity diagram is essentially an advanced version of the flow chart that models the flow from one activity to another activity.

Use Case Diagram: Use-case diagrams are a type of UML diagram that helps to represent a system's behavior and capture its needs.
The high-level functions and scope of a system are described using use-case diagrams. The interactions between the system and its actors are also depicted on these diagrams. Use-case diagrams show the system's performance and how the actors interact with it. Use-case diagram is the starting point for UML modeling.

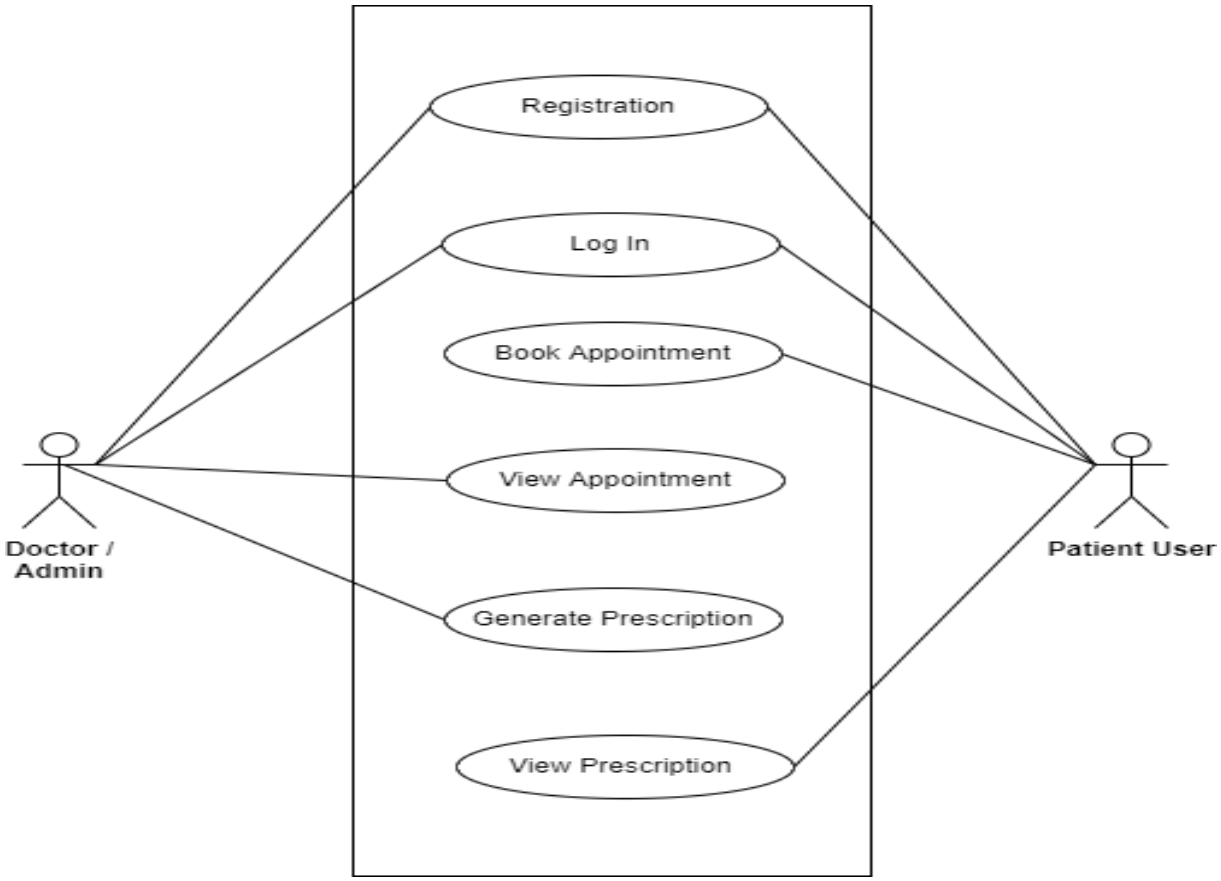

Figure 5.2: Use Case Diagram

Activity Diagram: The activity diagram is another essential diagram in UML for describing the system's dynamic characteristics. An activity diagram is a flowchart that depicts the movement of information from one action to the next. The action can be described as a system operation.

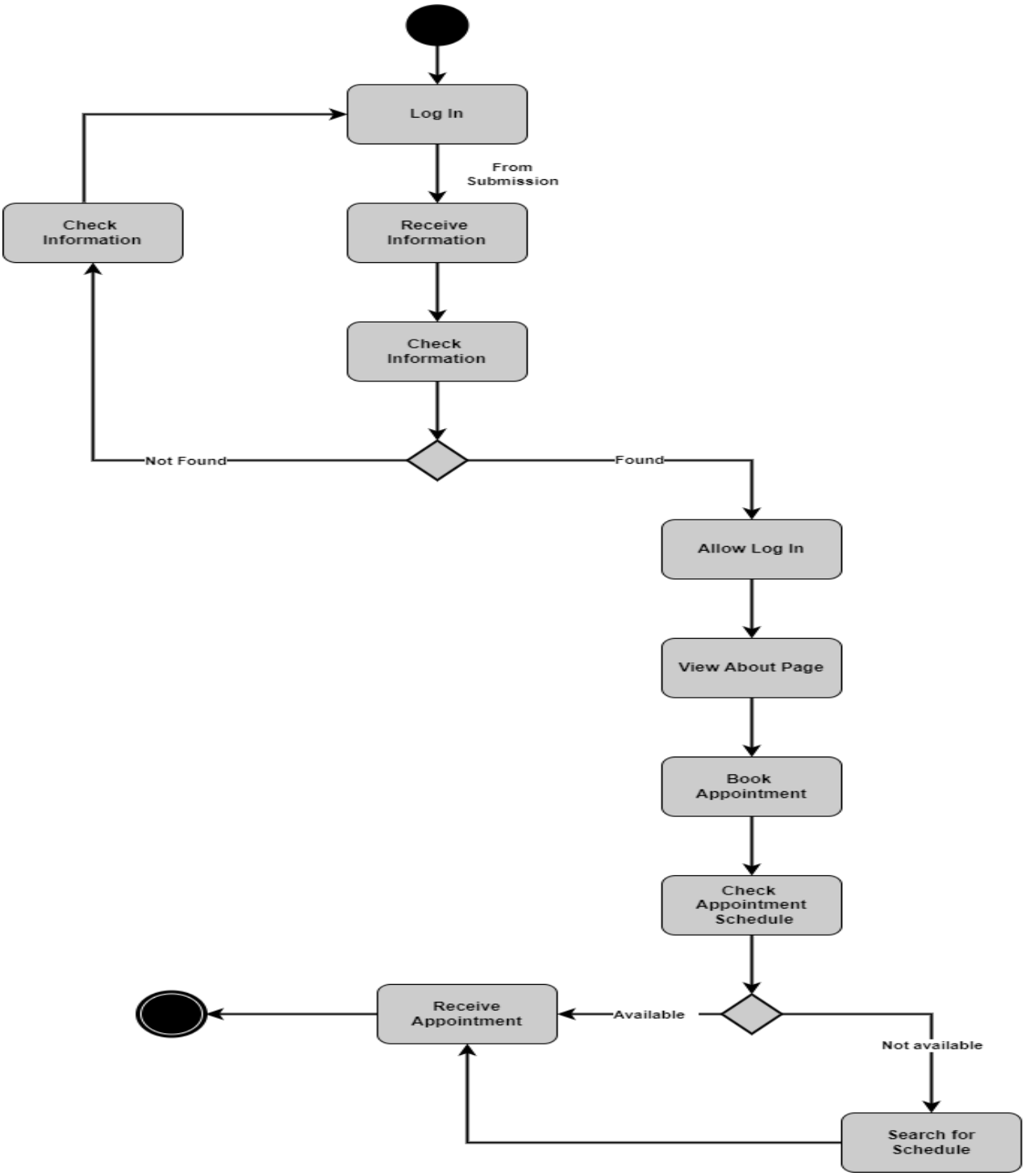

Figure 5.3: Activity Diagram for Patient

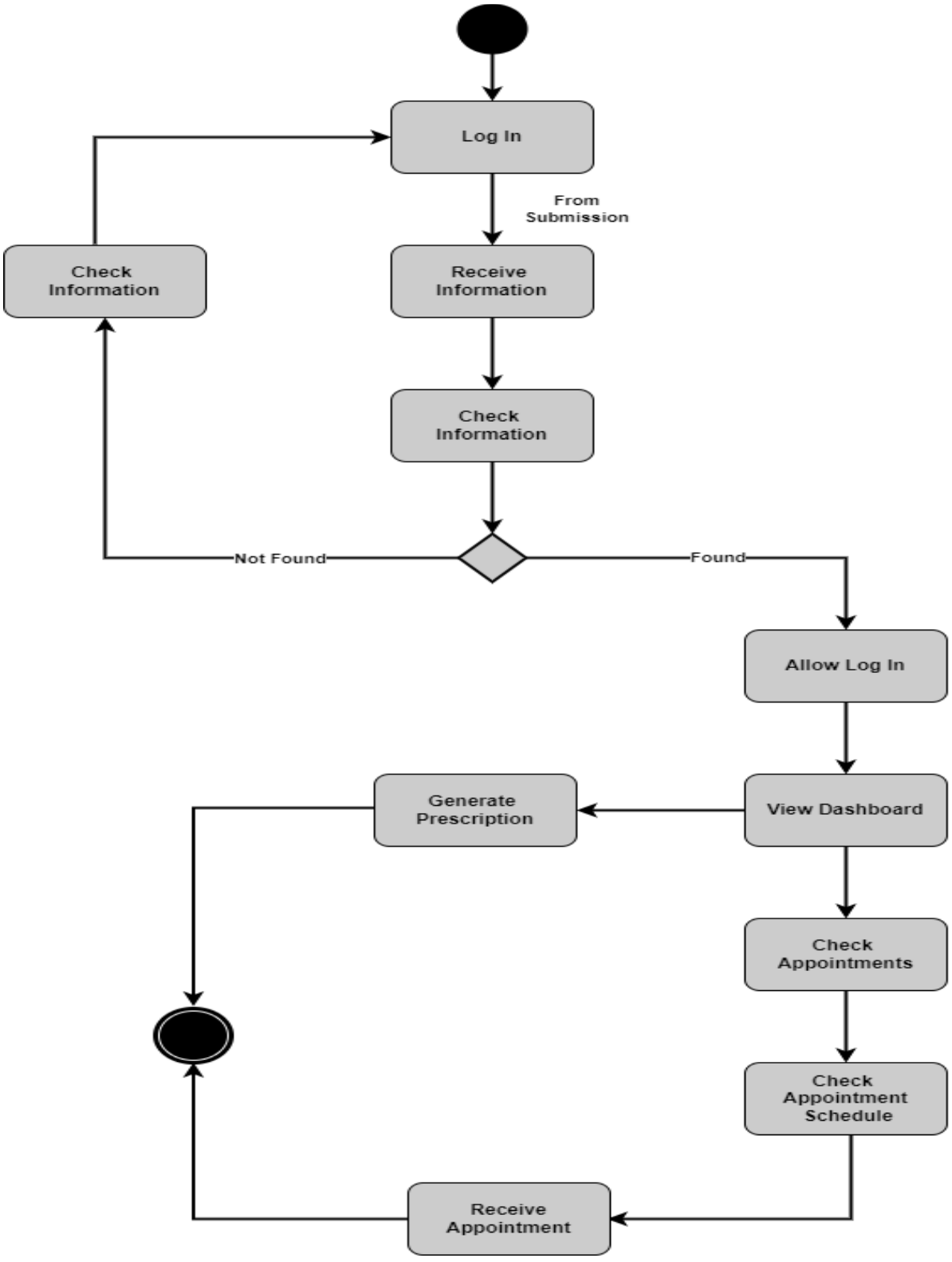

Figure 5.4: Activity Diagram for Doctor

5.4.2 Architecture

The Single Page Application or (SPA) was used for developing this application. A single-page application (SPA) is a web application or website that interacts with the user by dynamically rewriting the current web page with new data from the webserver, instead of the default method of the browser loading entire new pages. In a SPA, all necessary HTML, JavaScript, and CSS code is retrieved by the browser with a single page load. The appropriate resources are dynamically loaded and added to the page as necessary, usually responding to user actions. The page does not reload at any point in the process, nor does it transfer control to another page (Flanagan, 2006). For the development JavaScript framework, React was used for the front end, and the express framework of NodeJs was used for the backend. As for the database, a NoSQL database called MongoDB was used. Overall a MERN (MongoDB-ExpressJS-ReactJS-NodeJS) stack was used to develop the entire application.

Front-End:

JavaScript is a programming language. It is designed to create network-centric applications. It is complementary to and integrated with Java. Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web. JavaScript enables interactive web pages and is an essential part of web applications. It has a lot of frameworks and libraries, one of which is Reactjs. React (also known as React.js or ReactJS) is an open-source, front end JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in developing single-page or mobile applications. The reason React was used for the application was mainly because it works well with NoSQL databases and in the future, making mobile app for the application will be much simpler with React-native.

Backend:

Node.js is an open-source, cross-platform, back-end, JavaScript runtime environment that executes JavaScript code outside a web browser. Node.js lets developers use JavaScript to write command-line tools and for server-side scripting—running scripts server-side to produce dynamic content before the page is sent to the user's web browser. For this application, the express framework of Nodejs was used. Express is a minimal and flexible Node.js web application framework that provides robust features for web and mobile applications. The reason to use express was that the application was API driven. Hence REST API's were created using express.

Database:

MongoDB is a cross-platform document-oriented database program. It is a NoSQL database program; MongoDB uses JSON-like documents with optional schemas. The reason for choosing MongoDB as the database was mainly due to the abundance of resources and many built-in functions. Also, with no initial cost to maintain the database, it was the ideal database to choose.

5.5 Implementation

Login and Registration: Like any other web application that contains user systems, login and registration are the most common features of any application. Patient Users and Doctor Users have to be registered and login to perform their operation.

Patient User: Patients can view their profile and Prescription generated by Doctors.

Appointment: Patient-users can access the Appointment panel to apply for an Appointment. Users will fill in the necessary information submit it for getting an Appointment.

Doctor User: Doctors can view Patient's List, Appointments List and can generate prescriptions for Patients.

Prescription: Doctors will be generated prescription after meeting with Patients/seeing patients illness history.

Record of all information: The system will record all the data starting from user data, Appointment lists, prescription history etc.

5.6 Testing

5.6.1 Input

The following table shows the processes and the fields required for the inputs of the corresponding method.

Table 5.6.1: Input table with their fields

Process	**Fields(Types)**
Sign Up(Doctor & Patient)	User Name – String Full Name – String Phone Number – String Email Address – String Birth Date– Date Gender– String Blood Group– String Address – String
Sign In	Email – String Password – String
Appointment	Patient User Name– String Appointment Date- String Appointment Time – String Patient illness history– String
Prescription	Patient Username – String Patient Full Name – String Phone Number – Number Birth Date – Date

	Gender– String Blood Group– String Patient illness history– String Patient Weight– String Patient BP– String Temperature– String Medicines Name– String Test Name– String Description– String

5.6.2 Output:

Table 5.6.2: Output table with process

Process	**Output**
Sign Up	On Success – Alert Message: "User Signup Successfully" On Failure – Error shown under the field's input
Sign In	On Success– Alert Message shown "Login is Successful" and redirect to dashboard For Doctor & Appointment for Patient. On Failure – Error shown under the field's input
Appointment	On Success – Alert Message shown "Appointment Successful" On Failure – Error shown under the field's input
Prescription	On Success – Alert Message shown "New Prescription Generate Successfuly" On Failure – Error shown under the field's input

Chapter 6

Results & Analysis

6.1 Results

1. Patient & Doctor sign up: The patient must sign up to request an appointment. And Doctor must sign up to see the Admin Panel and Appointments.

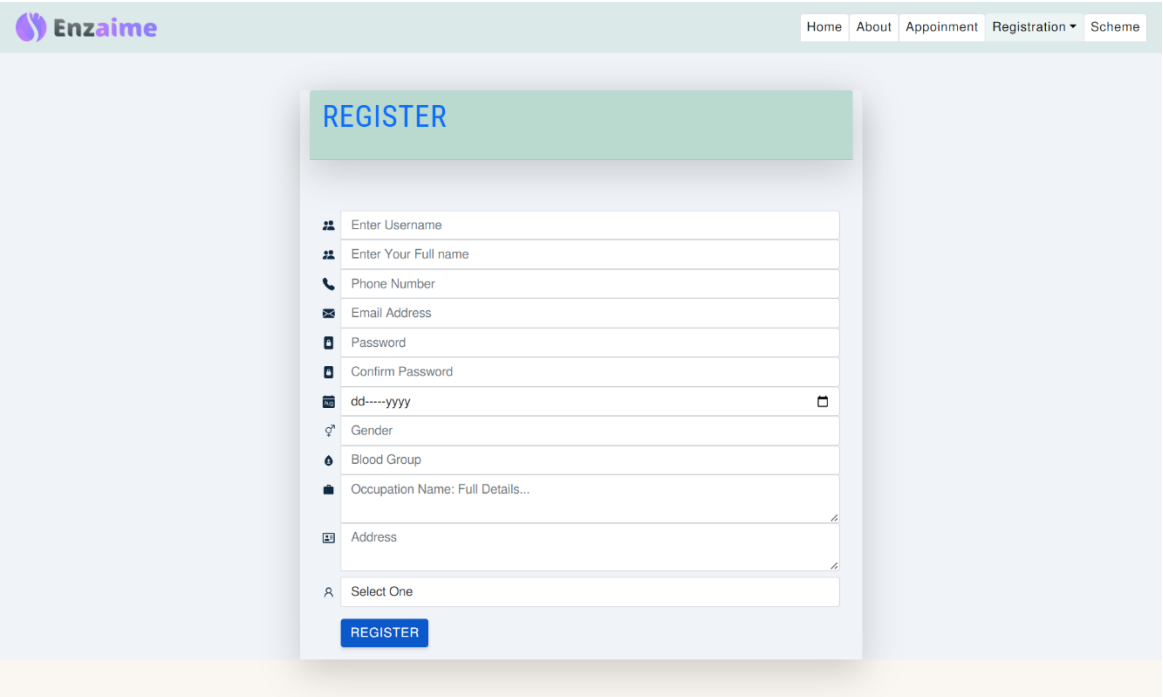

Figure 6.1: User Sign Up Page

2. User Login: After successfully registering, Patient & Doctor must be logged in to see their specific panel.

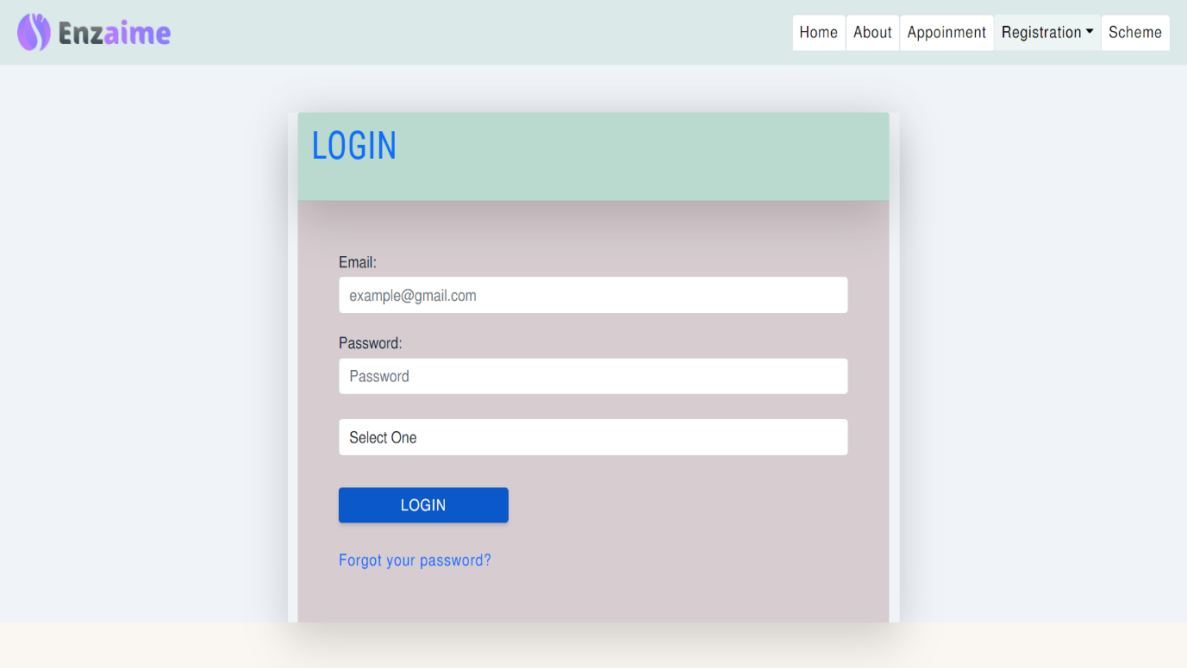

Figure 6.2: User Login Page

3. User Profile: After Successfully Login User can see their profile.

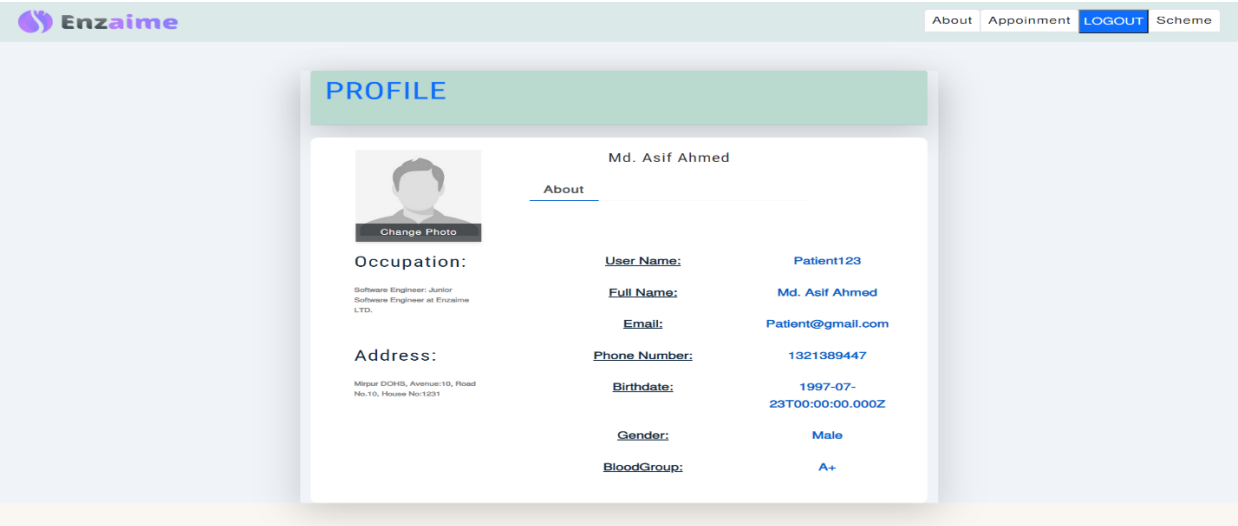

Figure 6.3: User About Page

4. Appointment: After Successfully Login Patient can Apply for the Appointment.

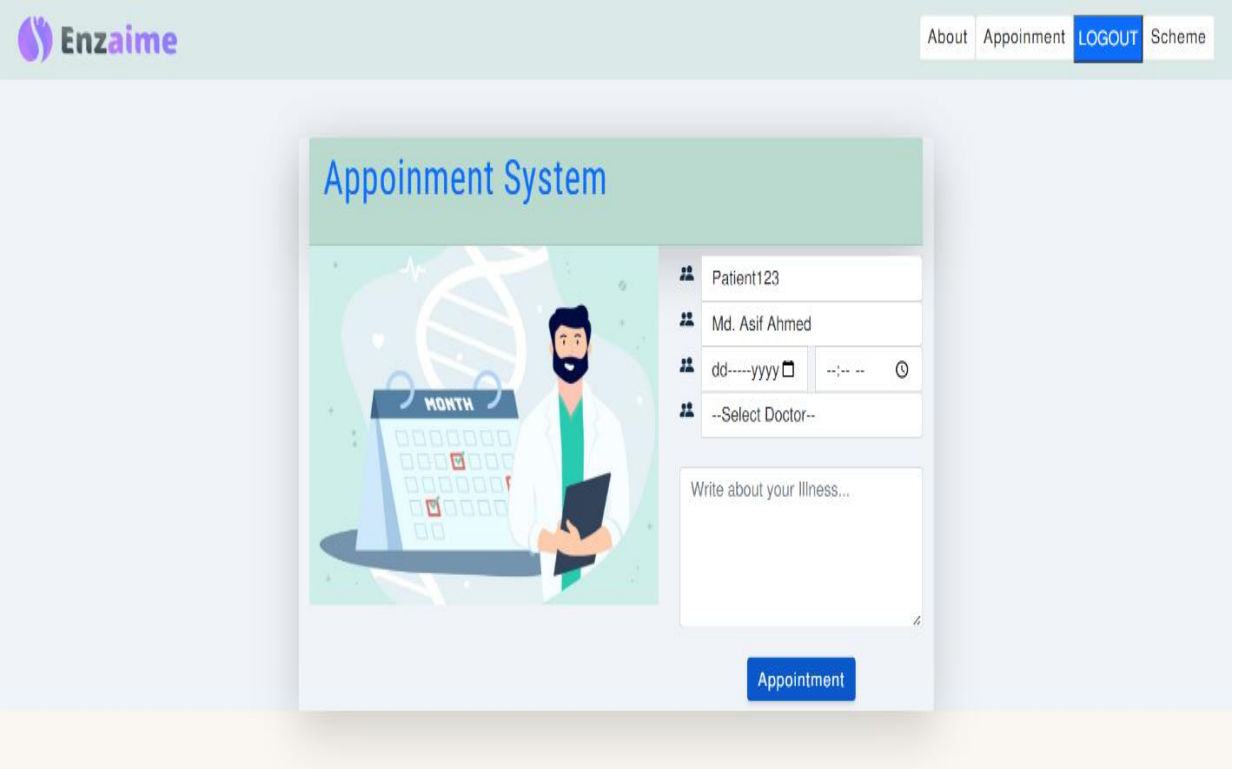

Figure 6.4: Appointment Page

5. Doctors Time Schedule: Patients can Apply for the Appointment to see the available Doctor's schedule.

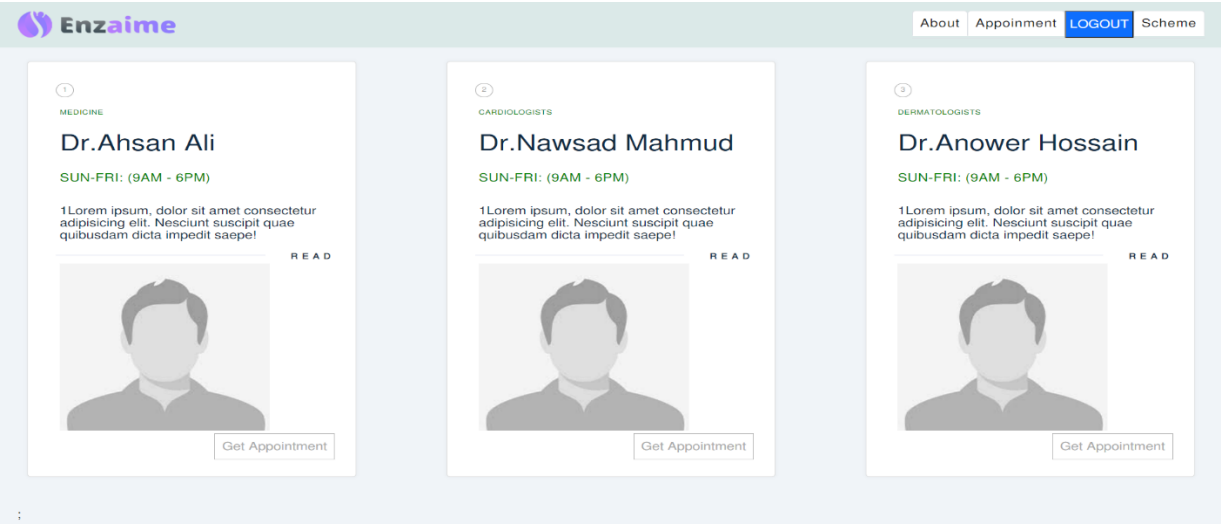

Figure 6.5: Doctor's Time Schedule

6. Admin Dashboard (Doctor): After Successfully Login, Doctors can see the Panel.

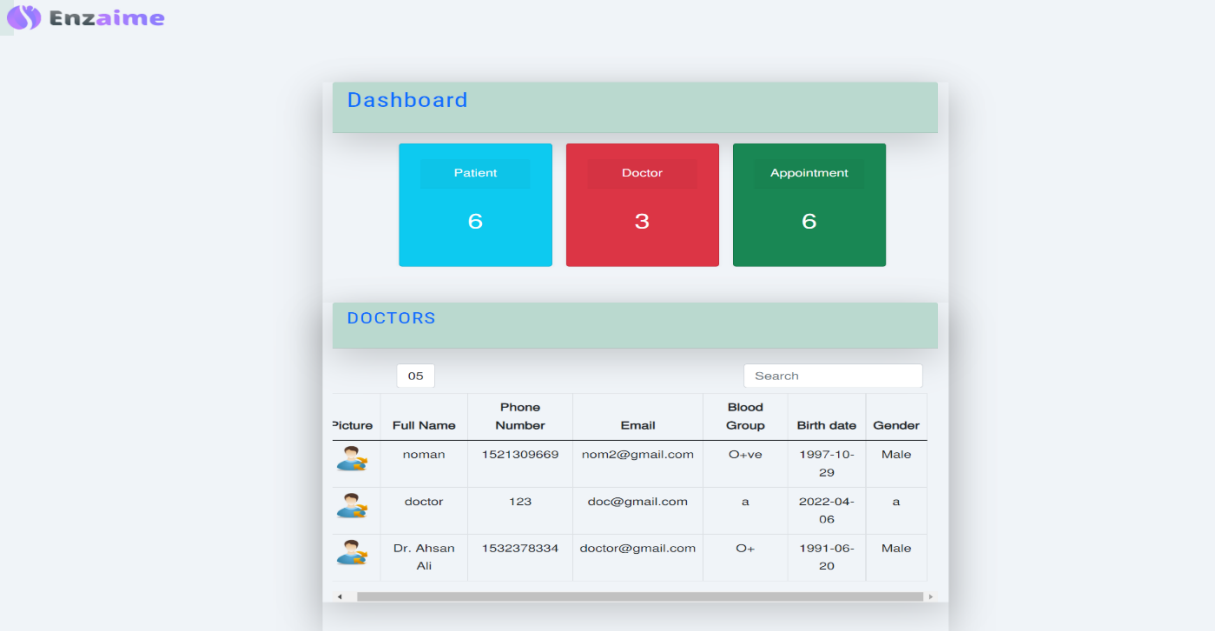

Figure 6.6: Admin Dashboard (Doctor) Panel

6. Appointments List: Doctors can see the Appointments List.

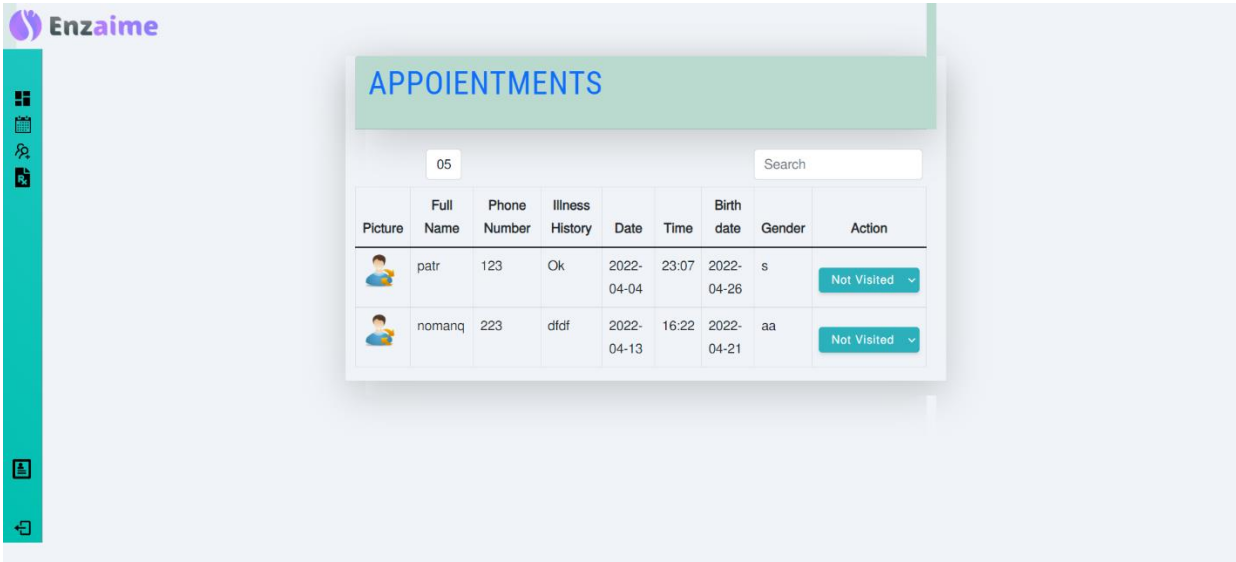

Figure 6.7: Appointments List

6. Patients List: Doctors can see the Patients List.

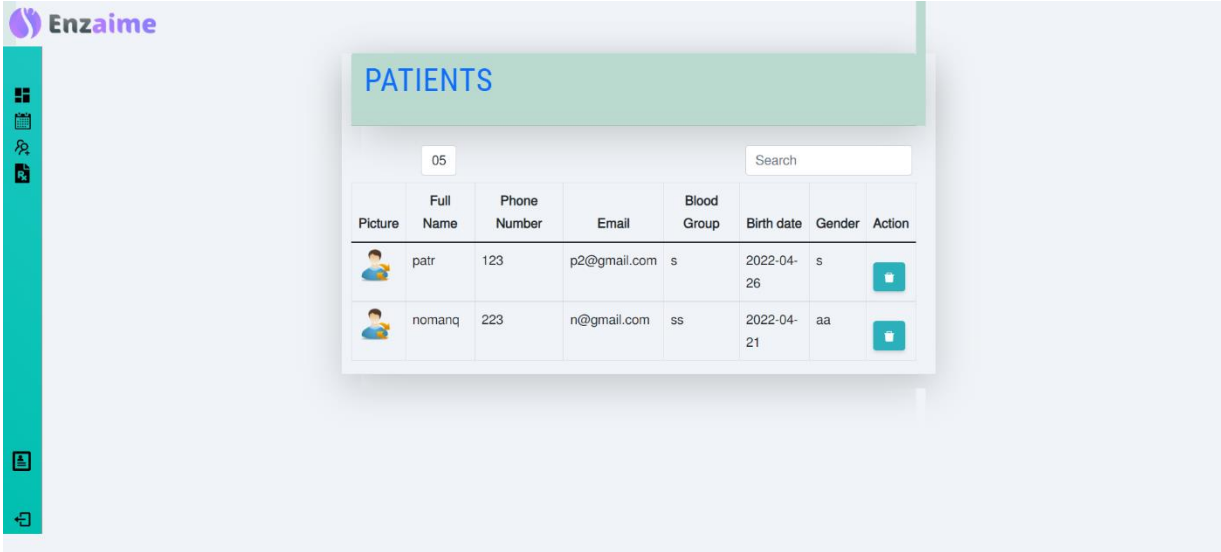

Figure 6.8: Patients List

7. Create Prescription: Doctors can generate Prescriptions for the Patients.

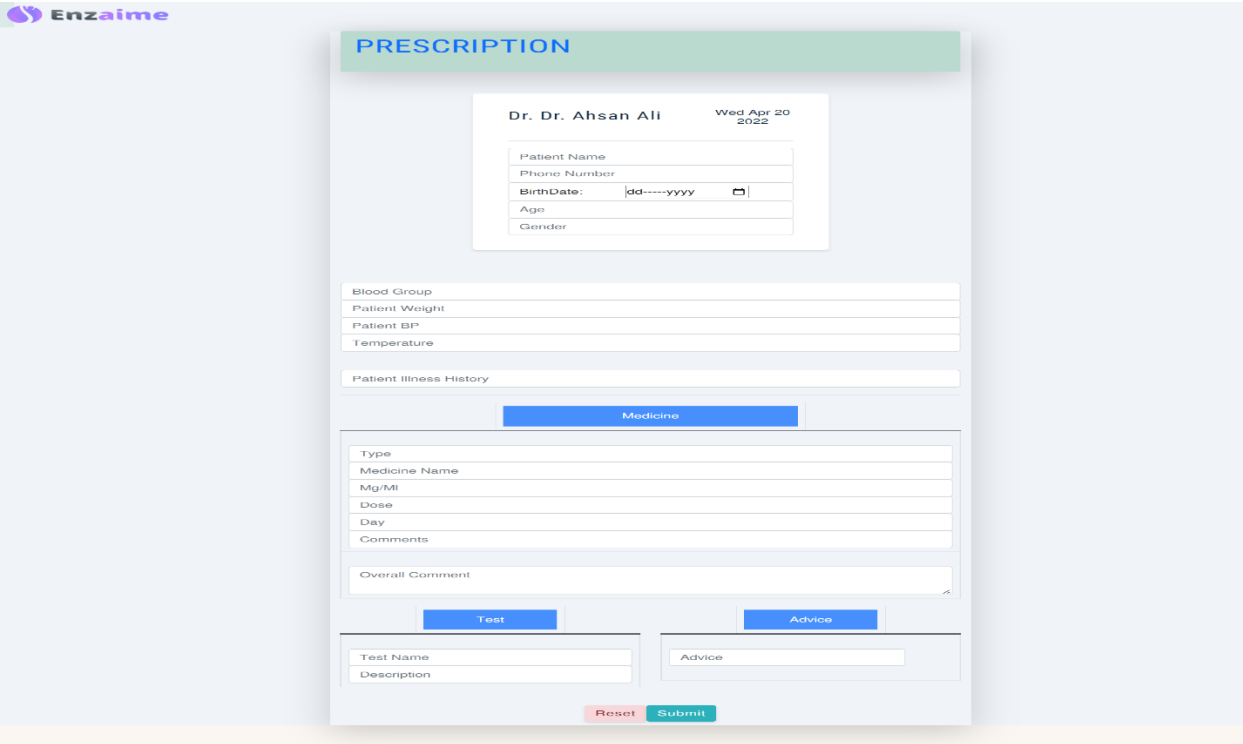

Figure 6.9: Prescription

Analysis of Front-end and Back-end:

While developing the system, I tried to maintain these standards of UI design. User Interface (UI) Design is concerned with anticipating what users may need to do and ensuring that the interface contains simple features to access, understand, and utilize to assist those actions. Interaction design, graphic design, and information architecture are all combined in UI. The essential requirement of a standard UI design is keeping the interface simple. We should maintain consistency and use common UI elements, be purposeful in page layout, use colour and texture strategically, Use typography to create hierarchy and clarity, etc. The UI design of the system is kept very minimal and simple, and there are no extra elements other than what the user needs in the system. The user and admin's table and dashboard have been made by maintaining a similar theme. The colour and fonts used are also minimal and easy to the eye of the user. The input forms are also described by texts so that users can understand where they should write anything. The components are also arranged with care to help draw attention to the most important information while also facilitating scanning and reading.

While developing the system, the basic standards of coding were maintained. MongoDB, Express JS, React JS, and Node JS developed this system. Coding standards are rules and principles that define a programming language's programming style, techniques, and methods. The basic coding standards are appropriate naming convention, organizing files and folders separately, maintaining formatting and indentation, defining classes and functions, and Documenting and commenting where needed. The naming convention specifies how we should name our packages, classes, methods, variables, etc. Using standard indentation and formatting is very important because this kind of big project contains thousands of lines of code. Without proper configuration, spacing, and indentation, anyone can get lost and have difficulty understanding the code. After coding a certain function or procedure, I included short comments so that the next time I review my code, or my company supervisor sees it, he can easily review it.

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

Project sustainability is currently a widely used method to project management. From project identification to feasibility studies, design, funding, implementation, and evaluation, specific criteria and standards must be established for projects to be sustained. A sustainability analysis will determine the acceptability, viability, and exibility of a project.

In before developing this project, the company has done a lot of requirement analysis for the project. There are few other websites from which they have analyzed and found what improvements could be done. The company will also take feedback from the users of the system, the user can tell the good and the bad sides of the system, and according to the feedback, we can make changes in the system. I believe that the project will sustain well. People from rural areas will also be able to use our system. It is going to make their life easy.

7.2 Social and Environmental Effects and Analysis

The project Doctor Appointment and Prescription System is a system by which patients will be able to consult with Doctors. Patients can easily use this application by registering themselves, and the doctor can prescribe medicines to the patient based on their medical condition. I believe that the software will make the life of people easier. Whenever a person wants to consult with a doctor, he/she needs to go to the chamber physically. For taking an appointment, he/she have to wait for a long time to get a serial, Sometimes doctors aren't available at the hospital for that patients have to suffer a lot of difficulties. Still, in our system, everything is done online.I believe that the system will have a positive social and environmental effect.

7.3 Addressing Ethics and Ethical Issues

When we create a website, we are supposed to address technical questions such as functionality and project specifications as a developer. However, it is not the first thing we have in mind. But what we often overlook is how software and technology touch people's lives on a personal level, with the ability to improve or deteriorate them. Because technology has become such an integral part of our daily lives, it is impossible to separate it from the ethical issues that it raises. They influence how we consume and create. Some of the common ethical issues that developers face were kept in mind when doing this project are,

- **Customers' data protection:** Because of the sensitive information that our clients entrust us with, personal data security is one of the most pressing concerns in the digital age. So data security was given the most priority while making this project.

- **Copyright ownership:** As the code of this project is the property of the company Enzaime LTD., without their permission, no one can reproduce, distribute, display, or edit it.

Chapter 8

Lesson Learned

8.1 Problems Faced During this Period

I have faced new challenges throughout the internship, and I also learned how to overcome those. For the current pandemic, getting an internship was very difficult. I had to go to the office from time to time.
I had never worked in a professional place before. I was never an 8am-4pm routine person, so the new lifestyle was a bit problematic for me. Sometimes I cannot cope-up with immense work as I wasn't used to this kind of pressure. When I was doing my internship, a few things were new to me, which i haven't done before. I was facing problem if few parts of the report when I was doing it. The main problem for me was the framework that I was working with. MERN Development (MongoDB, Express JS, React JS, Node JS). It was totally new for me. I had faced a lot of difficulties understanding the work of it. At the very beginning, I was learning that by myself, and it wasn't very clear for me.

It was quite challenging to complete the project scheduling and resource allocation accurately as this project management thing is very new for me. Some works were being delayed than the planned schedule as now it is not possible to work in an office setting. Rather than planning, it was more difficult to maintain the project plan properly. The project I am working on is a way for the company for evaluating my skills. So, at times, I got very overwhelmed and stressed. I struggled a lot in between the designing and coding phases. This made me realise the urgency of enhancing my coding skills, so I had to work very hard to come up with the pressure.

8.2 Solution of those Problems

Even though there were many problems, I knew that I had to overcome my problem. It was very tough for me to go to the office daily and work from 8am-4pm

I had to google and find out many parts I was not familiar with. My supervisor helped me a lot when I faced any difficulties in the codes. At first, he gave me a total overview and taught me about Code Igniter. I was very scared and confused whether i could finish my work within the given time, but by doing hard work, I completed my work within the time. I have learnt that in life, problems will always be there. We just need to figure out a solution for the problem and face them without any fear.

Chapter 9

Future Work & Conclusion

9.1 Future Works

The company has future plans for the project. The company's main plan is to integrate a payment gateway of their own with the system. Currently, the company has plans to develop a video calling website of their own for the consultation between patients and doctors. For now, the patient's data will be input manually to the system. The company will later bring biosensor and integrate it within the system so that the data can be automatically sent to the system using the biosensor. This current application is just for the web. The company has the target to create a mobile app for the application in the future. There are many design issues still which will be resolved in another month of testing and correction.

9.2 Conclusion

At first I would like to give thanks to IUB for the Internship course, I have got to learn a lot which I can use in my professional career. I have gained experience that I can use later on in my life. I have learned new skills and techniques. I always wanted to be a web developer, and now I believe I have gained enough experience.

The report goes through all the intricate details of the project from the conceptual level to the functional level and the design patterns. Although the project will be incomplete during the creation of the report, but most of the functionalities should in the application. The report also explains the sustainability and the methods where the application should bring in money for the company.

Working on this project has made me realize a few things throughout the internship period. It has made me realize how diverse, and competitive the real corporate world is. It has made me feel to make an actual difference in the real world. As an undergraduate student, it is really tough for any student to have an actual taste of how the real companies of the world works. My Internship experience with Enzaime Ltd. was really good. But to actually live it for 3 months was a unique experience and hopefully will be the start of my journey into the corporate world as a developer.

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