



An Undergraduate Internship/Project on E-Appointment System

By

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Computer Science**

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Attestation

I hereby attest that I, Niloy Mallick-1731151 an undergraduate affiliate of Independent University Bangladesh, have completed the report and submitted it in partial fulfillment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). I have been guided by my respected faculty Ms. Moumita Asad. All the sources of information used in this project and report has been duly acknowledged in it.

Signature

Date

Niloy Mallick

Name

Acknowledgement

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability accomplishing my internship report timely.

I express my gratefulness to my internal supervisor, **Ms. Moumita Asad**, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh (IUB), for her invaluable instructions, constant guidance, support and motivation during my internship period and preparation of this report.

It has been a great privilege to work for ‘OS-It Solutions’ as an Intern. I have received so much support and encouragement from the individuals of ‘OS-It Solutions’. I would like to thank my supervisor for spending his valuable time and knowledge which was essential for the completion of this report.

I would like to thank my classmates. They have always been helpful and provided valuable insights from time to time.

Finally, yet importantly, I would like to thank my family. Their endless support has been unconditional. Their hopes and faith on me had me keep going even when days were challenging.

Letter of Transmittal

Ms. Moumita Asad

Lecturer,

Department of Computer Science and Engineering,

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Subject: **Submission of Internship Report.**

Dear Madam,

This is to inform that with due honor and respect, I, Niloy Mallick (ID: 1731151) from CSE 499, Internship Course of Autumn 2021 Semester, Section 12, would like to submit my Internship report. I have completed my internship program under the supervision of Mr. Mohammad Muniruzzaman (Munir). This report is based on my internship program and the project I have worked on at Os It Solutions Ltd. I tried to make this report as much informative as possible with the experience I have gained during my internship period.

I have tried my best to deliver a good report. However, it might lack perfection. I shall be highly obliged if you are kind enough to receive this report and provide your valuable judgment. I hope the following report can achieve your approval and is adequate. Sincerely,

Niloy Mallick

ID-1731151

Department of Computer Science and Engineering

Independent University, Bangladesh

Evaluation Committee

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Signature

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Name

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Supervisor

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External Examiner

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Convener

Abstract

This document contains the Project Management , architectural design, user interface design, testing and future work of ‘E-Appointment System’. This System provide customer appointment booking services via online. In this system, customer need to register and book their desire time and date of the organization’s employee. After the approval of the employee appointee can visit for the meeting. This system will reduce the human error of overbooking. It will also gives customer access to book appointment from home.This document can be followed to develop a ‘E-Appointment’system ***Keywords***— appointment,e-appointment,online scheduling,online appointment

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Chapter 1

Introduction

1.1 Overview/Background of the Work

Information System has become an important aspect for any developing business in recent years. As the growing business needs to have accurate information and necessary technology for solving problems and to catch up with ever-growing customer needs, Information System Technology has been a key force for an organization to determine their business criteria. Web applications have helped in streamlining many of the tasks we perform on a daily basis and helped business organizations using Information Systems. [1]

Using Information Systems for managing information in the organization such as keep service candidate records, service candidate appointment system, scheduling appointments, cancellation appointment is not only a simpler way to save time and reduce cost but also a way to improve the business organization information to be more accessible and flexible for system uses and storing data efficiently. It also reduces human error like overlapping an appointment or forgetting to cancel an appointment which improves the quality of data control.

In the current Covid-19 situation it has become a challenge to provide services while maintaining hygiene and social distance. In this situation, different organizations are constantly facing different problems while providing customer service, besides the number of patients suffering from Covid is also increasing day by day. In addition, extensive preparations are being made worldwide to deal with the Covid-19. As part of this, the Government of Bangladesh, like other countries, encouraging social distance. But this work needs to be conducted in a smooth and orderly manner with a sound management system maintained by the organization.

The purpose of this internship is to develop and evaluate an online appointment system where all process of appointments is verified. E- Appointment System will not only help the business organization to organize the appointment process but also helps in this current Covid-19 situation to face the challenge. E-Appointment services could be considered as simple solutions providing significant benefits for improving the accessibility and efficiency for delivering public services requiring face-to-face interactions. Given the high number of services requiring appointment scheduling across government or non-government organizations, which provides E-Appointment service as part of software infrastructure for any organization is appealing over agency-specific solutions. The e-Appointment system is an online service that manages the appointment slots for any organization. In the past,

appointment processes were done manually and because of this, there were many instances of overbooking or forgetting to cancel an appointment which could free up the space to schedule another in its place.

1.2 Objectives

- To develop a system that allows users to have control over their appointment making service.
- To facilitate the service holder with real time scheduling.
- To manage staff resources need for managing appointments.
- To maximize operation hours.
- To make use of online platform for less customers inconvenience and high productivity among staff.
- To optimize time saving and monetary savings as both staff time and services translate into expenses and revenue.

1.3 Scopes

The E-Appointment System has potential to increase the accessibility of a general practice, by offering the service candidate the opportunity to schedule a service holder's appointment fast and easily. Appointment scheduling software refers to the management of meetings and appointments in real-time efficiently. It includes several key features, such as staff scheduling, automatic reminders, etc. Organization can allocate time for their staffs. E-Appointment System allows the users the power to book their own appointments with respective office staffs. This system will automatically send notification to the visitor who book an appointment. Users gets automatic reminders which will help them to allocate their precious time. Also, this system will be beneficial to the organization to manage a tremendous amount of time that would otherwise have been spent answering phone, responding to e-mails and voice messages. This online platform improves flexibility of management service with customized reporting and security features.

Appointment scheduling software helps organizations in enhancing efficiency, improving productivity, automating daily tasks, etc. At present, large companies with a remote workforce are adopting customer appointment management (CAM) to schedule home service appointments automatically.

The escalating demand for online appointment booking on account of COVID-19 pandemic is driving the appointment scheduling software market, particularly across the healthcare facilities. This software enables patients to book appointments, collect essential data, fill vaccination forms, etc. Furthermore, the rising adoption of appointment scheduling software by educational institutions for web conferencing, class scheduling, automating reminders, etc., is also propelling the market growth.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

First and foremost, the university emphasizes teaching and learning and the process of learning in its commitment to the development of mature, responsible, well-educated citizens. The knowledge and skills that I gain from my undergraduate programs help me with the development of this "E-Appointment System" project. It would have been more difficult if these courses had not been covered before working on this project. Besides those, the individual and group projects I have done in my undergraduate courses helped me with this project. Some of the courses are:

- **CSE 203 Data Structure:**

A data structure is a specialized format for organizing, processing, retrieving, and storing data. There are several basic and advanced types of data structures, all designed to arrange data to suit a specific purpose. Data structures make it easy for users to access and work with the data they need in appropriate ways. Most importantly, data structures frame the organization of information so that machines and humans can better understand it. It is not only important to use data structures, but it is also important to choose the proper data structure for each task. Choosing an ill-suited data structure could result in slow run times or unresponsive code.

This course was about teaching how to handle and manipulate complex arrays, objects, classes, array of objects, objects of array, nested arrays, nested objects, etc. As "E-Appointment System" involves many complex data structures, the knowledge gained from this course made handling them much easier.

- **CSE 213 Object-Oriented Programming:**

Object-oriented programming is based on the concept of objects. In object-oriented programming data structures, or objects are defined, each with its own properties or attributes. Each object can also contain its own procedures or methods. Software is designed by using objects that interact with one another. OOP can also be used in manufacturing and design applications, as it allows people to reduce the effort involved. For instance, it can be used while designing blueprints and flowcharts. It helped to write the real time system design that are used to develop the "E-Appointment System".

- **CSE 303 Database Management:**

A database management system (DBMS) is a software package designed to define, manipulate, retrieve, and manage data in a database. A DBMS generally manipulates the data itself, the data format, field names, record structure and file structure. It also defines rules to validate and manipulate this data.

Database management systems are set up on specific data handling concepts, as the practice of administering a database evolves. The earliest databases only handled individual single pieces of specially formatted data. Today's more evolved systems can handle different kinds of less formatted data and tie them together in more elaborate ways.

This was the first course that taught me how to design and plan a project. In the database management course, I have got the basic knowledge of popular planning and strategy practices such as System development life cycle, Six Element Analysis, Rich Picture, Requirement Analysis, Entity Relationship Diagram, Business Process Model, and many more. These techniques helped in the development planning and strategy of "E-Appointment System" and, they helped in writing this report.

- **CSE 309: Web Applications and Internet:**

This course serves as a comprehensive overview of web technologies and their usage. Essential topics such as OSI and TCP/IP architecture, Internet Routing, IP addressing and Domain Name System was covered. Discussions on popular browsers, HTML and Cascading Style Sheet, HTTP, HTTPS, FTP, Client and Server-side scripts, Scripting (JavaScript, AJAX, XML) with jQuery libraries, Web Servers (IIS, Apache) helped me with my project. I learn to design dynamic websites using Django with SQL server and with MySQL.

- **CSE 307: System Analysis and Design:**

Systems development is systematic process which includes phases such as planning, analysis, design, deployment, and maintenance. Here, in this tutorial, we will primarily focus on System Analysis and System Design.

This course examines the tools and techniques used for the design and analysis of information systems. Topics covered include Systems and models; Project management; Tools for determining system requirements; data flow diagrams; decision table and decision trees; Systems analysis: systems development life cycle models. Object oriented analysis: use-case modeling, Unified Modeling Language. Feasibility analysis, Structured analysis; systems prototyping; system design and implementation: application architecture, user interface design. Front-end and back-end design; database design; software management and hardware selection. Case studies of Information Systems. These techniques helped in the development planning and strategy of "E-Appointment System" and, they helped in writing this report also.

2.2 Related works

The Project I am working on, E-Appointment System, is an online appointment scheduling system. There are some related web applications that share the ideology of "E-Appointment System". simplybook.me, pick-time.com, appointy.com are one of those web applications.

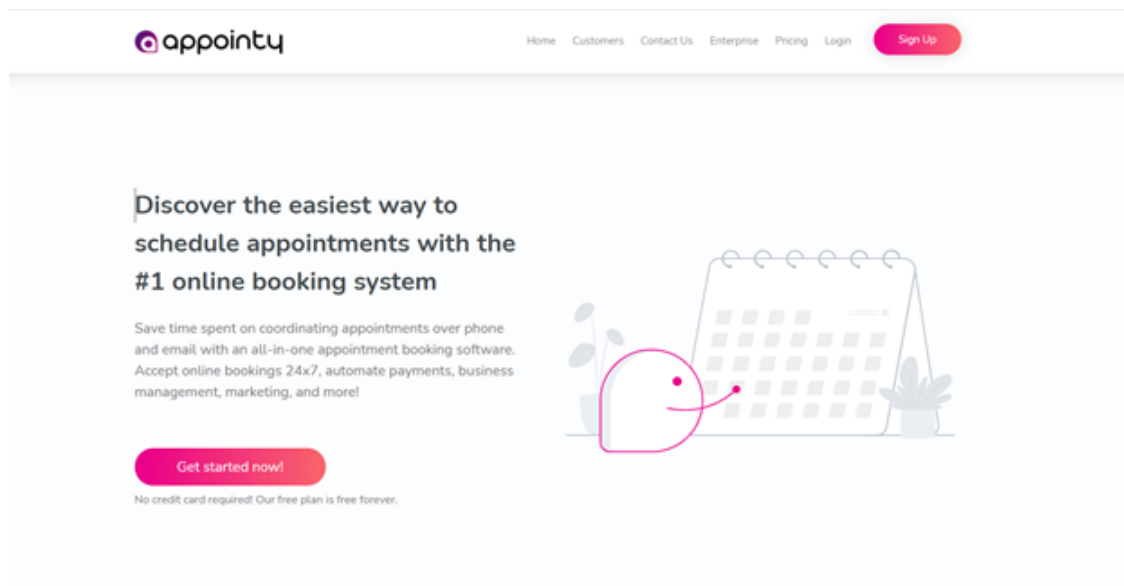


Figure 2.1: appointy.com

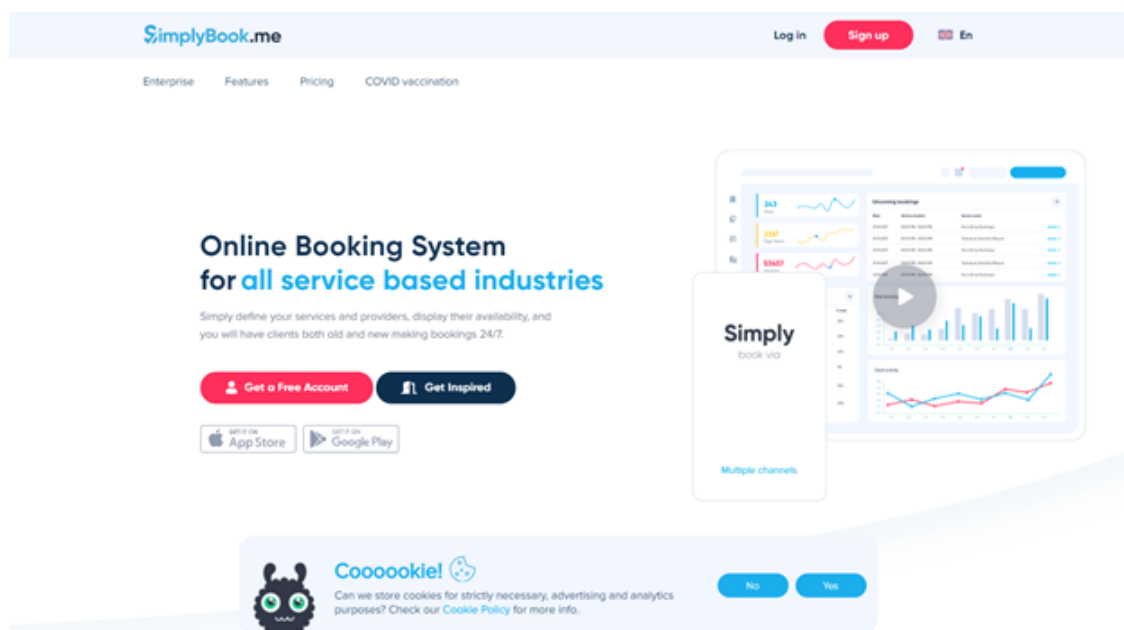


Figure 2.2: SimplyBook.me

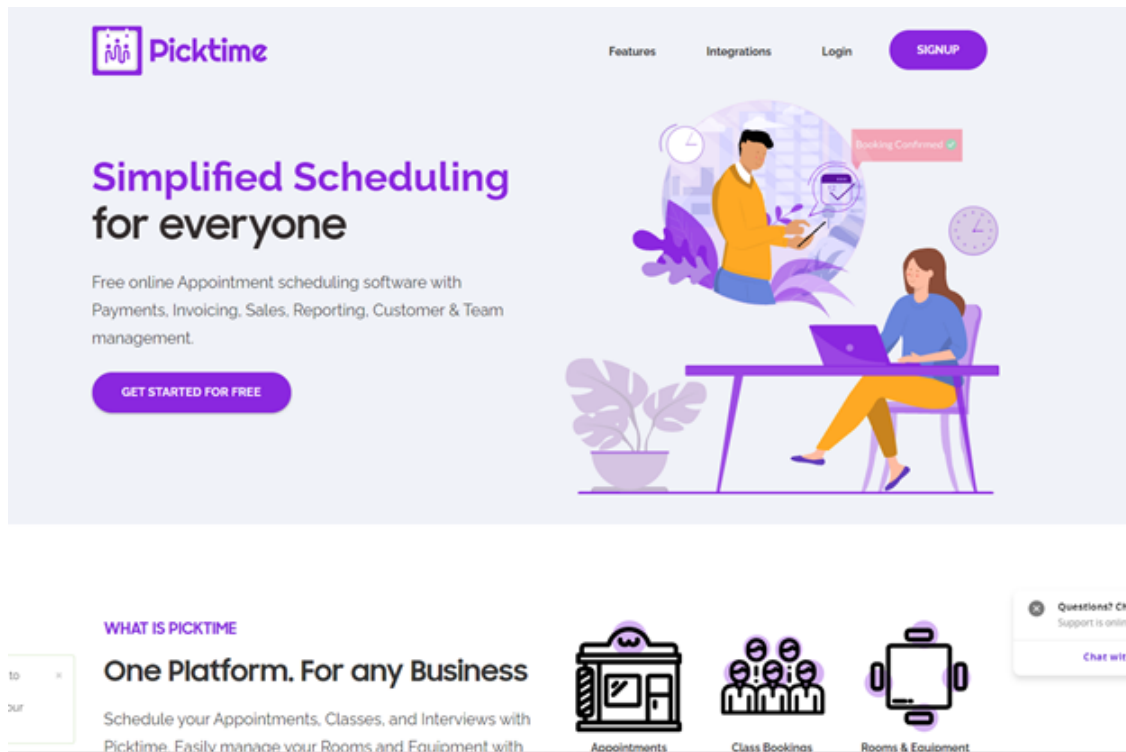


Figure 2.3: picktime.com

Web applications have helped in streamlining many of the tasks we perform on a daily basis and helped business organizations using Information System.

The objective of this project is to develop a system that allows users to have control over their appointment making services and to facilitate the service holder with real time scheduling. we want to bring up the current status of various organizations regarding appointment. As far as we know, every organization in our country manage their appointment in their platforms. These may include online or offline appointment making. So, if a client wants to make or schedule an appointment in different organizations, he/she has to do this by going to different sites or by going to the organizations individually. Our target is to streamline this process in such a way that a client can do this from a single site thus saving their time. This may be just a simple convenience for the client but the inconvenience of going through various sites just to make one or two appointments is too much for a client we presume. So, we have thus confirmed the demand for this site.

We also have found that there is no such website like the one we wish to build in our country. So, there is less competition as of now and we can be the first ones to bring this to market. For now, the scope of this project is confined to small organizations but as time will go by, we hope that various other organizations will come to recognize the value of this site and we will be able to expand. We have very high hopes for this project and have plans to expand the site internationally in the future. Which Makes our system different then other platforms currently available.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

A Work Breakdown Structure (WBS) is a hierarchical outline of the tasks required to complete a project.[2] WBS is a tool used in project management that helps in breaking down a complex project into smaller manageable and achievable activities or processes. E-appointment system have processes/Activities like Concept, Design, Development, Maintaining and Closing. Those process are further broken into smaller tasks and sub task. Detailed sitemap, Project Timeline, Risk Analysis Cost Estimation are the sub task of Requirement Analysis. Design Process have two sub-task Development Oriented Model and System Design. In development oriented model we break down our task on class diagram, use case diagram and UML design. For the system design we have task like rich picture, flow chart, and system architecture. Frontend and backend are the two process of development the project. User Acceptance four tasks System Testing, Bug Reports, Bug Fixes and client feedback. Review Deployment Deliverable, Documentation Formalities, Finalize Changes and Deploy Final Product tasks are under Deployment Process which is the activity of Closing. The goal of this WBS is to make a large project manageable. In OS-IT Solutions we follow this top-down approach as WBS.

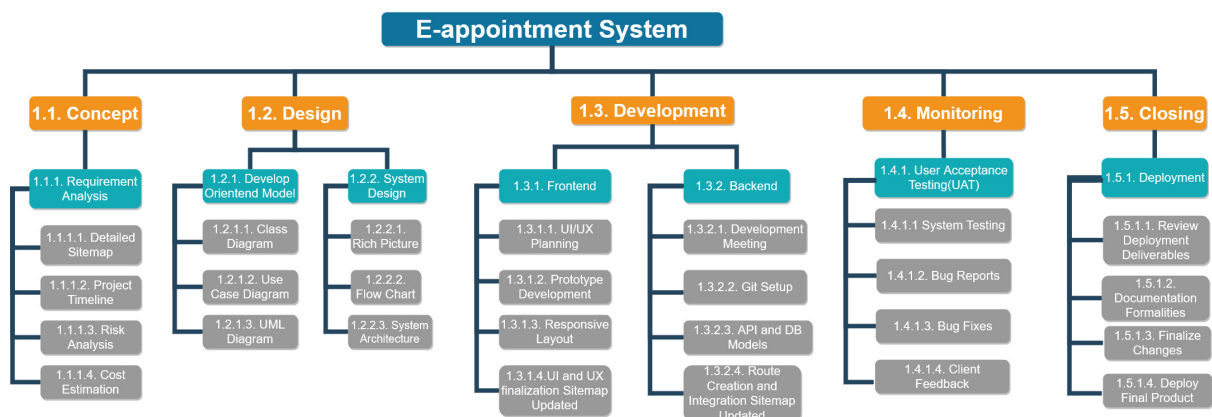


Figure 3.1: WBS of E-Appointment System

3.2 Process/Activity wise Time Distribution

Process/Activity wise time distribution is widely used by project managers and practitioners as the probabilistic form of the Critical Path Method (CPM). The critical path method is a technique that allows one to identify tasks that are necessary for project completion. The major problem faces by the project manager and the developers in correctly designing an application is time management. A critical path in project management is the longest sequence of activities that must be finished on time for the entire project to be complete. Any delays in critical tasks will delay the rest of the project. Critical Path Method provide significant role in project management. CPM calculates the longest path of planned activities to logical end points or to the end of the project, and the earliest and latest that each activity can start and finish without making the project longer. This process determines which activities are critical.

Task	Days
Requirement Analysis	5
Design layout	10
Development	30
User Acceptance Testing	7
Deployment	8
Total	60

Table 3.1: Process/Activity wise Time Distribution

Here, we need 5 working days for requirement analysis, 10 days for design layout, 30 days for development, 7 days for user acceptance and testing and 8 days for deployment. A Total 60 days for developing e-appointment system.

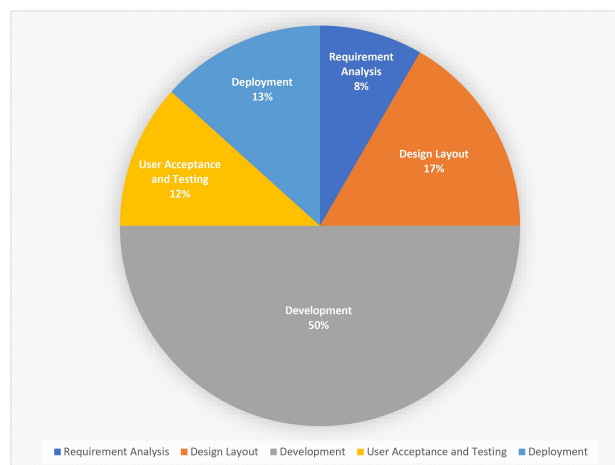


Figure 3.2: Process/Activity wise Time Distribution Chart

In this chart above process/Activity percentage wise time distribution are shown.

- Requirement Analysis: Gathering requirements is a crucial task before the onset of any project. If the requirements are not properly gathered and analyzed, it can lead to project failure. Similarly for “E-Appointment Solutions”. We dedicated 8% of the entire work to Requirement Analysis
- Design Layout: The need for a good Design Layout is key. The main user of will be all types of users. Therefore, the design of this system should be intuitive so that the user can easily understand what each component of the system is doing. We allocated 17% of the entire workload for this.
- Development: The most crucial part of any system is the development. If it is not developed properly, it will be received poorly by its users. From designing a good and responsive system to making it fast, reliable and bugs fixed is very important. For this phase, we allocated 50% of the entire workload.
- User Acceptance Testing: After everything is developed, some revisions must be done to the system to check for any underlying bugs before it is handed over to the client. Some documentation also needed to be done. About 12% of the workload was allocated to this phase.
- Deployment: At the very end we have Deployment. After checking everything, the system is hosted on the client’s domain and handed over to them. Some training is also given to 13% was allocated to this phase.

Below is the table of entire activity wise resource allocation for “E-Appointment System”:

Below is the critical path Method of E-appointment System.

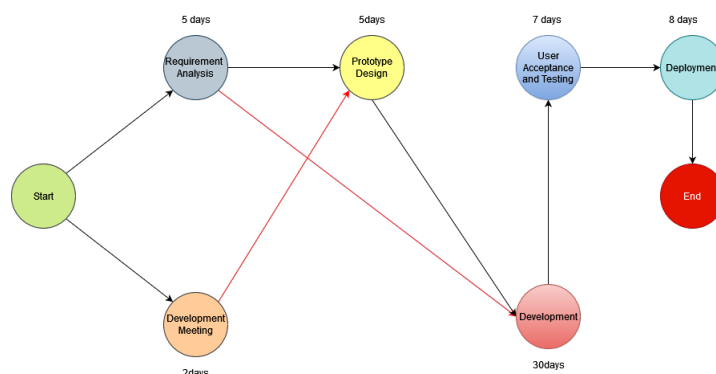


Figure 3.3: Critical Path Method for E-Appointment System

In this diagram, Requirement Analysis, Development Meeting, Prototype Design, Development, User Acceptance and Testing and Deployment are the activities where Prototype Design and Development have critical path drag (red arrow). Activities that are off the critical path delaying completion of the project, those on the critical path will usually have critical path drag, i.e., they delay project completion. For developing the e-appointment system prototype design and requirement analysis can changes as per client request. Which can cause delay of submitting the project.

3.3 Gantt Chart

A Gantt chart, commonly used in project management, is one of the most popular and useful ways of showing activities (tasks or events) displayed against time. On the left of the chart is a list of the activities and along the top is a suitable time scale. Each activity is represented by a bar; the position and length of the bar reflects the start date, duration, and end date of the activity. With the help of Gantt Chart, we can keep track of the progress of the project. Also, it helps us to focus and keep maintain our commitment which goes with the methodology we use. Below is the monthly view and weekly view of our project management and details project management.

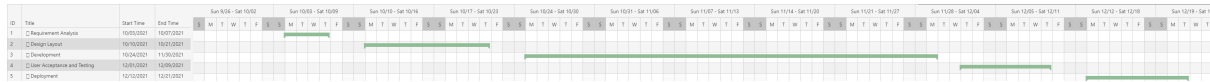


Figure 3.4: Weekly View

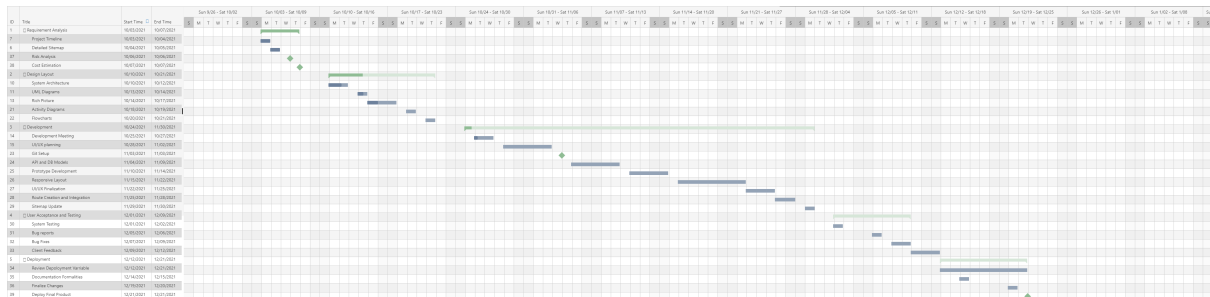


Figure 3.5: Details Weekly View

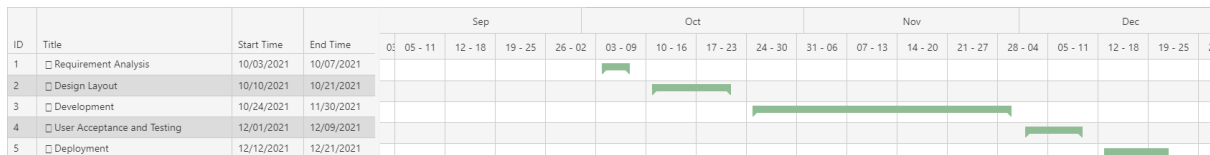


Figure 3.6: Monthly View

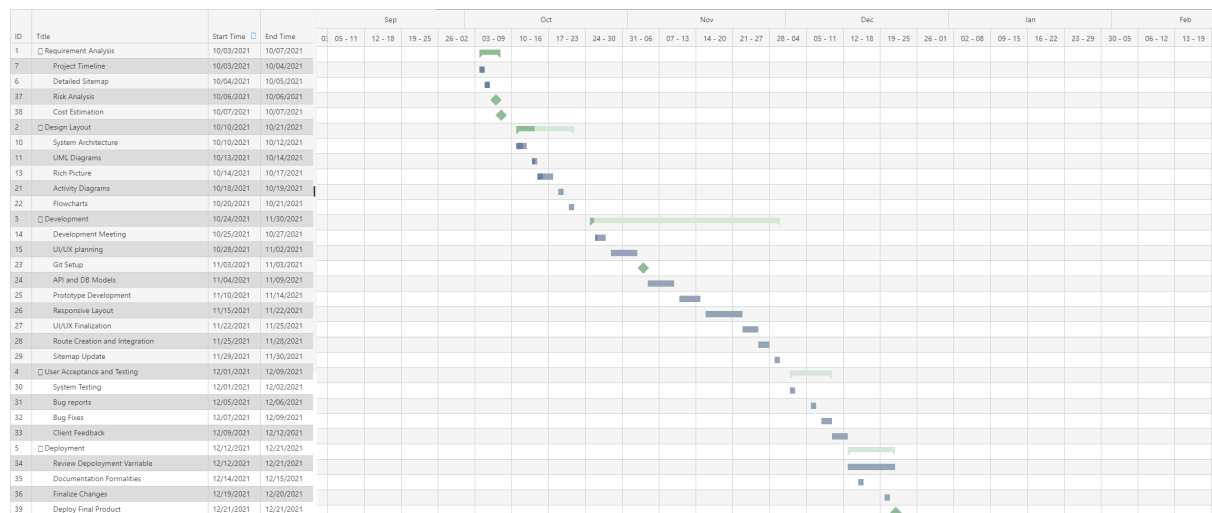


Figure 3.7: Details Monthly View

3.4 Process/Activity wise Resource Allocation

Resource allocation is the process of assigning assets in a manner that supports team's goals. Having the right resource at the right time is critical to project success. The table is shown the staffs who are assigned for this project.

Serial No.	Position	Input(months)
1	Project Manager	2
2	Business Analyst	0.5
3	Database Designer	0.5
4	Sr. Developer	1
5	Developer	2
6	UX designer	0.5
7	UI designer	0.5
8	QA Expert	0.5
9	System Administrator	0.5

Table 3.2: Process/Activity wise Resource Allocation table

3.5 Estimated Costing

The estimated costing of “E-Appointment System” is associated with multiple of services. The development of the project before handover to the client the estimated costing is around Three hundred and twenty thousand BDT. An approximate of cost of the system is given below. It can be expanded on the changes in the software and keeps up fetched.

Serial No.	Position	Staff Month Rate	Input(months)	Sub Cost(BDT)
1	Project Manager	50,000	2	100,000
2	Business Analyst	30,000	0.5	15,000
3	Database Designer	30,000	0.5	15,000
4	Sr. Developer	40,000	1	40,000
5	Developer	25,000	2	50,000
6	UX designer	20,000	0.5	10,000
7	UI designer	20,000	0.5	10,000
8	QA Expert	35,000	0.5	17,500
9	System Administrator	30,000	0.5	15,000
Sub Total				2,72,500
Reimbursable Expenses				30,000
Total without VAT				3,02,500
VAT 4.5%				13,612.5
Total with VAT				3,16,112.5

Table 3.3: Estimated Costing Table

Chapter 4

Methodology

The system development life cycle is a project management model that defines the stages involved in bringing a project from inception to completion.[3] There are few stages of software development life cycle. Systems development life cycle phases include requirement analysis, system analysis, system design, development, implementation, integration and testing, and operations and maintenance. SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process. There are various software development life cycle models defined and designed which are followed during the software development process. These models are also referred as Software Development Process Models. Each process model follows a Series of steps unique to its type to ensure success in the process of software development. Following are the most important and popular SDLC models followed in the industry :

- Waterfall Model
- Iterative Model
- Spiral Model
- V-Model
- Big Bang Model
- Agile

Different software developing methods have different characteristics of process to reach completion of a system. Based on the discussion with my project manager and the developers of “OS-IT Solutions Ltd” the E-Appointment System is select Agile Method. Agile process is an iterative approach that prioritize customer satisfaction and customers have direct involvement emulating the software. Agile Method follows the SDLC that includes requirement analysis, design, development, user acceptance and testing. As a result, the approach delivers a partially implemented software and waits for client’s feedback. The aim of Agile Method is to allow organization to be active in terms of delivering the product quickly to the customers. Agile approach is a combination of group of methods. One of the key reasons why OS-IT solutions choose agile method for the E-appointment System is

that agile approach is able to identify and respond to changes more quickly than using a traditional approach. Agile was the first choice because agile process requires less planning, and it divides the tasks into small increments. Following the reason, it allows us to make necessary changes according to the client's. Agile development methods break a problem into smaller tasks. It provides modularity to the system. It decomposes the complete system into manageable modules. Which plays an important role in software development. Following is the agile manifesto and the principles which matches our company's vision and goal for the proposed system.[4]

Agile Manifesto


We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

While there is value in the items on the right, we **value the items on the left more**.

The 12 Principles of Agile

- 1 Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- 2 Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- 3 Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- 4 Business people and developers must work together daily throughout the project.
- 5 Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- 6 The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- 7 Working software is the primary measure of progress.
- 8 Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- 9 Continuous attention to technical excellence and good design enhances agility.
- 10 Simplicity – the art of maximizing the amount of work not done – is essential.
- 11 The best architectures, requirements, and designs emerge from self-organizing teams.
- 12 At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Advancing the principles of Agile  Learn more at AgileAlliance.org

THE MANIFESTO AUTHORS

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Figure 4.1: Agile Mainfesto

For the development of the project as agile manifesto address features such as individuals and interactions over process and tools, working software over comprehensive documentation, customers collaboration over contract negotiation and responding to changes over following a plan developers choose Agile Methodology. For the implementation of Agile Method there are several frameworks such as Extreme Programming, Pair Programming, Scrum, etc. Among several frameworks available in Agile Method, the developers have chosen the Scrum approach for the development of the project. Scrum is the one of the most widely used agile framework. Scrum is a lightweight framework that helps people, teams and organizations generate value through adaptive solutions for

complex problems. Scrum is simple. It is the opposite of a big collection of interwoven mandatory components. Scrum replaces a programmed algorithmic approach with a heuristic one, with respect for people and self-organization to deal with unpredictability and solving complex problems. The below graphic represents Scrum in Action as described by Ken Schwaber and Jeff Sutherland in their book *Software in 30 Days* taking us from planning through software delivery. [5]

SCRUM FRAMEWORK

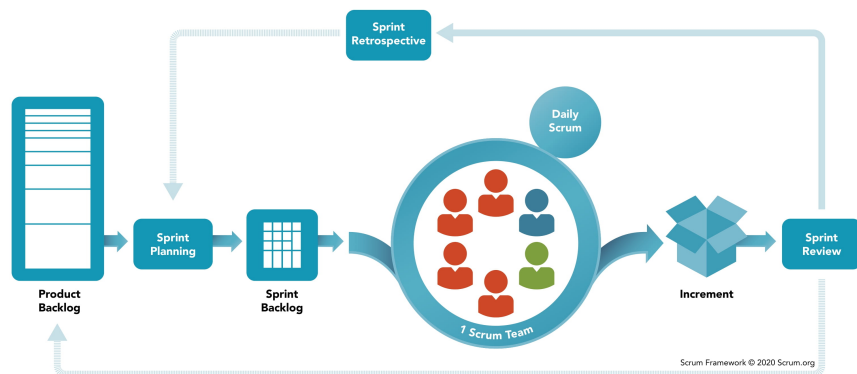


Figure 4.2: Scrum Framework

S

A team's success with Scrum depends on five values: commitment, courage, focus, openness and respect. Bellow is given the five values of Scrum framework.[6]



Figure 4.3: Scrum Values

The five values are decided to adapt to this approach:

- We are constantly encouraged to show courage. To think outside the box, and to try and use new methods of implementation which would help processes become quicker and more efficient.
- We had to focus on the work of the sprint and the goals that helps us to finalize the project. It would help us to develop the system withing the time limit.
- We are strongly Committed to keep the commitment that we want to achieve the goal. Which can reinforce each other over time but they are careful not to over-commit.
- There is a mutual respect amongst everyone in the team. Every decision, suggestion was taken with utmost respect and answered with constructive criticism if needed.
- We consistently seek out new ideas and opportunities to learn.

These five values boosted our strength while developing the project. By focusing and practicing this methodology, it will make possible to eliminate re-occurring error and finish the product in time.

Chapter 5

Body of the Project

5.1 Work Description

‘E-Appointment System’ is a web-based application that serves as an online scheduling platform for any organization who are looking for a solution of the appointment booking process. We digitized the appointment booking process in an easy, faster, and smooth way. By using this system organizations can manage their staff’s scheduling, meeting in a systematic way. On the other hand, people who need an appointment can use this system to get their appointment in a fastest and hassle-free way. Users can easily get to know about the scheduled date and time of their desired officers or staff and make their appointment.

This system consists of different modules. These are-

1. Registration and Login: First of all, there is the registration page. People have to sign-up to the system before they can use it. In the registration page, user has to input the usual information required to register, i.e. email address, a unique password, a username. After Successfully register People need to login to use the system.
2. Searching Staff: Where user can search the staffs of the organization by filtering name, designation with available schedule date and time.
3. Update Profile: Where User and staff can update their Profile, change their password.
4. Appointment Booking: For Appointment Booking user can book an appointment, staff can accept or reject the booked appointment.
5. Managing Staff: Admin can add staff, remove staff, make view records and maintain the whole system.

For this system, I worked on both the front-end and back-end. It consisted of fetching, storing, updating, and deleting data to and from the database, along with uploading media such as images to the server, and updating the front-end in regard to state and data change. I was also assigned to make the system responds with a mobile-first approach.

5.2 System Analysis

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components.

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. [7]

5.2.1 Six Element Analysis

Process	System Roles					
	Human	Non-Computer Hardware	Computing Hardware	Software	Database	Communication and Network
Landing Page	User, Staff, Admin	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Sign-Up	Users: Users signup for the system Admins are preregistered to the system	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Sign-In	Users, Admin: Users and admin need to login the system before they can use it	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Add Staff	Admin	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
View Appointment History	Staff/User	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
View Report	Staff/Admin	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Staff Search	Users	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Book Appointment	Users	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
View Appointment	Staff/Users	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication
Edit Profile, Delete Profile	Users, Admin: Users and admin may updates their profile information and also when they want to delete their account	Pen and paper, pdf: To keep a track of the requirements and note down bugs	Desktops, Laptops, Smartphones	Web Browsers, VSCode, Postman, Git, Notepad, Discord: To test the system, note-taking, documentation, and collaboration with team	postgresql	WAN/LAN and Email: For work and communication

Table 5.1: Six Element Analysis

5.2.2 Feasibility Analysis

Before the onset of the development of ‘E-Appointment’, a very important preliminary study was done to find out a key outcome, that is, is this project feasible? By conducting a feasibility analysis, it allowed us to create a comprehensive report on what are the strengths, weaknesses, opportunities, and threats for this project.

- **Technical feasibility:** Technically, this project is safe and sound. It does not require any fancy hardware or anything. The system is developed with state-of-the-art web technologies, and because of that, it checks all the system requirements.
- **Legal feasibility:** This system complies with all the laws of cyber-security.
- **Operational feasibility:** With the demand for computers in this pandemic, and also the added shortage of silicon supply, the only feasible option for most of the public is getting second-hand hardware. This system will be able to help people connect with the sellers and vice versa.
- **Economic feasibility:** This system does not excessive moderation. Also, as this project was developed using open-source technology no additional funding was needed for development.

5.2.3 Problem Solution Analysis

While developing the e-appointment system using established tools and techniques helps us to improve our approach to solving the problems that our team and our organization face. There are four basic steps in solving a problem:

1. Defining the problem.
2. Generating alternatives.
3. Evaluating and selecting alternatives.
4. Implementing solutions.

we had encountered some problems that were halting our progress. But we brainstormed and overcame these issues with those four steps. The major problem was the budget of the software was a problem for the software but later some changes took place and minimized a few functions and workload for the software to meet up with the budget. The client wanted the searching feature to be unique and powerful. They wanted the results to be returned no matter what the user typed granted the search term was relevant to the staff. This was a difficult task which meant the search function must not only go through the title or name of the staff field but also other fields. What we come with was data aggregation. Aggregation helped us get the data from multiple fields of the data model. From that, we could return the result regarding what the user searched. And as a fail-safe, we also added the reporting a post or user functionality that would notify the admin to take action.

5.2.4 Effect and Constraints Analysis

The system lets users search and book an appointment and staff can see the appointment request. But the System lacks the Instant Messaging feature. We are still working on adding this and many more features. Since the current system is a web application, we are also on the early stages of creating mobile application of this

system to make it easier for everyone. It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components.

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.

5.3 System Design

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently. [7]

5.3.1 Rich Picture

Rich picture helps to understand the complexity of the environment in which the development intervention is operating, providing a spatial overview of the situation. Below is the rich picture of our system.

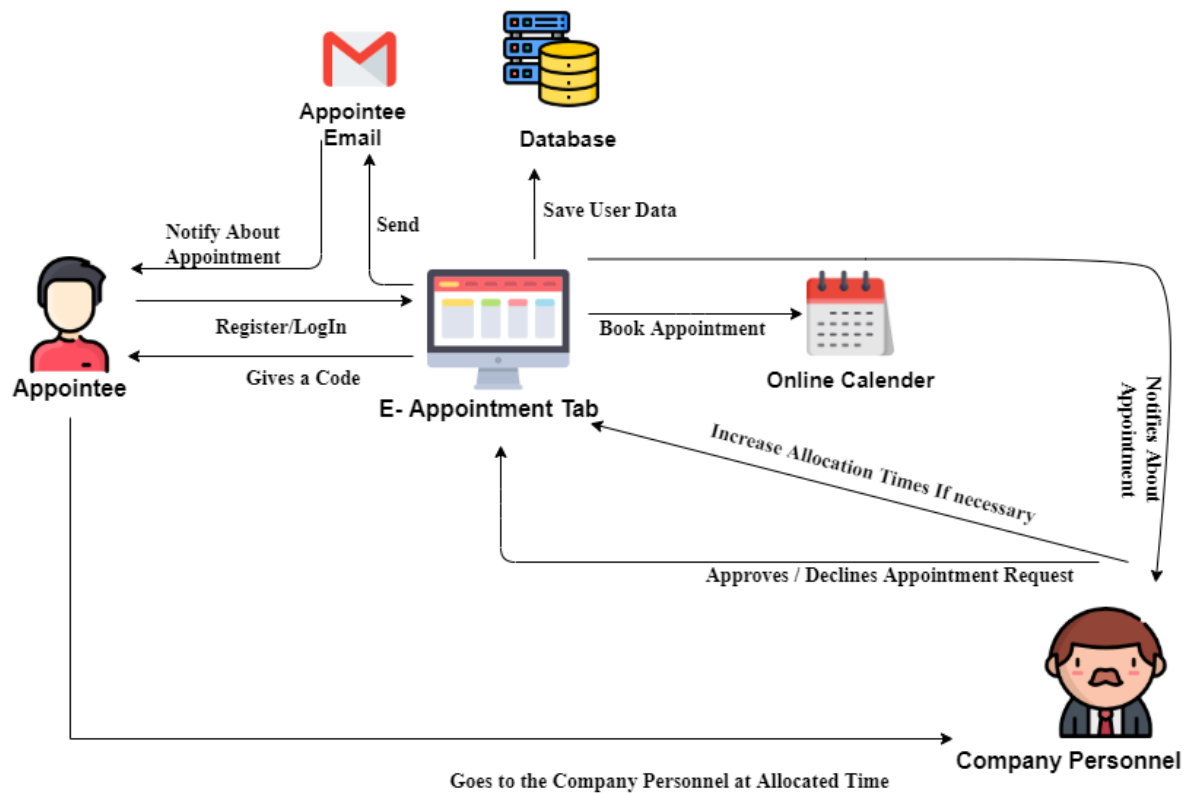


Figure 5.1: Rich Picture

5.3.2 UML Diagrams

Use Case Diagrams A use case diagram is a way to summarize details of a system and the users within that system. It is generally shown as a graphic depiction of interactions among different elements in a system. Use Case diagrams of E-appointment System are given below:

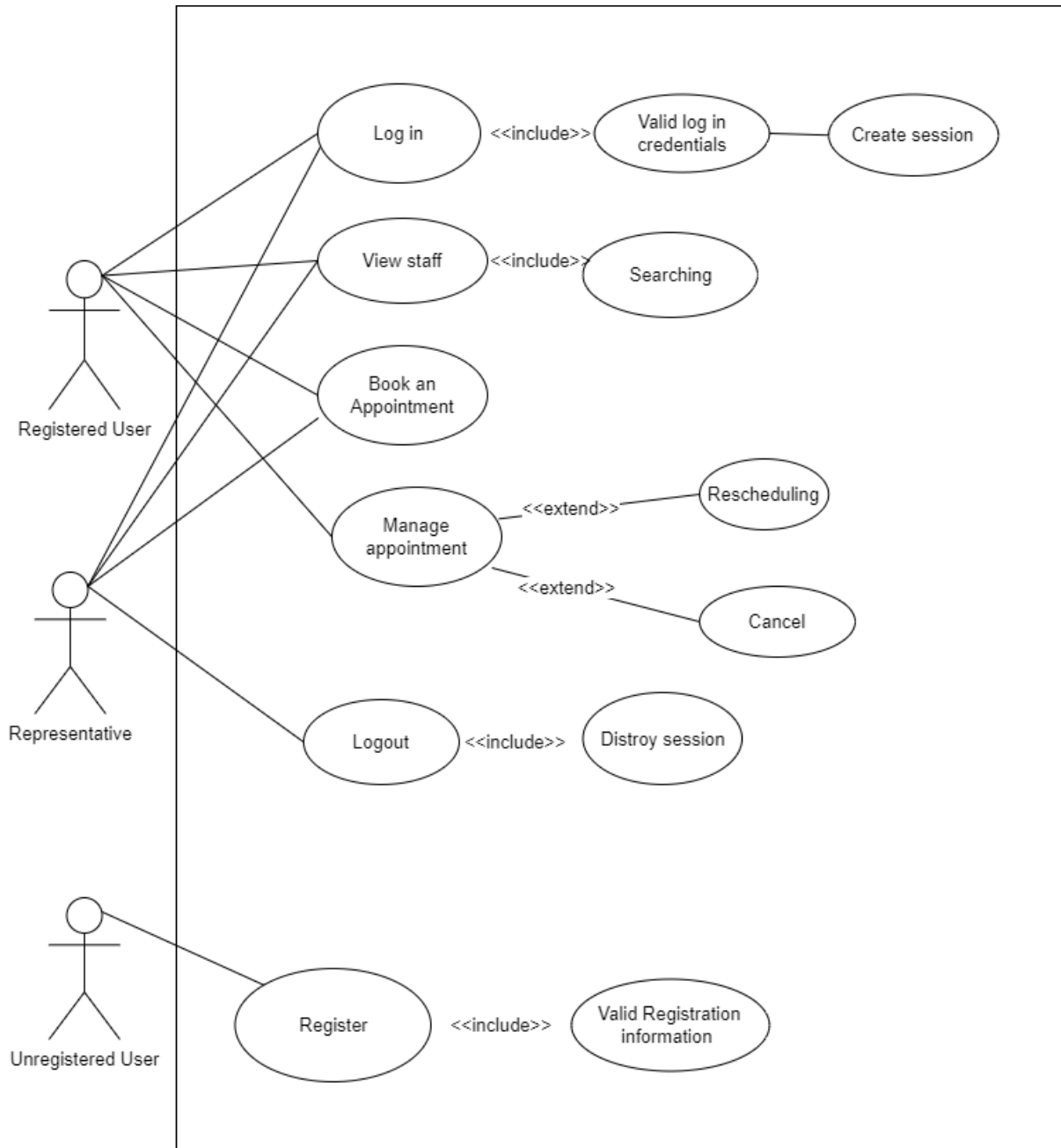


Figure 5.2: Use case Diagram of Users

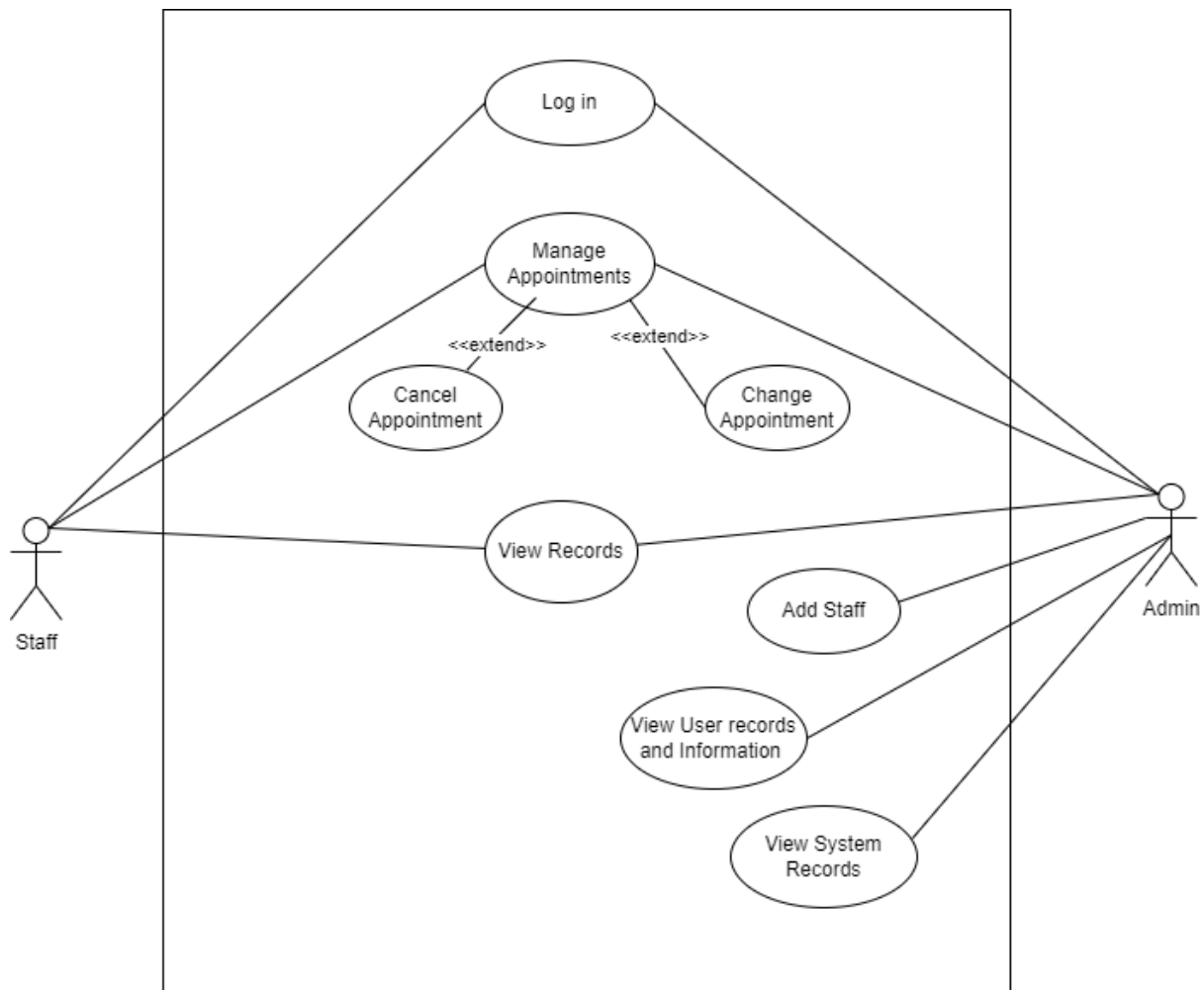


Figure 5.3: Use case Diagram of Admin-Staff

Activity Diagram Activity diagram is another important diagram in UML to describe the dynamic aspects of the system.

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system.

The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all type of flow control by using different elements such as fork, join, etc. [8]

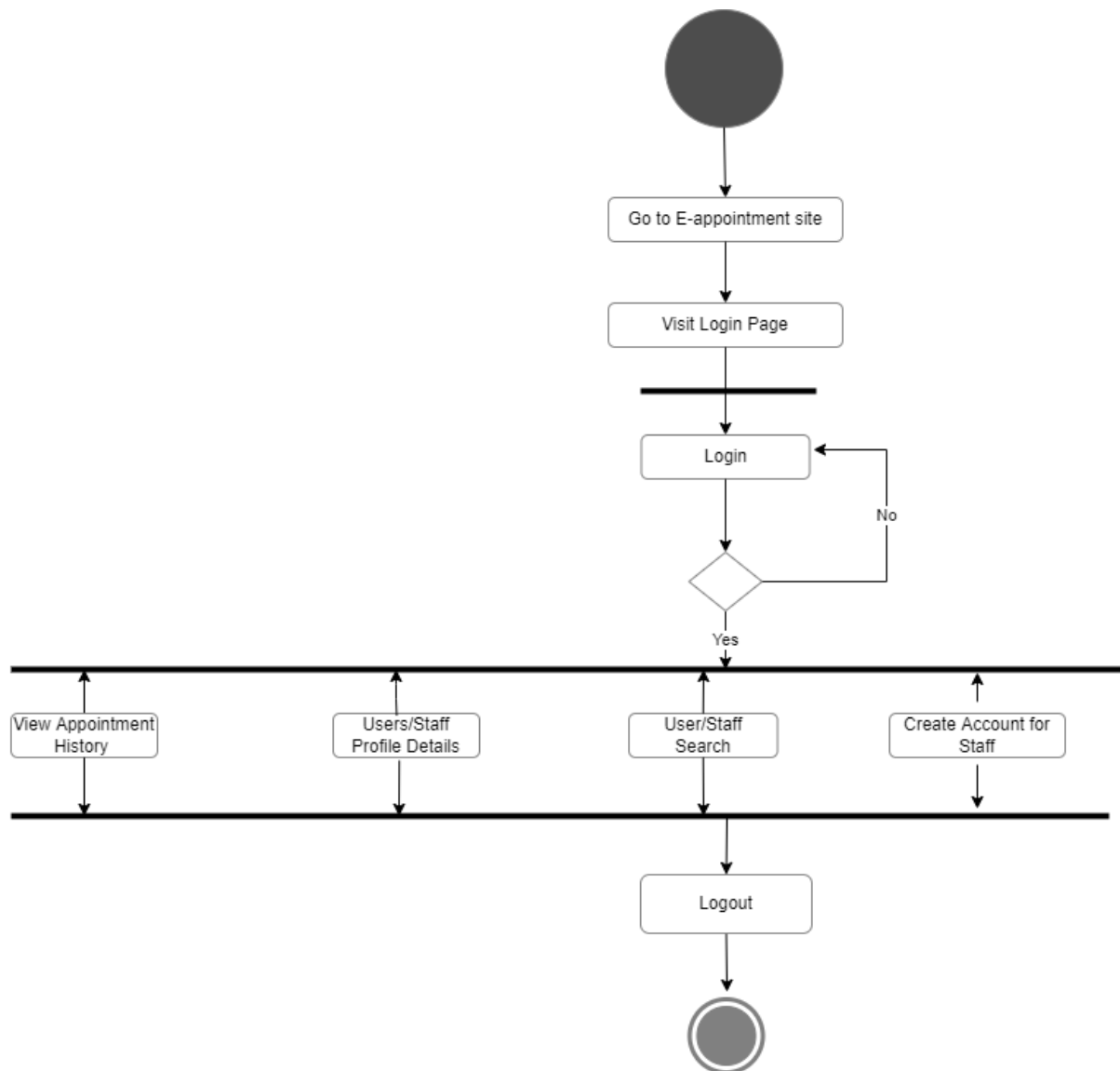


Figure 5.4: Admin activity Diagram

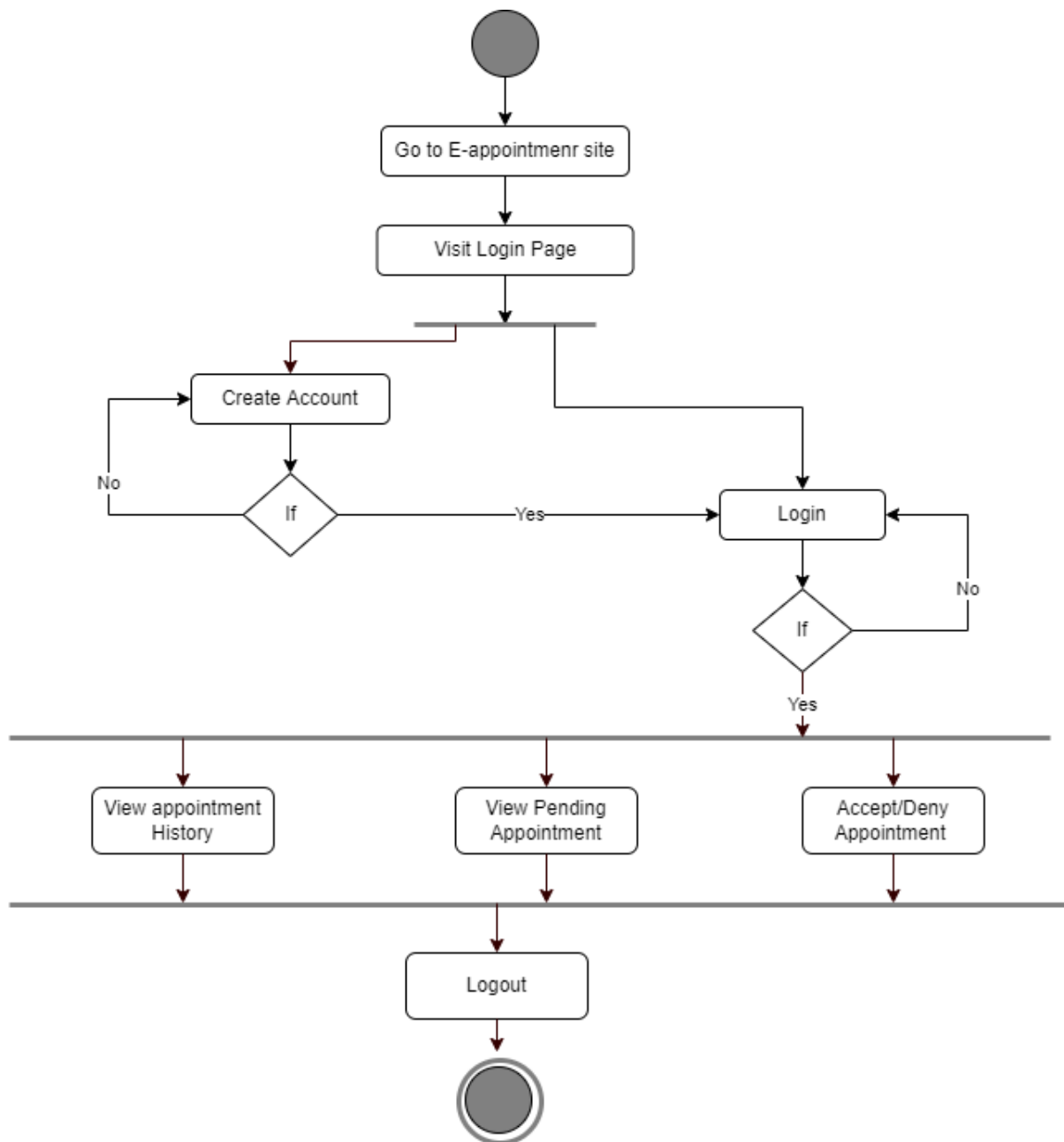


Figure 5.5: Staff activity Diagram

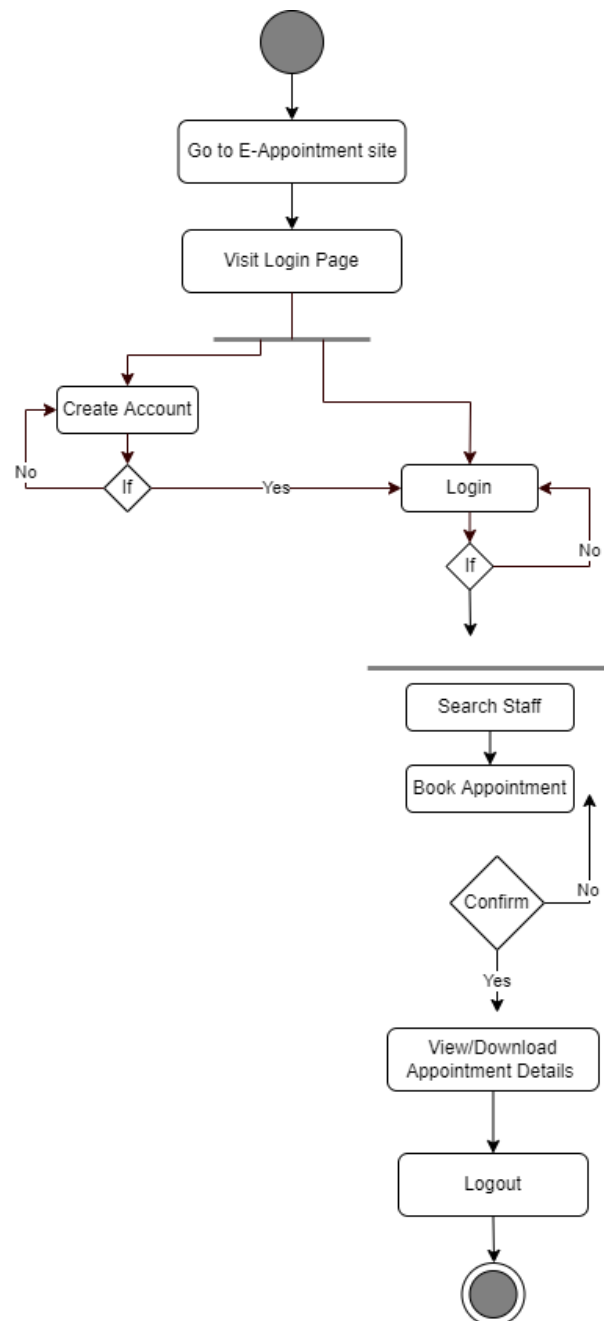


Figure 5.6: User activity Diagram

Class Diagram The class diagram depicts a static view of an application. It represents the types of objects residing in the system and the relationships between them.[9]

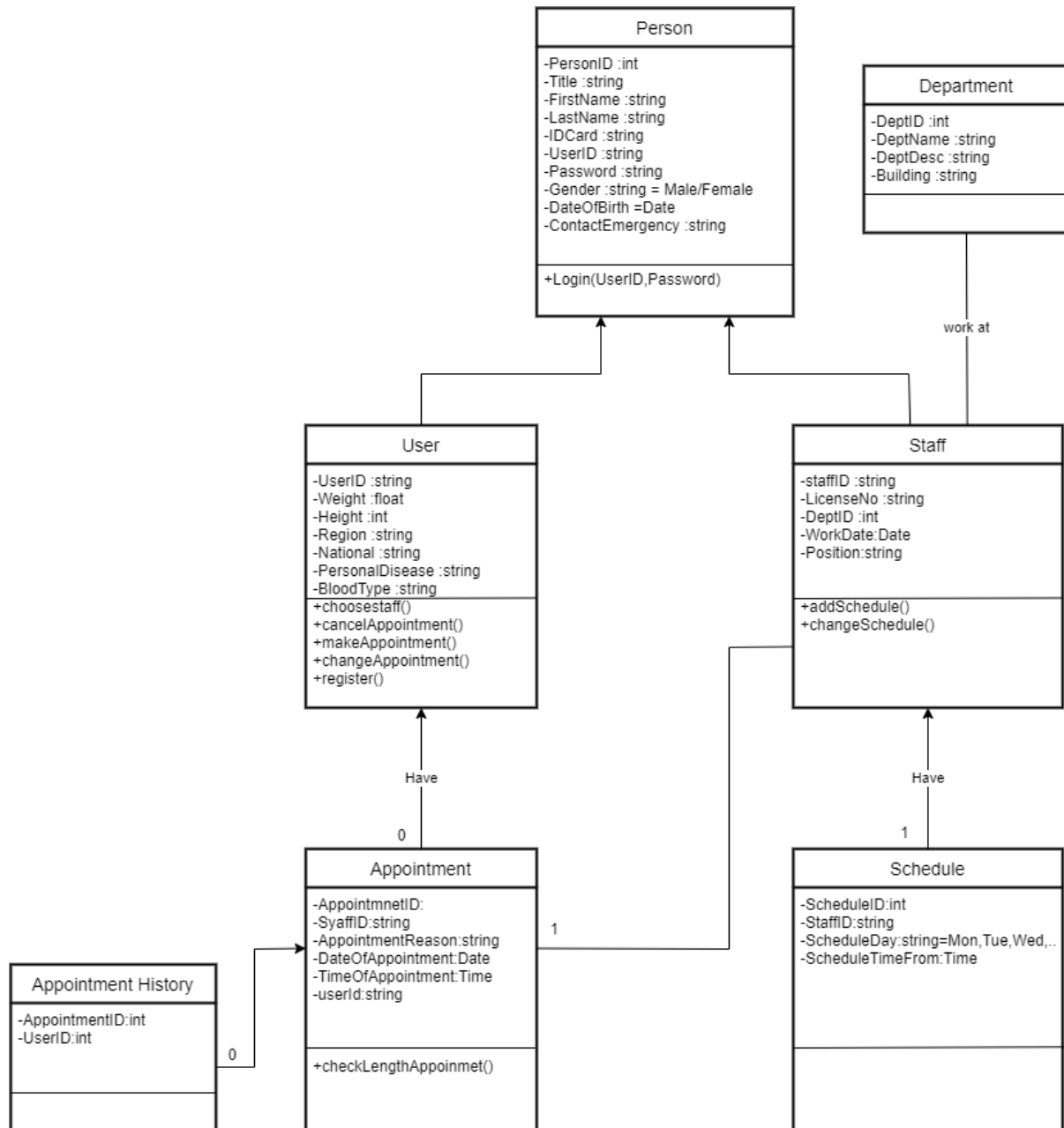


Figure 5.7: Class Diagram

5.3.3 Functional and Non-Functional Requirements

Functional Requirements:E-appointment System has the following functional requirements:

Function: Sign-Up		
Input: Username/ email, password.	Process: Save signup details to database.	Output: New user created and added to database.
Precondition	Must have internet access.	
Postcondition:	User gets confirmation message and gets redirected to login page.	

Table 5.2: Functional Requirement Sign-Up

Function: Sign-In		
Input: User Name, email, Password	Process: Matches with Database User group	Output: Based on user category redirected to their dashboard page
Precondition	Must have internet access.	
Postcondition:	User gets confirmation message and gets redirected to dashboard page	

Table 5.3: Functional Requirement Sign-In

Function: Search Staff		
Input: Input Staff Name or designation.	Process: Search in database and if match shows the list.	Output: Search Result will be shown on the screen
Precondition:	Must have internet access and sign in to the system and sign in to the system.	
Postcondition:	Notification of found result will be given.	

Table 5.4: Functional Requirement Search Staff

Function: Book appointment		
Input: Personal information like phone number, address, age etc.	Process: Save details of the patient in database.	Output: Appointment will be created and staff can approve or deny the request.
Precondition:	Must have internet access and sign in to the system.	
Postcondition:	Get booking confirmation message and able to see it in history section.	

Table 5.5: Functional Requirement Book Appointment

Function: Add Staff		
Input: Input Staff details like name, designation.	Process: Staff information stored in database and generate account.	Output: New Staff will be added to the database.
Precondition:	Only Admin can login and add staff to the system and need to login as admin.	
Postcondition:	Notification of saved result will be given.	

Table 5.6: Functional Requirement Add Staff

Function:Reset password		
Input: User email address and new password.	Process: Replace old password with new one.	Output: New password will be updated and added to database
Precondition:	Only Admin can login and add staff to the system and need to login as admin.	
Postcondition:	User will get notification of password reset successfully.	

Table 5.7: Functional Requirement Reset Password

Non-Functional Requirements: The system will have the following non-functional system requirements:

- The system will be very secure as only authorized users is allowed access to the system
- The system will be fast providing users with utmost performance
- The system will be intuitive so that users can easily navigate through the system
- The system will be responsive and follow the mobile first approach
- The system will be very reliable with almost zero downtime unless maintenance take place

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently.[7]

5.4 Product Features

5.4.1 Input

Inputs of E-appointment System	
Process	Fields type
Sign-up	Name - string Email - string Password - string Phone - integer Date of Birth - string Address - string
Sign-In	Email- string Password- string
Search	Department- string Staff Name - string
Book Appointment	Appointment Date - Date & Time Time - Date & Time
Confirm Appointment	Confirm/Deny- Boolean

Table 5.8: Input for E-Appointment System

5.4.2 Output

Outputs of E-appointment System	
Process	Fields type
Sign-up	On success- Show success message \Registration successfully done!". On failure- Show error message \Registration not done!".
Sign-In	On success- Redirect to user dashboard. On failure- Show error message \Please enter correct id or password".
Search	On success- Show specific profile. On failure- Show error message \Staff not found!".
Book Appointment	On success- Show success message \Appointment booked successfully!". Wait for Approval. On failure- Show error message \Appointment not done!".
Confirm Appointment	On success- Show success message \Appointment Confirmed!". On failure- Show error message \Appointment Rejected!".

Table 5.9: Output for E-Appointment System

5.4.3 Architecture

Architecture serves as a blueprint for a system. It provides an abstraction to manage the system complexity and establish a communication and coordination mechanism among components. 'E-Appointment' somewhat follows a three tier architecture much like the MVT(Model View Templet) model. Our E-appointment solutions are made up of two primary components:

Client-side: popularly called: the frontend, where the code is written in React.Js with HTML, CSS, JavaScript and stored within the browser. It's where user interaction takes place.

Server-side: also known as the backend, controls the business logic and responds to HTTP requests. The server-side code is written in Python.

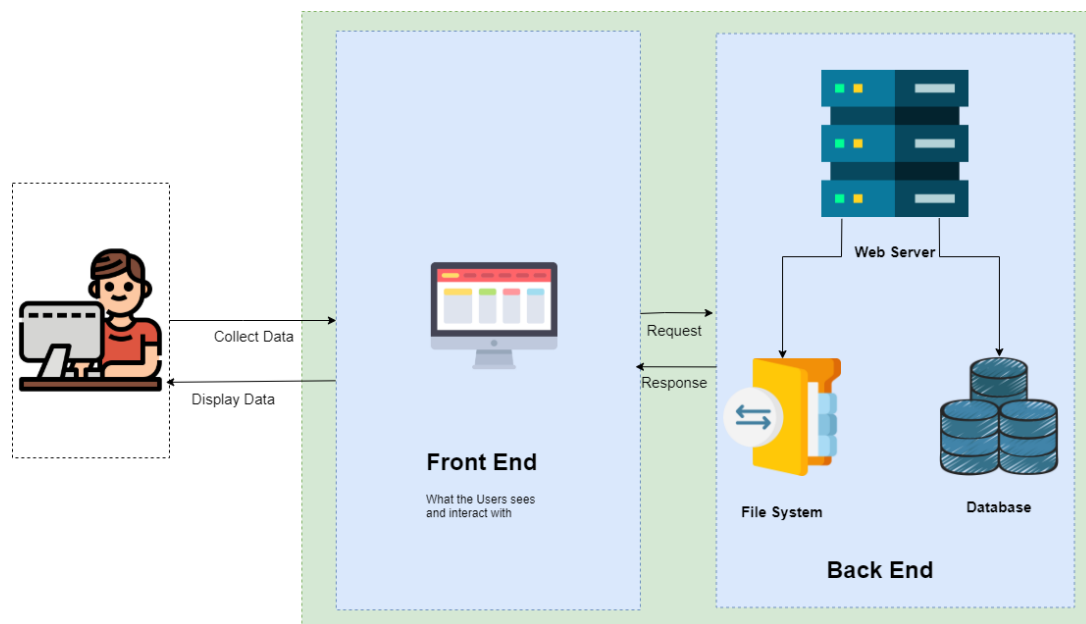


Figure 5.8: Architecture of the system

Here the diagram clearly illustrates that user can only see and interact with the front end of the website, the frontend receives the request or commands from the users and transfer it to the web server, which then retrieves and stores data from the file system and database accordingly and sends it back to the frontend for the users as a response.

Chapter 6

Results & Analysis

The results section should aim to narrate the findings without trying to interpret or evaluate, and also provide a direction to the discussion section of the research paper. The results are reported and reveals the analysis. The analysis section is where the writer describes what was done with the data found. In order to write the analysis section it is important to know what the analysis consisted of, but does not mean data is needed. The analysis should already be performed to write the results section.[10]

While testing the program, there were several issues. This was a minor issue that we were able to resolve. After the resolving of these issues, test cases were documented. Testing methodologies have been used to justify all test cases. We did our testing on a local server.

6.1 Software Testing

Software Testing is a method to check whether the actual software product matches expected requirements and to ensure that software product is Defect free. It involves execution of software/system components using manual or automated tools to evaluate one or more properties of interest. The purpose of software testing is to identify errors, gaps or missing requirements in contrast to actual requirements. The figure below shows the results of tasks that I have worked on. Each of the tasks is only provided if and only if it meets the requirements successfully.

Test ID	Test Case	Description	Steps to be Executed	Expected Result	Actual Result	Pass/Fail
T1	Sign Up	User need to Successfully register in order to book appointment	1. From Navbar users need to go Login page 2.Input all the information. 3.Click on Sign In	Information will be stored in the database and	Information Stores in database	pass
T2	Sign In	User need to Sign in with registered email	1. From Navbar users need to go Login page 2.Input all the information. 3.Click on Sign In	Information will be check in database if found redirect to users dashboard	Information check in database if found redirect to dashboard	pass
T3	verification Email	User Need to verify email in order to book appointment	1.A automatic verification token will send to user account after Sign Up 2.User click on verification button	Information will be stored in the database.	Information Stored in Database.	Pass
T4	Appointment Book	Appointee need to login and then book appointment from appointee dashboard page	1.After Login page User Need to click make appoint button. 2. User Need to select Employee. 3.User need to Select Time and date appointment reason 4.Click Send Request Button	Information will be stored in the database.	Information Stored in Database.	Pass
T5	View Appointment	Both Employee and Appointee can view Appointment	1. User Need to login 2. User need to click view appointment from their dashboard	Information will be fetched from database and show them	Information will be fetched from database and show them	Pass

6.2 Graphical User Interface Result

Software testing determines the safety, accuracy, and quality of new software. Approval refers to the process of verifying that the generated computer software fits the clients' requirements. The main goal of software testing is to find bugs in the program. The figure below shows the results of tasks that I have worked on. Each of the tasks is only provided if and only if it meets the requirements successfully.

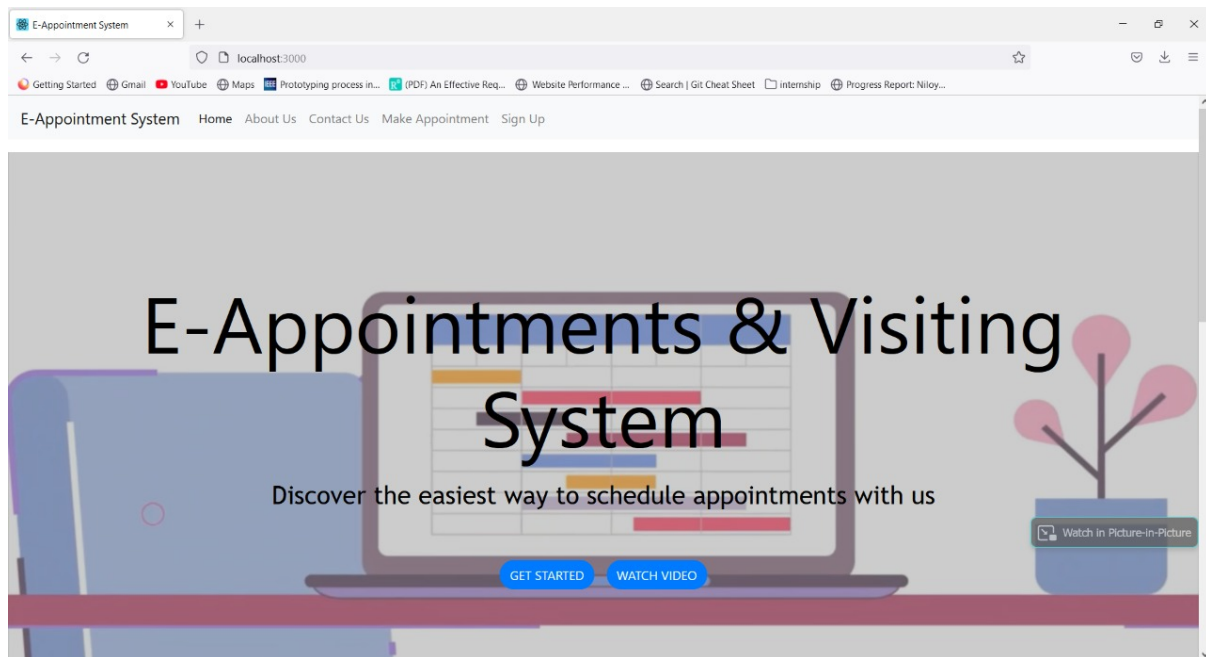


Figure 6.1: E-Appointment Home

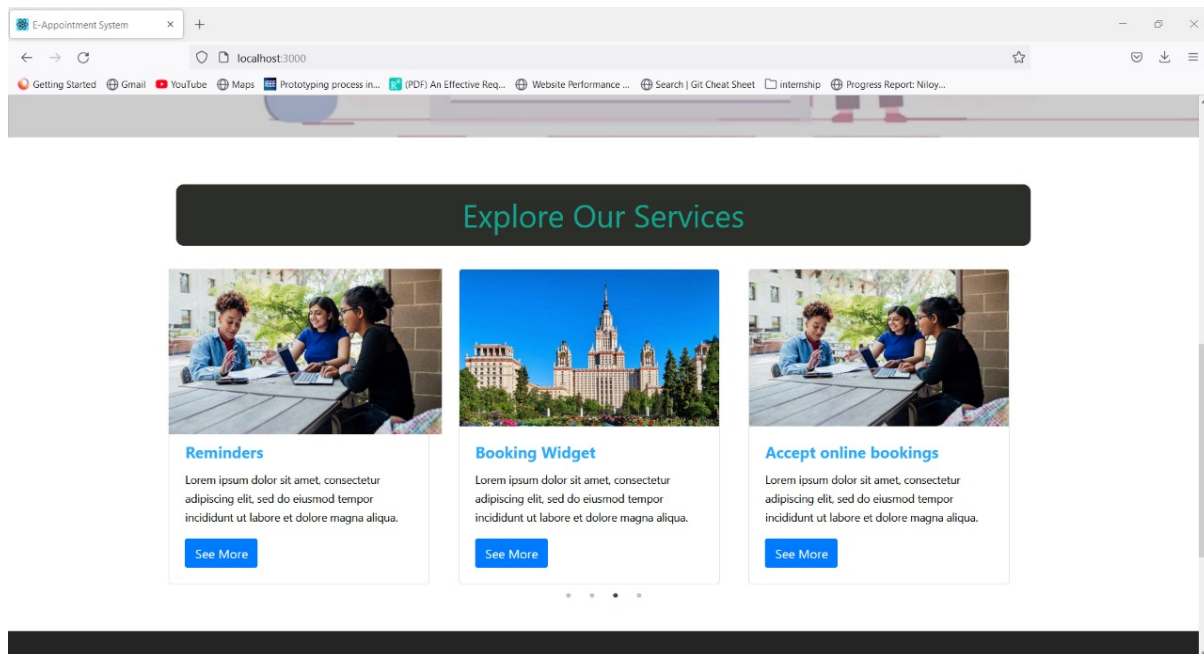


Figure 6.2: E-Appointment Services

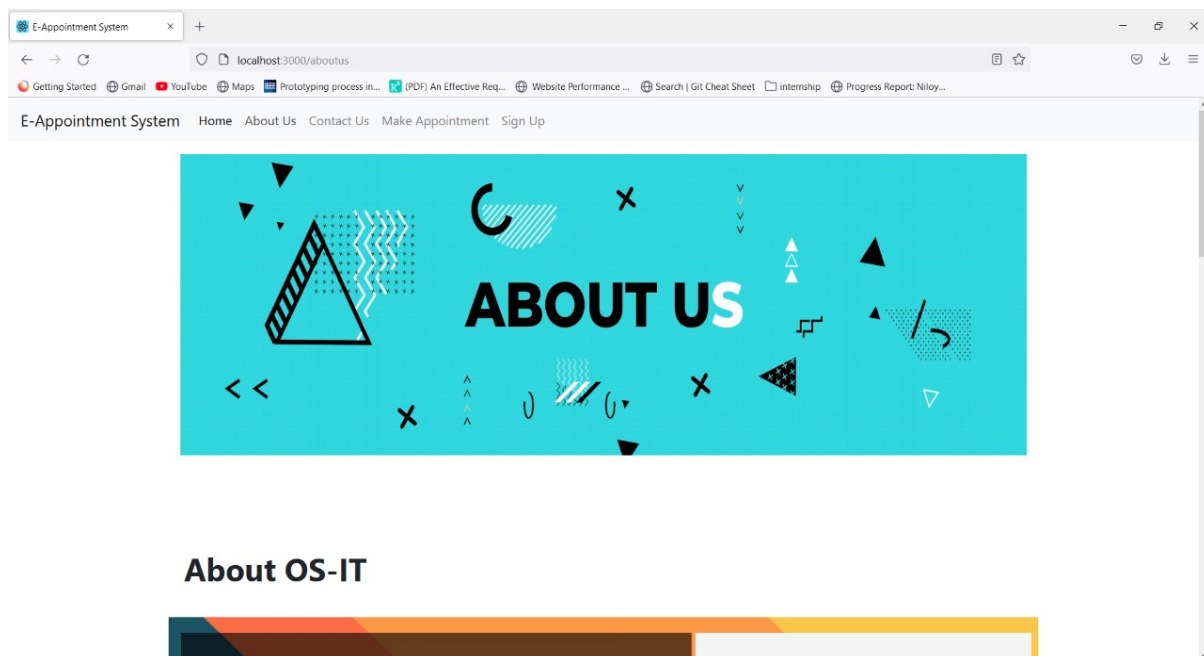


Figure 6.3: About Us page



Figure 6.4: About Us page

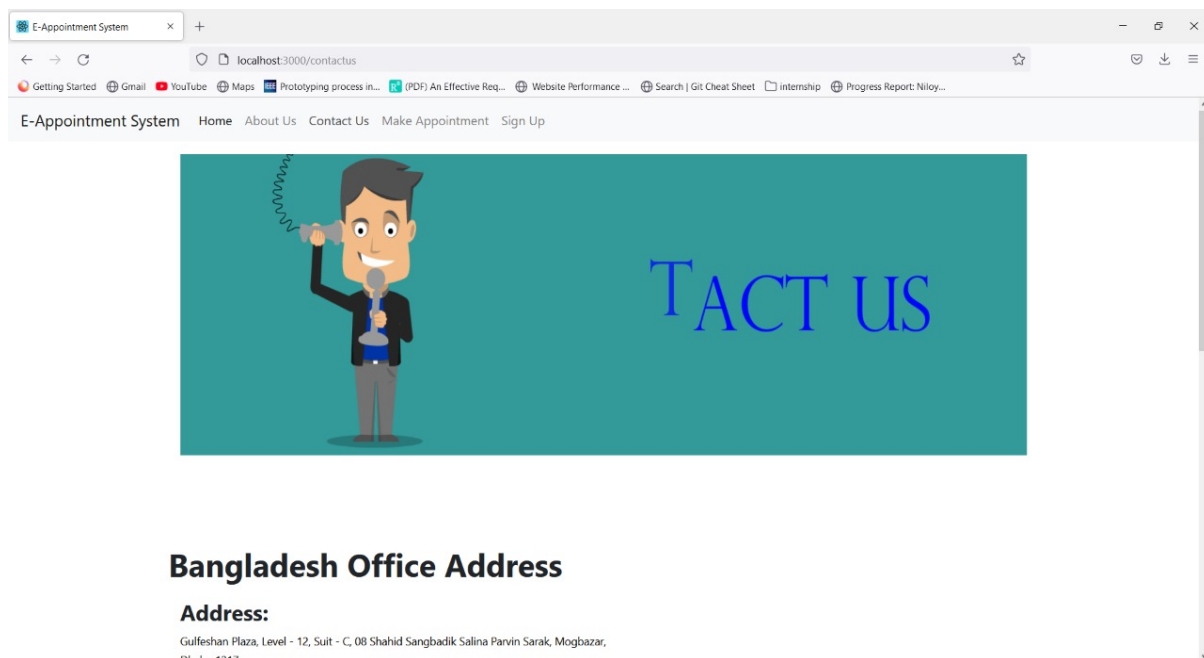


Figure 6.5: Contact Us page

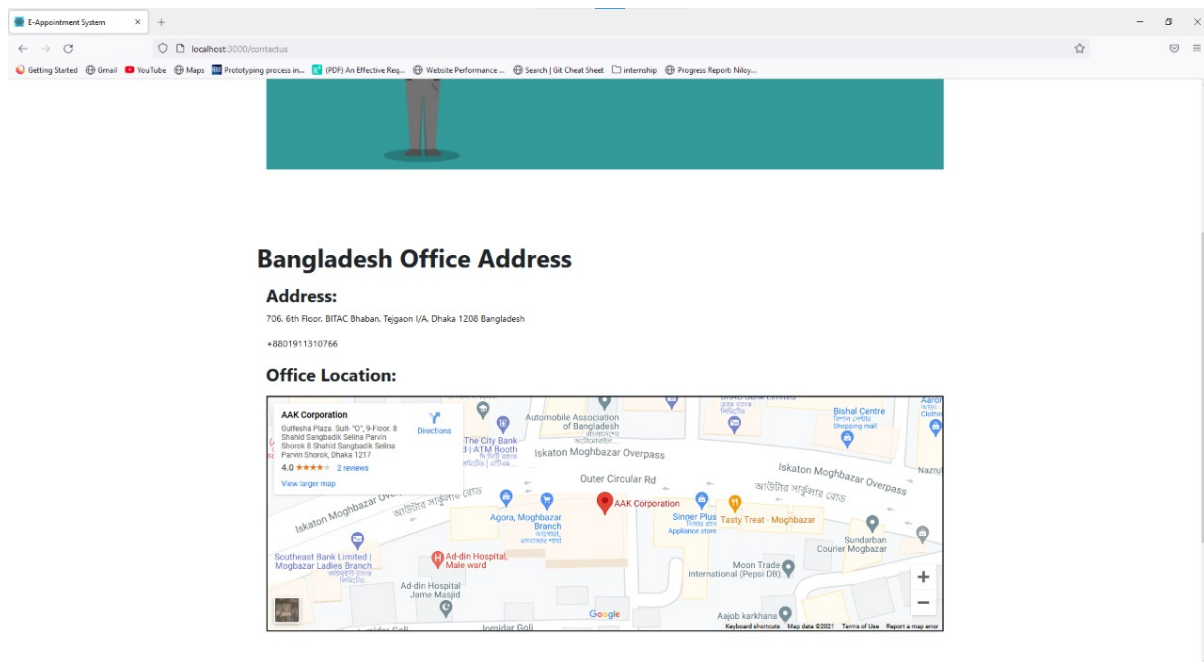


Figure 6.6: Contact Us page

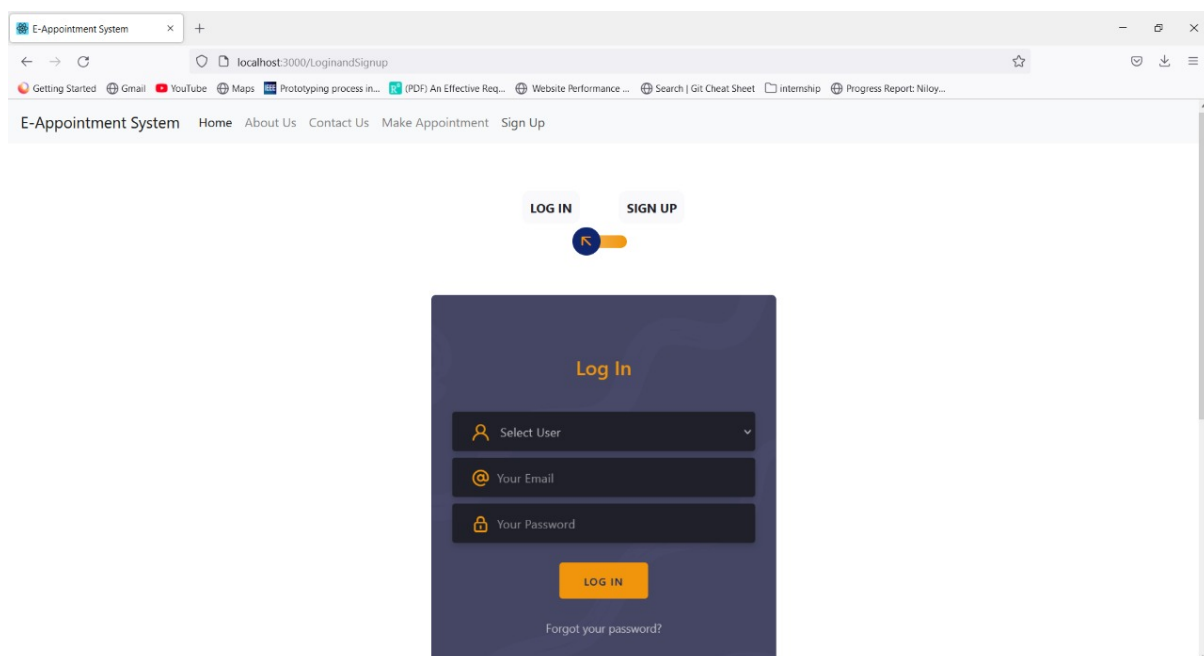


Figure 6.7: E-Appointment Login page

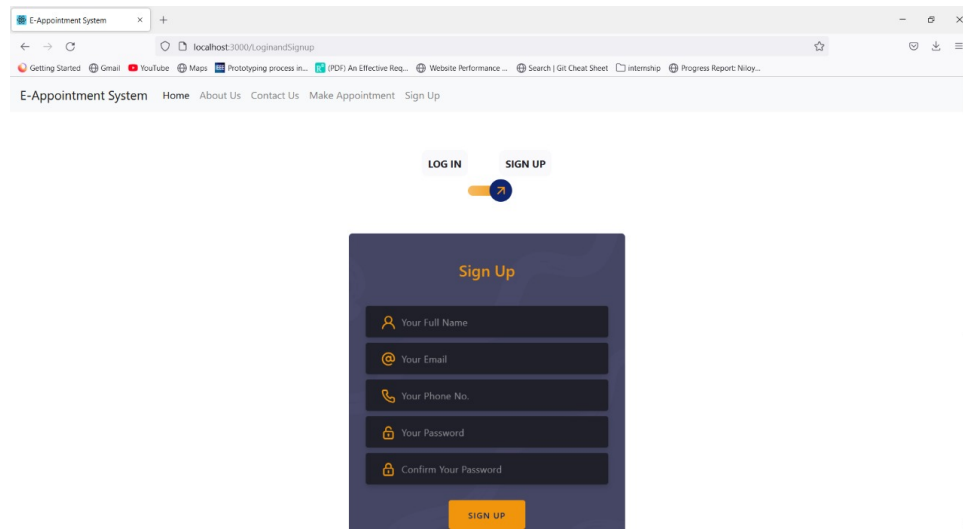


Figure 6.8: E-Appointment Sign up page

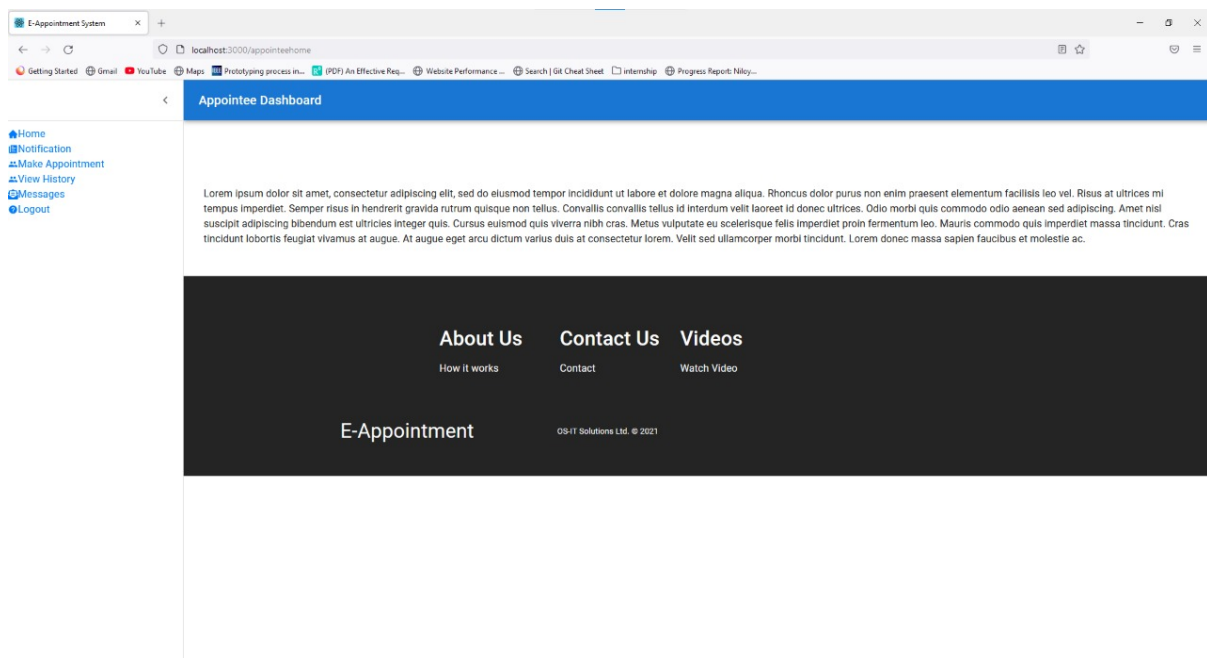


Figure 6.9: E-Appointment Appointee Dashboard page

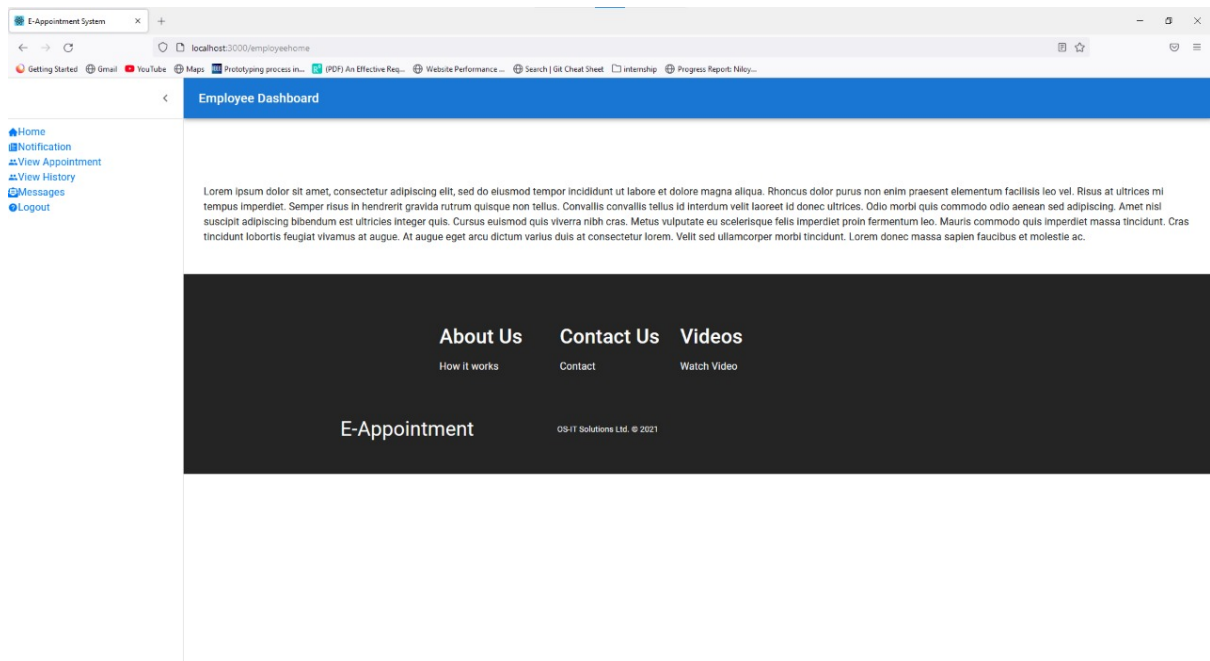


Figure 6.10: E-Appointment Employee Dashboard page

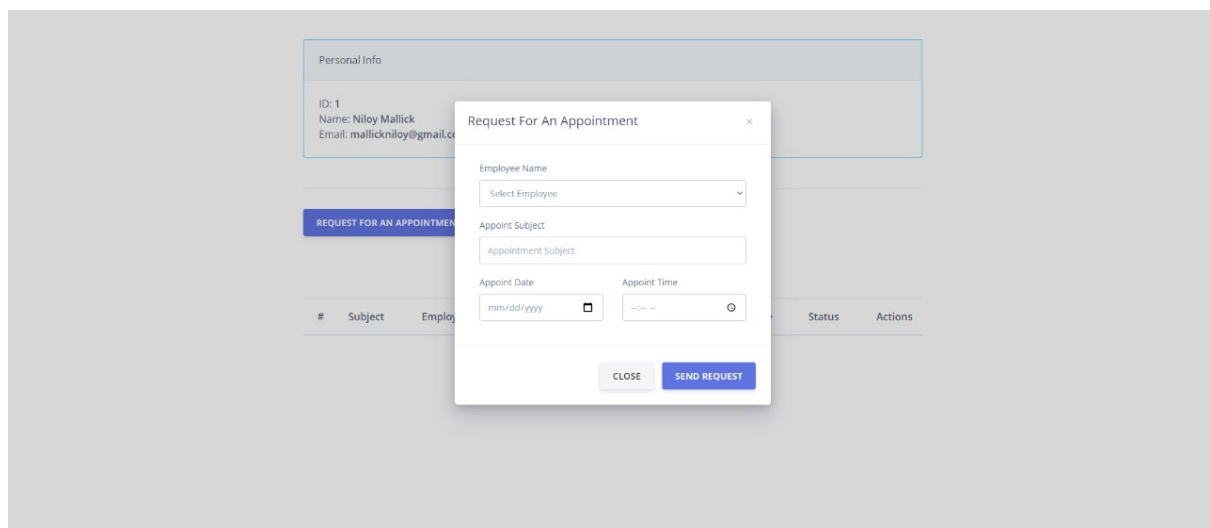


Figure 6.11: E-Appointment Appointee Appointment Book page

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

Engineering problems usually have more than one solution. It is the aim of the engineer to obtain the best solution possible with the resources available. Engineers are professionally responsible for the safety and performance of their designs. The objective is to solve a given problem with the simplest, safest, most efficient design possible, at the lowest cost. Engineering is obviously one of the applied sciences. The specific activities of the engineer cover a wide spectrum. They range from the role of a pure scientist to that of a sales or applications engineer who has more to do with people-oriented subjects such as psychology and economics. [11]

A product can be sustainable in three main categories:

- **Community Sustainability:** After the development and official release of ‘E-Appointment System’, it is predicted that it will create a strong user base and from that will emerge a community of users with mutual likeness.
- **Financial Sustainability:** The system aims to be free to use at the early stages. It will generate revenue from targeted ads. As the majority cost of maintenance of ‘E-Appointment System’ will be consisting of domain hosting and database storage cost, running ads on the system will be able to cover the costs at the beginning.
- **Organizational Sustainability:** It relates to how the organization will continue to operate after the release of the application. After the release of an application, usually the organization maintains the application via its current team, an extended team or by a fresh new team. Also, organizations update their project by adding newer features to it and organization may pivot to other projects, expand the teams, create new teams, etc. ‘E-Appointment System’ has many more features planned to be worked on and released. Since the application has further plans, the project will be maintained and updated after its release as well and release premium services to it. In conclusion, it can be said that the project is

organizationally sustainable.

7.2 Social and Environmental Effects and Analysis

Technology is increasing at a very fast pace. To keep with technology, people are in need of computers. Be it schools, work, home or any other aspect in life. [12]

Social Effect: In the current situation, safety is the top priority for all service providers who wish to reopen once the restrictions are eased. The risk of COVID-19 is likely to persist for a long time, so investing in solutions that can help with managing arrival and customer flows can help businesses & organizations to deliver their services while maintaining a high safety standard. In summary, appointment scheduling is important as it ensures the best use of time, it will also illustrate to others that you value time.

Environmental Effects: The environmental factors investigated include the variability of service times, the probabilities of no-shows and walk-ins, the number of appointments per session, and the cost ratio of the staff's time to users' time. The effects of these factors are evaluated using a near-optimal rule that already adjusts the appointment times to minimize the negative effects of these factors so that their residual or true effects on total cost performance can be isolated

7.3 Addressing Ethics and Ethical Issues

Ethics is rooted in the ancient Greek philosophical inquiry of moral life. It refers to a system of principles which can critically change previous considerations about choices and actions. [13] It is said that ethics is the branch of philosophy which deals with the dynamics of decision making concerning what is right and wrong. Scientific research work, as all human activities, is governed by individual, community and social values. Research ethics involve requirements on daily work, the protection of dignity of subjects and the publication of the information in the research.[14] We, as the developers of 'OS-Its ltd' adhered to all codes of conduct and privacy as we respect user's privacy.

- **No Sharing or Selling of User Data:** The system will not compromise any user data to any one nor will it allow purchasing of any data.
- **Data Security:** Only the owner, admin(s) and lead developer of 'E-appointment' will have access to the database of the system to limit the chances of data compromise.
- **Clean Ads:** The advertisement that will be run on 'E-appointment' will be the ones that are clear and clean. No sort of spam, scam or fussy ads will be allowed on the system. Keeping those add relevant and be specific about the system will managed by under advertising policy.
- **No discrimination Policy:** Apart from certain age restrictions, no one shall be discriminated in 'E-appointment'. It does not discriminate any kind of users based on race, sexuality, gender, religion, color, beliefs, political, be it national or international, birth or status.

Chapter 8

Lesson Learned

My time as an intern at ‘**OS-IT Solutions**’ has been a great eye-opener. I faced multiple challenges which I overcame by brainstorming for a workaround or a solution to those problems.

8.1 Problems Faced During this Period

Apart from all these, I have faced lots of challenges while working on this Project. Some of these are listed below:

- **Work Environment:** I faced some difficulties at work too. I had to be punctual and attend daily meetings. There were rules and regulations that were to be strictly maintained and I had to make sure that I followed them properly. I had to get myself familiar with their work culture in a very short period of time. The concept of a full-stack web application was new to me, and on top of that, I had to learn a completely new library of JavaScript, i.e. ReactJS and for back end python.
- **Worldwide Pandemic of COVID-19:** Even though almost two year had gone by for the pandemic, the norms were still very disruptive during daily procedures. Due to the lockdown almost, every member had been working from home and therefore many aspects lacked communication in the beginning however with routine changes and different protocols being set like regular meetings, pair programming and issue reporting, we got into a new normal to work in with which we picked up our productivity gradually.
- **Adapting to New Technologies:** Since this was the first time, I have ever worked on a web application in an office environment I had to learn and adapt to new technologies of the company. Although acquiring the skill set was possible it became hard to apply them in real life situations.
- **Identifying and Fixing Bugs:** Often there were bugs which were very hard to find, and even after they have been found it became a big problem to fix it. There were bugs that were so difficult to deal with that it would take a whole week to fix it.

8.2 Solution of those Problems

The last 4 years as an undergraduate student has taught me valuable lessons. which helped me to find most of the solutions of this problem. Solution for those problems are listed below:

- **Work Environment:** From the university lessons, I learned the crucial ability of time management. Because of this, I was able to adjust appropriate time for myself so that I can meet the strict deadlines and also study for my other courses as well as work on “E-Appointment System”.
- **Worldwide Pandemic of COVID-19:** As a solution to the lack of interaction within team members, we have been working on Discord servers and google meet during this period. We learned to do pair programming while sharing the screen.
- **Adapting to New Technologies:** In the beginning it was a difficulty situation for me to adopt with new technologies. But after some days I habituate with the entire process by the help of my supervisor and support of web developer team.
- **Identifying and Fixing Bugs:** Most of the time I take help from online platform ”Stackoverflow” and a senior developer helped me to fixed some issues. I issue that i cannot solve was fixed by another approach, for that i had to rewrite my code.

Chapter 9

Future Work & Conclusion

9.1 Future Works

The ‘E-appointment system’ is still under development. Some Features still need to be polished before it can be developed. ‘E-Appointment system’ is the first version of the system. It has many sides for improvement. Some of them are:

- In future E-Appointment System will be with visiting system management.
- A Mobile App Version of this project.
- Add Virtual meeting system.
- Add live chat system.
- Improve the existing system.

9.2 Conclusion

One of the prime reason that online scheduling is gaining popularity in recent days is that, the system provide an easier facilities to the general users. This paper has proposed an online scheduling system built on the web service architecture. The web service architecture would provide an appropriate paradigm for developing this scheduling and visitor management system. This system integers technology of Django and react. This system is design to achieved maximum user satisfaction. I got a first-hand experience of what it is like to work in a professional environment. I learned state of the art technology in web development like Django and React. I always had an interest in becoming a full-stack engineer. Working on such an exciting project like ‘E-Appointment’ boosted my self-confidence. I always had an interest in becoming a full-stack engineer. Working on such an exciting project like ‘E-Appointment’ boosted my self-confidence. I also learned how to collaborate with other software engineers, and consequently improved my inter-personal skills such as communication, teamwork, flexibility, working calmly under pressure and how to maintain a rapport with my co-workers. I am very grateful for an experience like this. I feel like working and applying my skills in actual development is really rewarding and self-satisfying.

The system was developed following the aims and objectives stated in the initial proposal. Though it had been a challenging process, the 'E-appointment system' has been furnished with the notion of meeting the client requirement. In conclusion, I would like to thank both my supervisors whose guidance and encouragement persuaded me to strive for the success in this project and for the endless project to come in my way in future.

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