An Undergraduate Internship/Project on E-Appointment System

By

Niloy Mallick

Student ID: **1731151**

Autumn, 2021

Supervisor:

Ms. Moumita Asad

Lecturer

Department of Computer Science & Engineering

Independent University, Bangladesh

December 6, 2021

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

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

*** Write about the originality of your work ***

Signature

Date

Write Your Name Here

Name

Acknowledgement

*** Write Acknowledgement ***

Letter of Transmittal

*** Write a Letter of Transmittal ***

Evaluation Committee

.....

Signature

.....

Name

.....

Supervisor

.....

Signature

.....

Name

.....

Internal Examiner

.....

Signature

.....

Name

.....

External Examiner

.....

Signature

.....

Name

.....

Convener

Abstract

*** Write Abstract***
Keywords— alpha, beta, gamma

Contents

List of Figures

List of Tables

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.

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 administrating 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 poplar 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, picktime.com, appointy.com are one of those web applications.

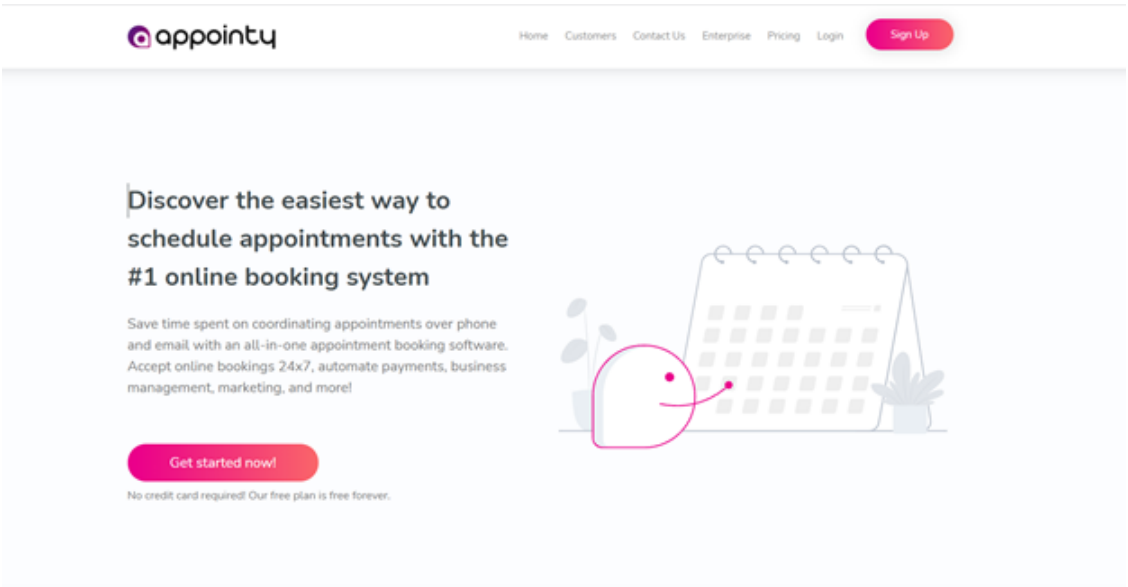


Fig 2.1: appointy.com

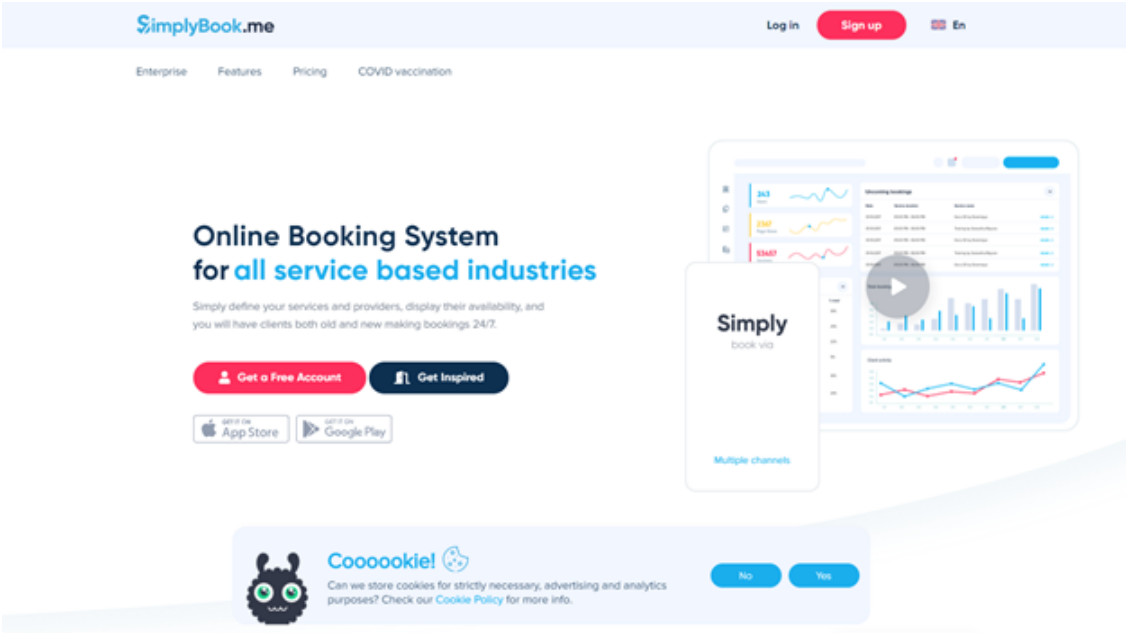


Fig 2.2: SimplyBook.me

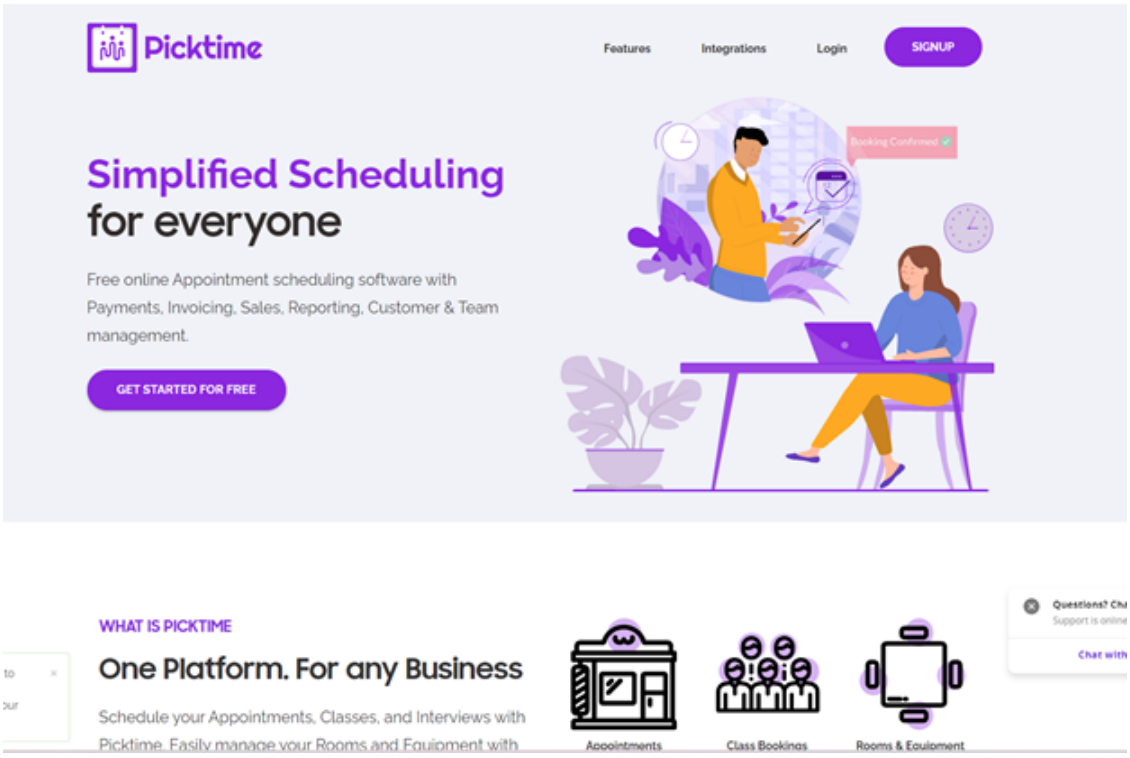


Fig 2.3: picktime.com

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 this project is confined to small organizations but as time will go by, we hop0e 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. WBS is a tool used in project management that helps is 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 rick 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.

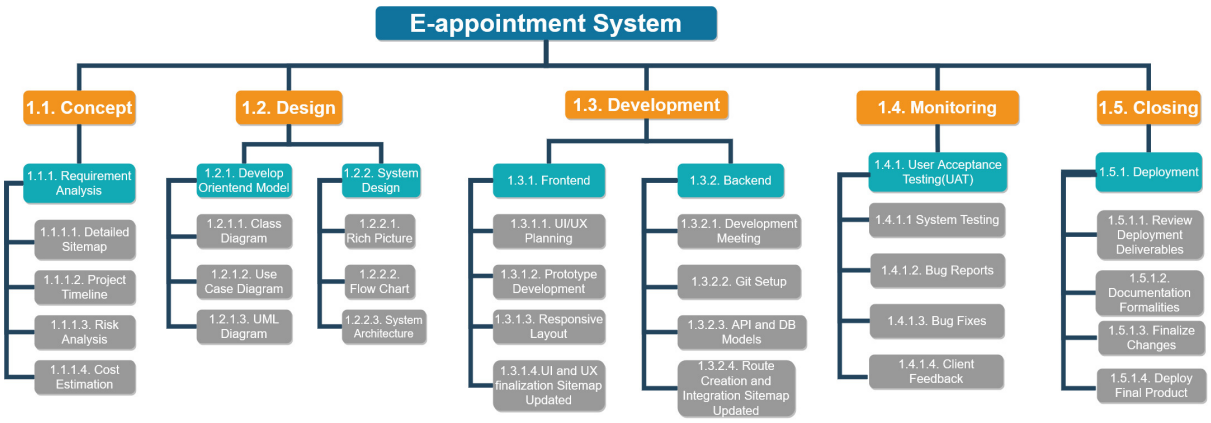


Fig 3.1: WBS of E-Appointment System

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

Fig 3.2.1: 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.

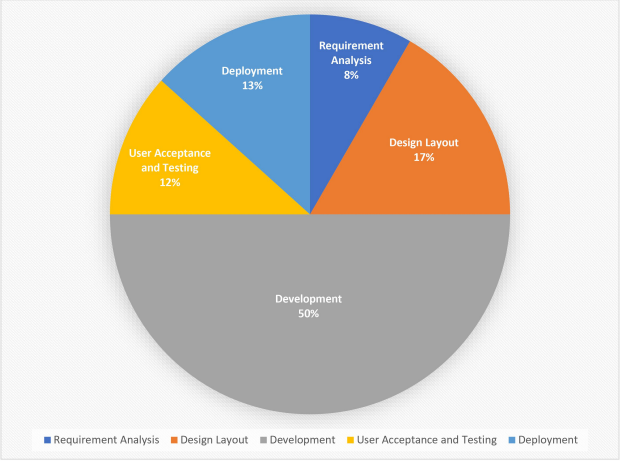


Fig 3.2.2: Process/Activity wise Time Distribution Chart

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.

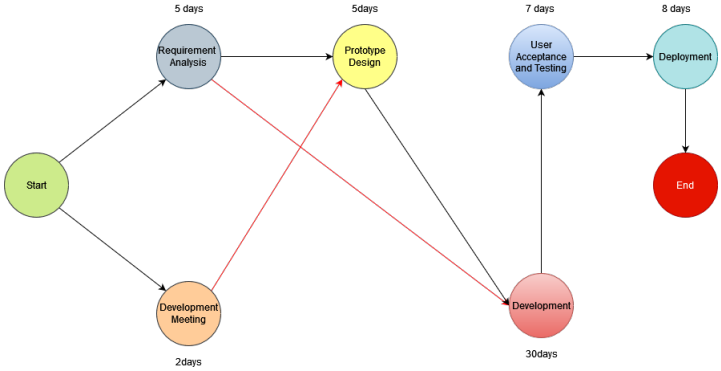


Fig 3.2.3: Critical Path Method for E-Appointment System

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.

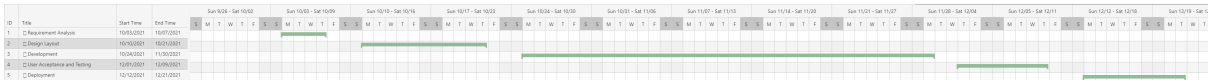


Fig 3.3.1: Weekly View

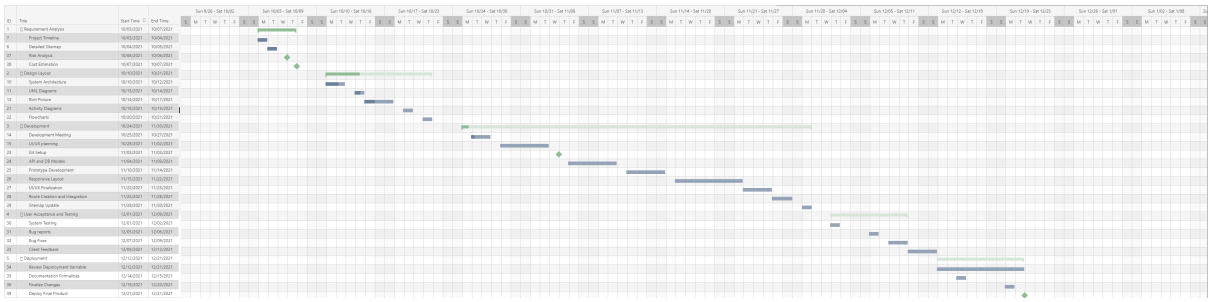
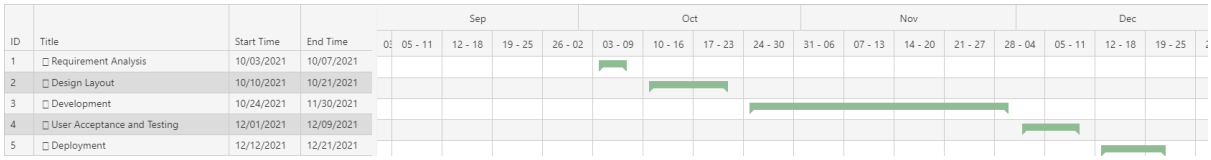
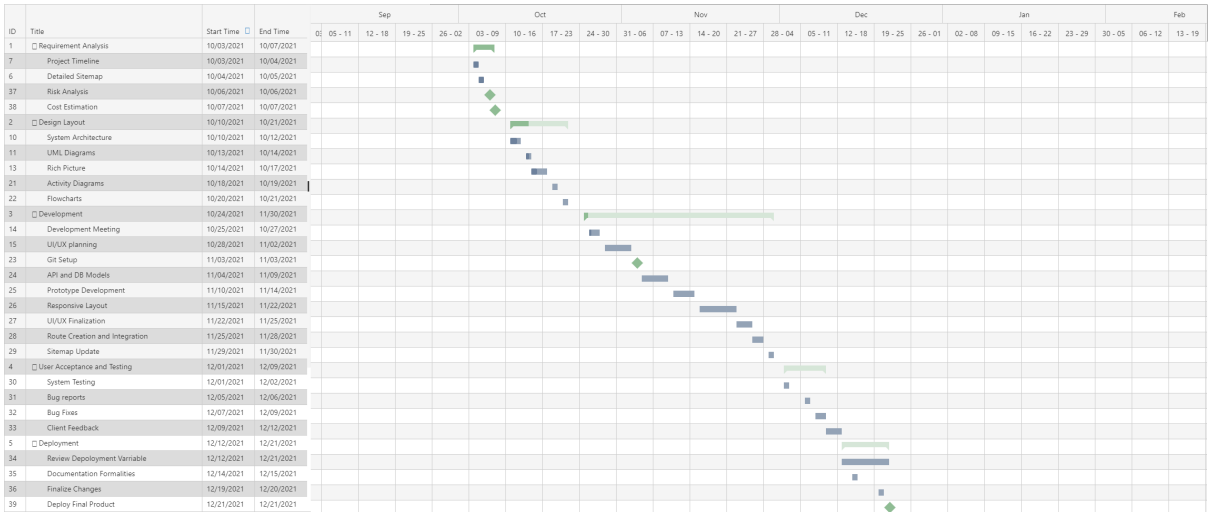


Fig 3.3.2:Details Weekly View



ID	Title	Start Time	End Time
1	Requirement Analysis	10/03/2021	10/07/2021
2	Design Layout	10/10/2021	10/21/2021
3	Development	10/24/2021	11/30/2021
4	User Acceptance and Testing	12/01/2021	12/09/2021
5	Deployment	12/12/2021	12/21/2021

Fig 3.3.3: Monthly View



ID	Title	Start Time	End Time
1	Requirement Analysis	10/03/2021	10/07/2021
7	Project Timeline	10/03/2021	10/04/2021
6	Detailed Sitemap	10/04/2021	10/05/2021
37	Risk Analysis	10/06/2021	10/06/2021
38	Cost Estimation	10/07/2021	10/07/2021
2	Design Layout	10/10/2021	10/21/2021
10	System Architecture	10/10/2021	10/12/2021
11	UML Diagrams	10/13/2021	10/14/2021
13	Rich Picture	10/14/2021	10/17/2021
21	Activity Diagrams	10/18/2021	10/19/2021
22	Flowcharts	10/20/2021	10/21/2021
3	Development	10/24/2021	11/30/2021
14	Development Meeting	10/25/2021	10/27/2021
15	UI/UX planning	10/28/2021	11/02/2021
23	Git Setup	11/03/2021	11/03/2021
24	API and DB Models	11/04/2021	11/09/2021
25	Prototype Development	11/10/2021	11/14/2021
26	Responsive Layout	11/15/2021	11/22/2021
27	UI/UX Finalization	11/22/2021	11/25/2021
28	Route Creation and Integration	11/25/2021	11/28/2021
29	Sitemap Update	11/29/2021	11/30/2021
4	User Acceptance and Testing	12/01/2021	12/09/2021
30	System Testing	12/01/2021	12/02/2021
31	Bug reports	12/05/2021	12/06/2021
32	Bug Fixes	12/07/2021	12/09/2021
33	Client Feedback	12/09/2021	12/12/2021
5	Deployment	12/12/2021	12/21/2021
34	Review Depolyment Variable	12/12/2021	12/21/2021
35	Documentation Formalities	12/14/2021	12/15/2021
36	Finalize Changes	12/19/2021	12/20/2021
39	Deploy Final Product	12/21/2021	12/21/2021

Fig 3.3.4 : 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**

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

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.[1] 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 then 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.[2]

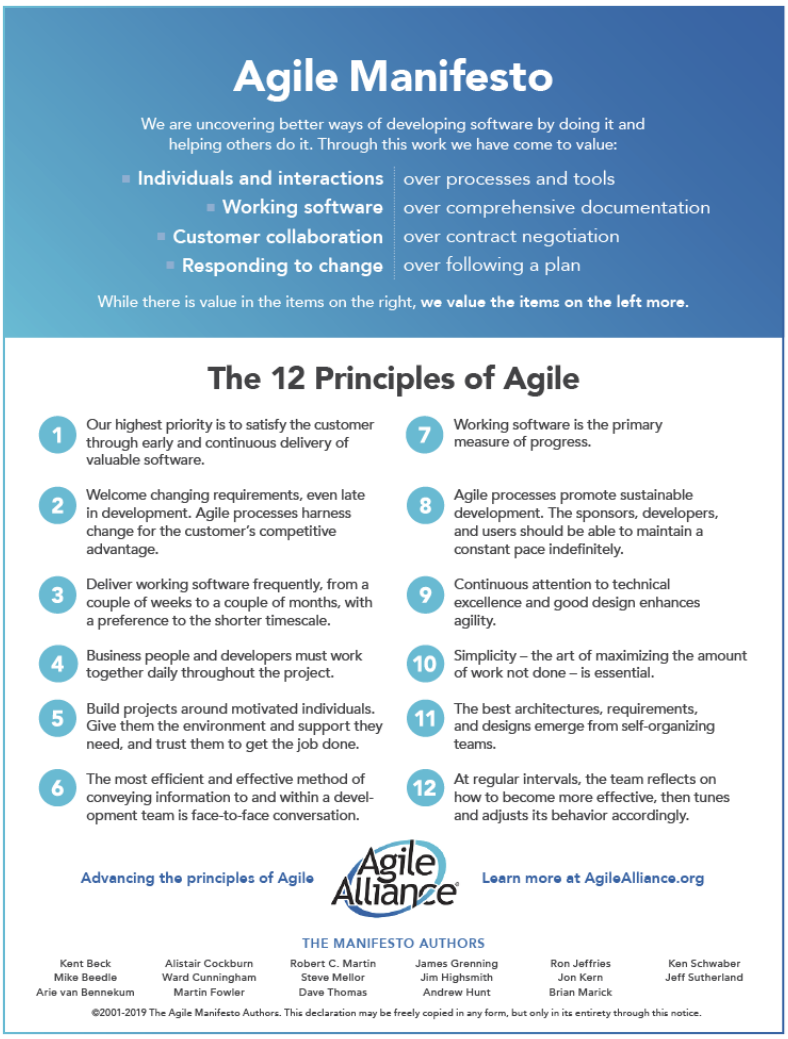


Fig 4.1: Agile Mainfesto

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. [3]

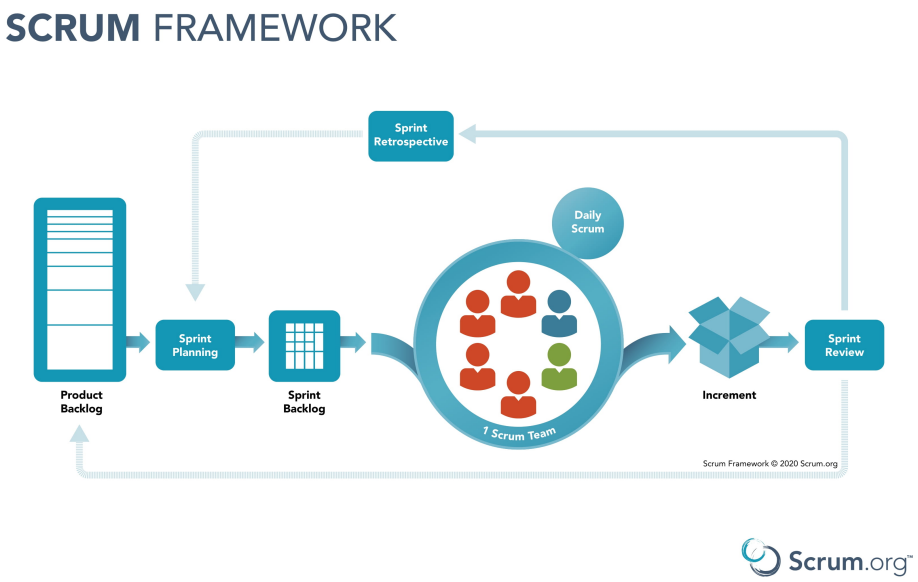


Fig 4.2: Scrum Framework

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.[4]

Fig 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.
6.

For this system, I worked on both the front-end and back-end of multiple modules. 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. [5]

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

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. [5]

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.

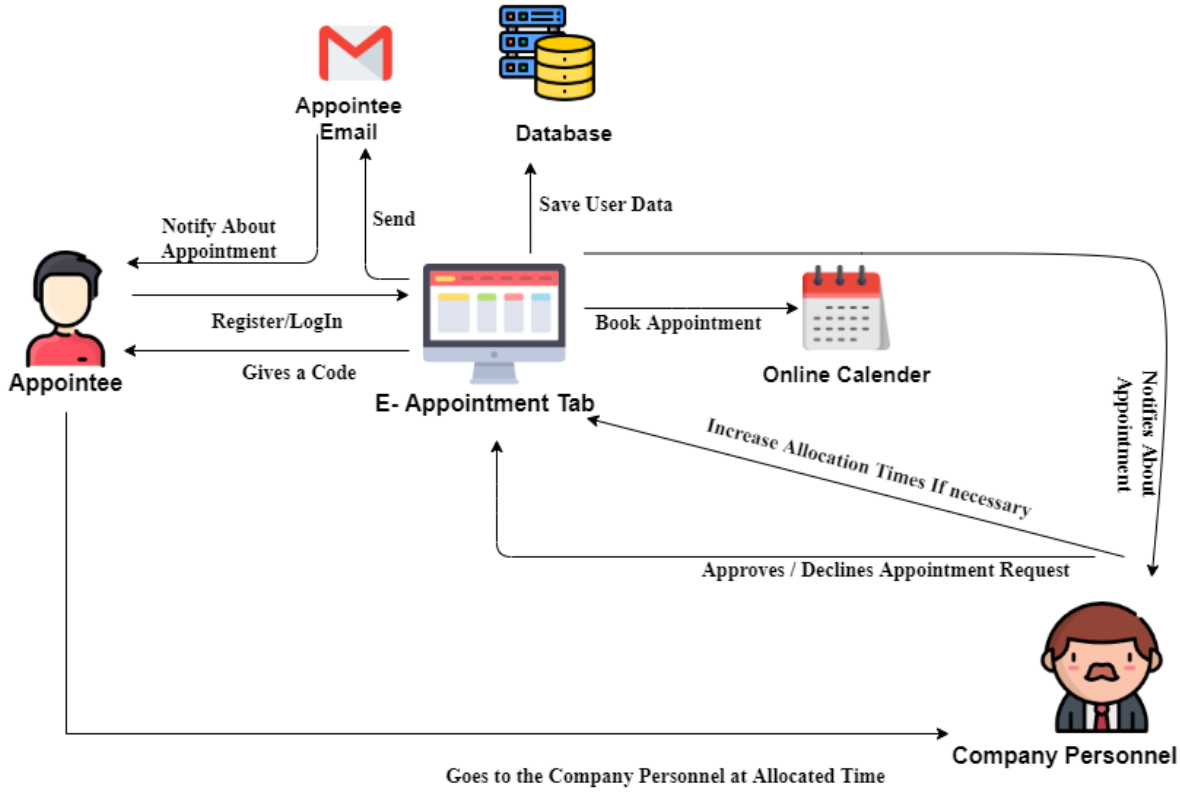


Figure 5.1: Use case Diagram of Admin-Staff

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:

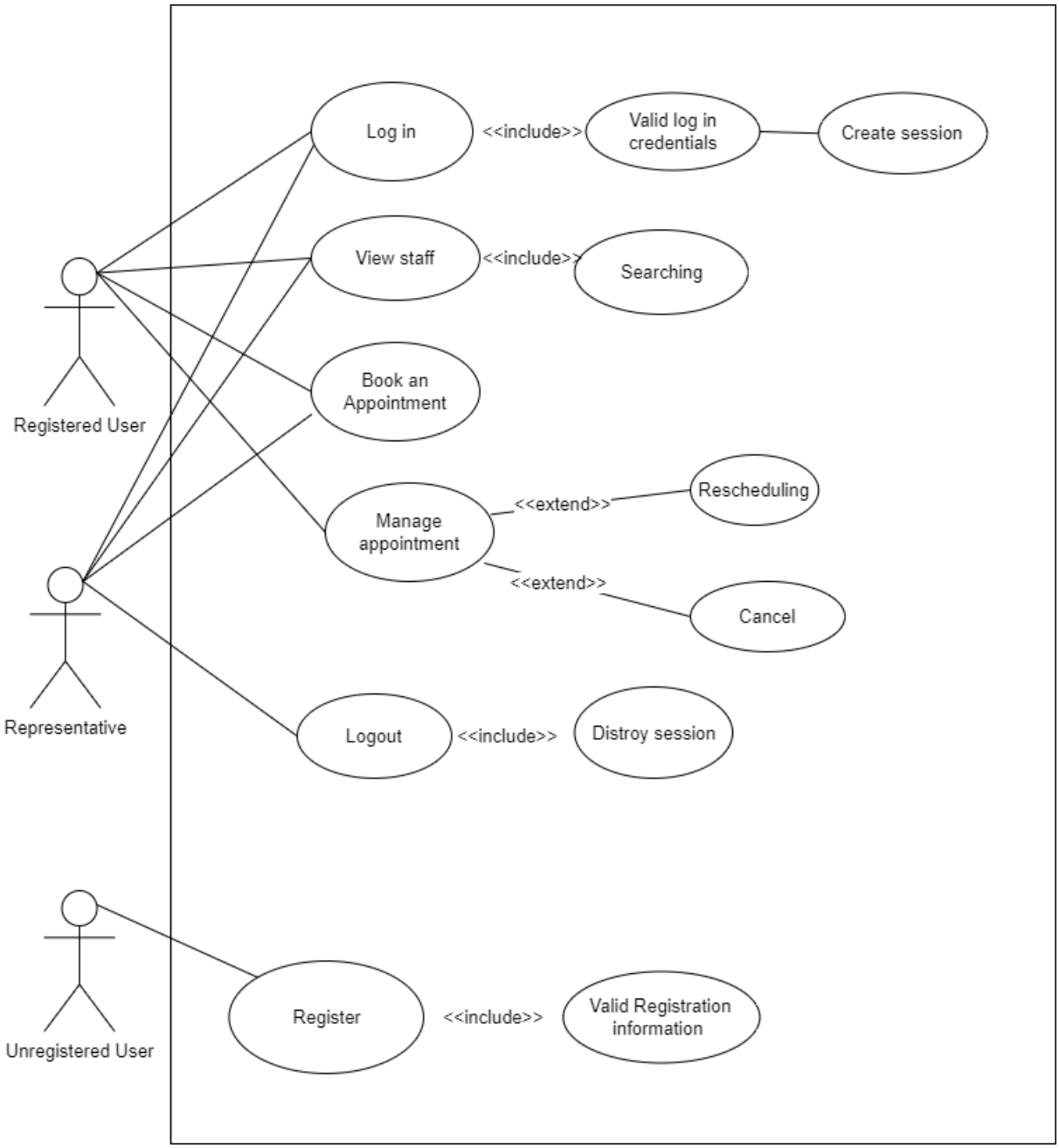


Figure 5.2: Use case Diagram of Users

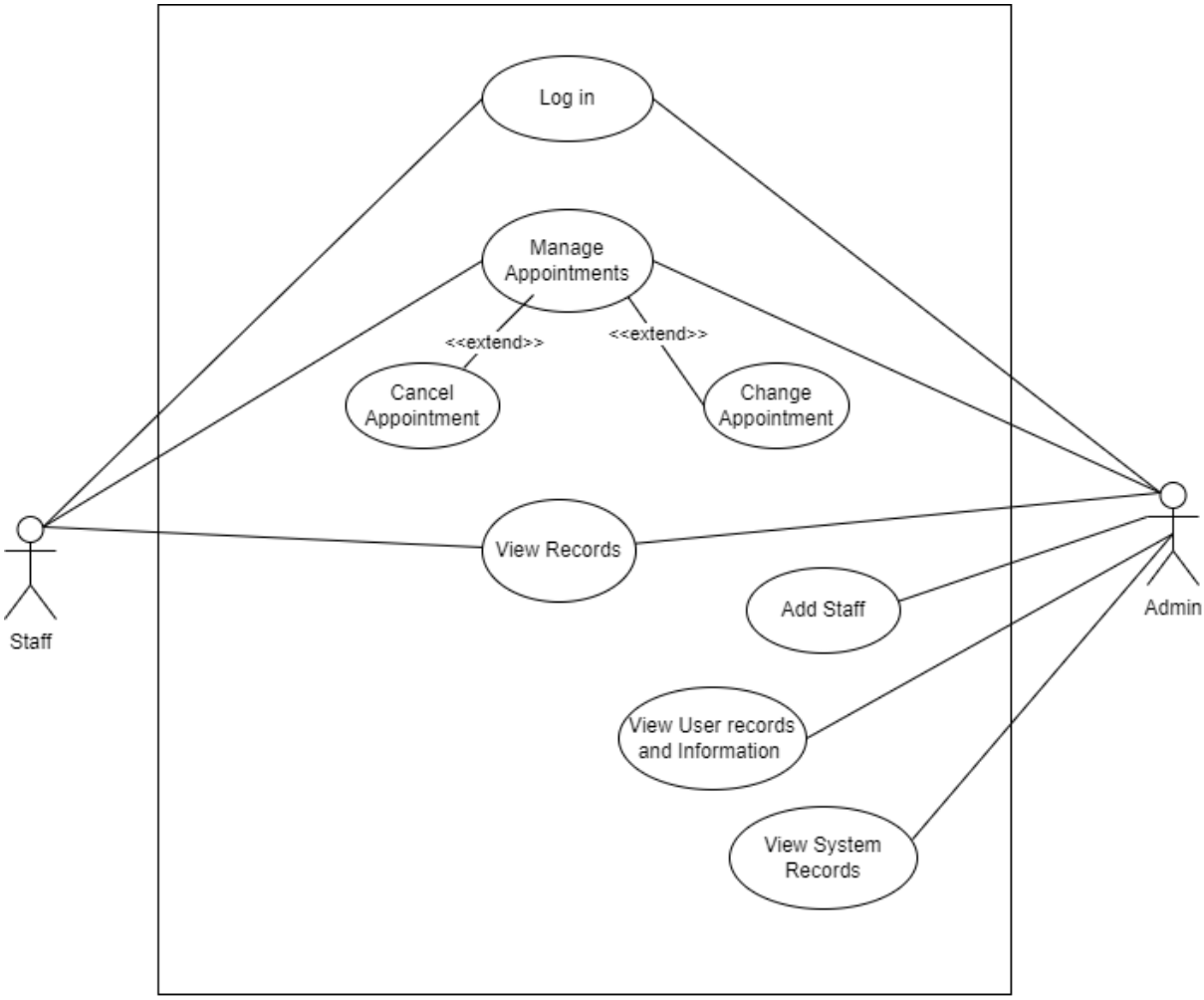


Figure 5.3: Use case Diagram of Admin-Staff

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.[6]

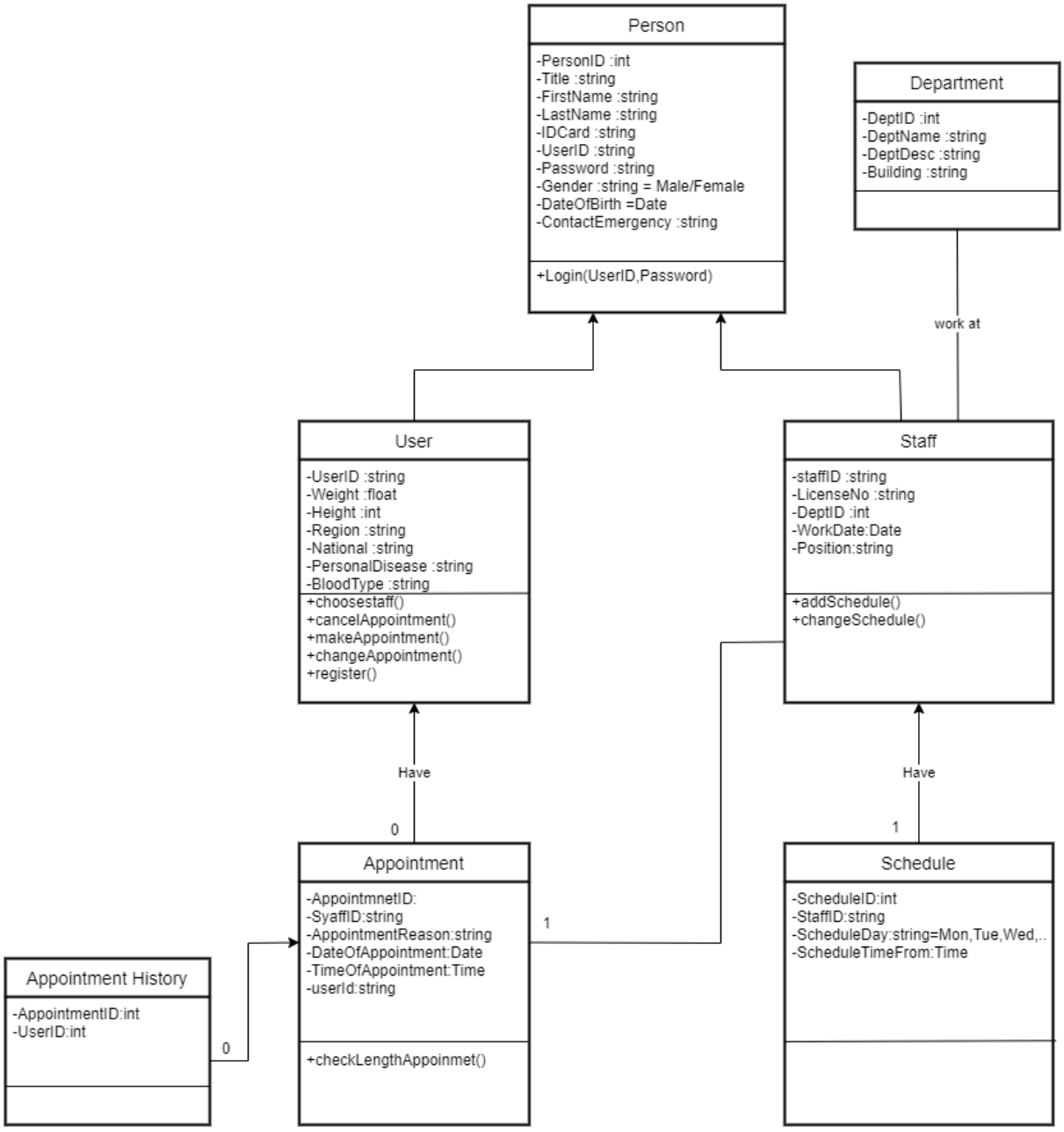


Figure 5.4: Class Diagram

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. [7]

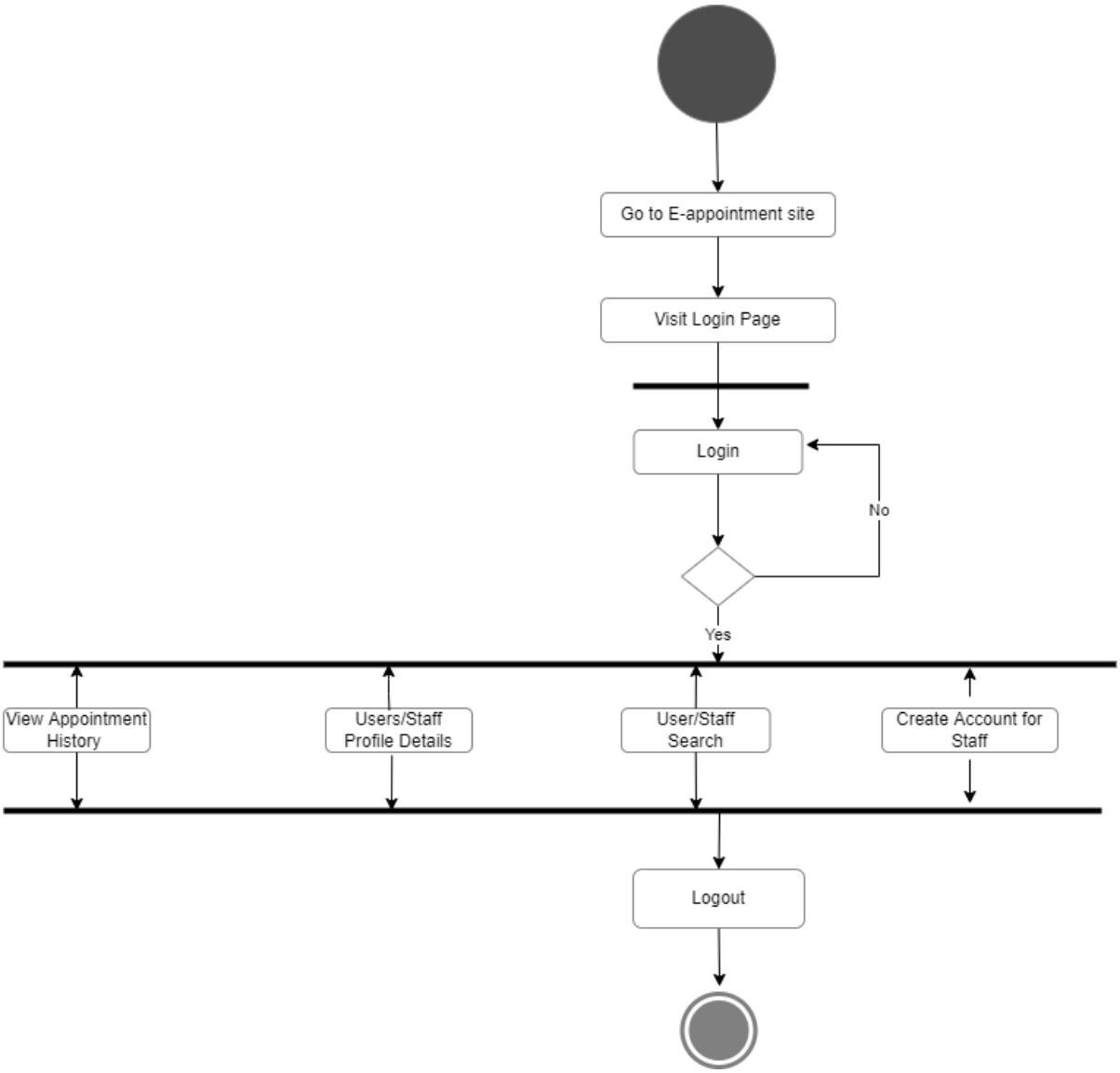


Figure 5.5: Admin activity Diagram

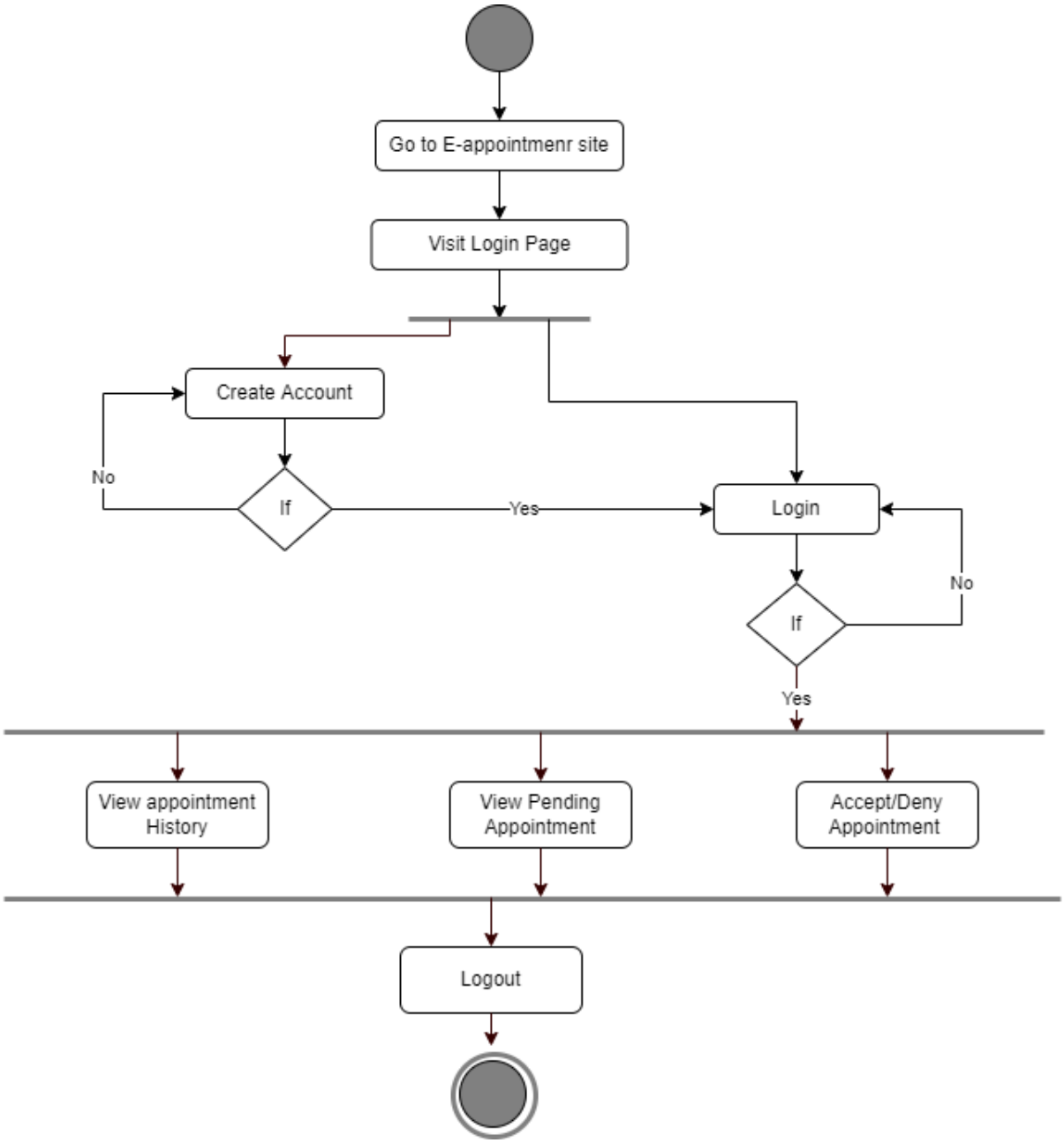


Figure 5.6: Staff activity Diagram

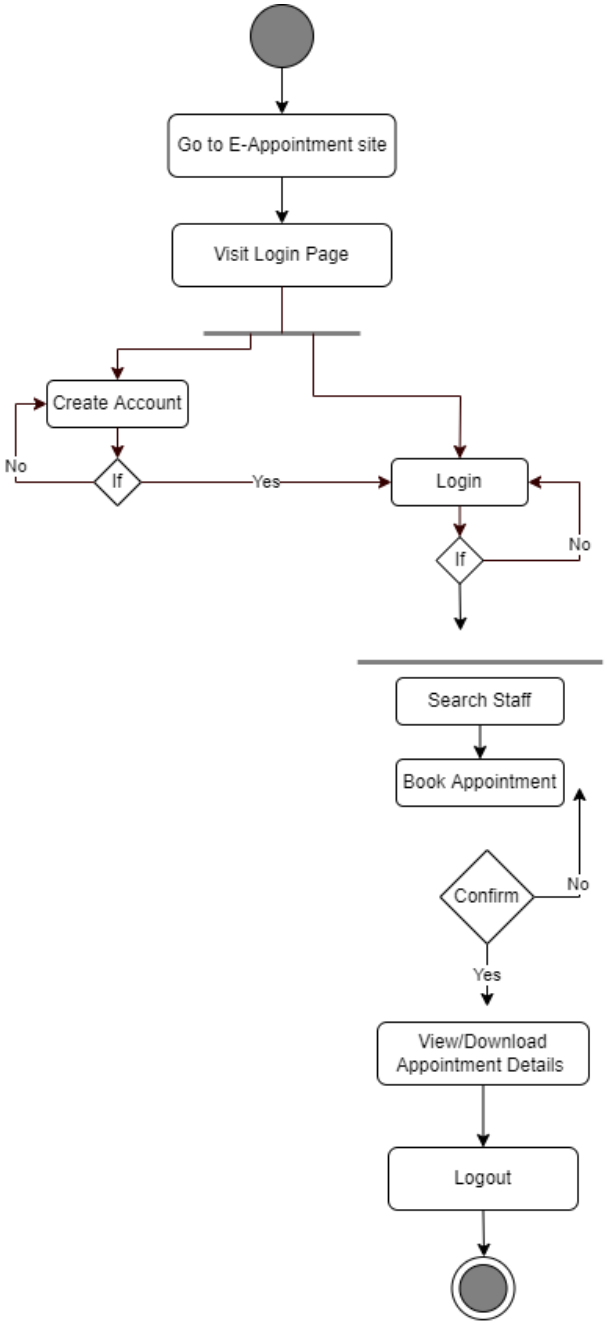


Figure 5.7: User activity Diagram

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 5.3.3.1: 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 5.3.3.2: 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 5.3.3.3: 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 con firmation message and able to see it in history section.	

Table 5.3.3.4: 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 5.3.3.5: 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 5.3.3.6: 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 takes
- 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.[5]

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

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!".

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. 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.

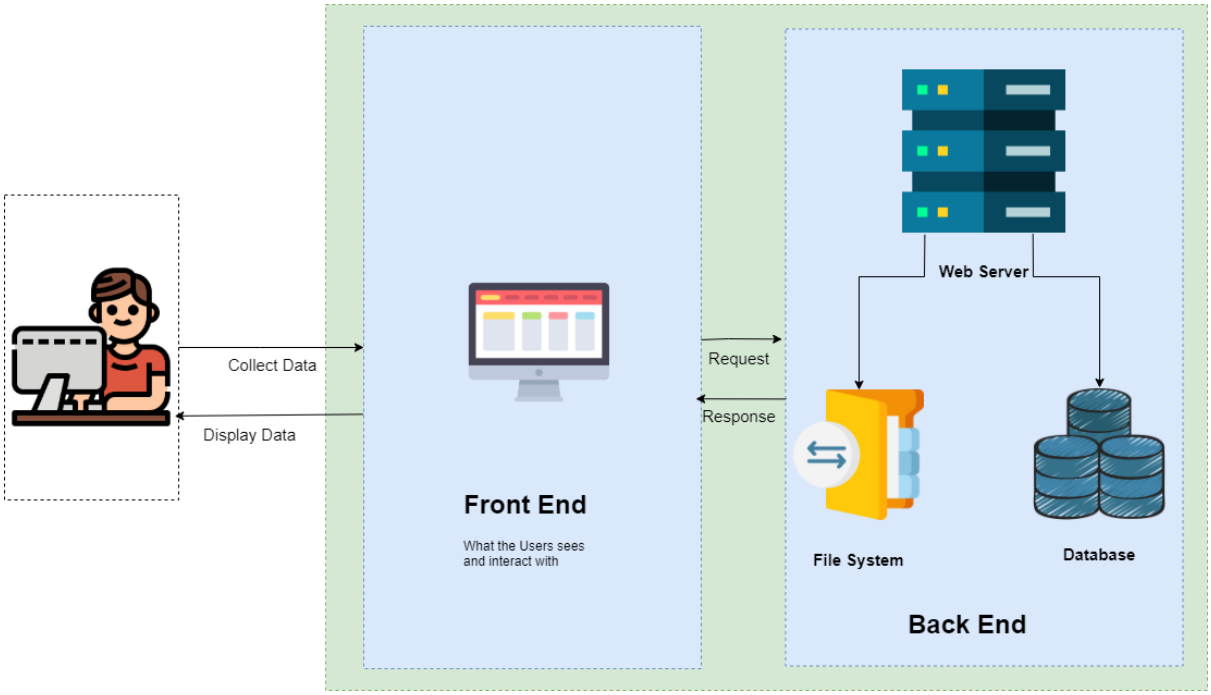


Figure 5.8: Architecture of the system

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

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.[8]

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.

6.0.1 Software Testing

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

*** Explain the sustainability of the project/work ***

7.2 Social and Environmental Effects and Analysis

*** Explain the social and environmental effects of your project/work and analyze them ***

7.3 Addressing Ethics and Ethical Issues

*** Explain ethical aspects/issues of your projects and suggest how to solve them ***

Chapter 8

Lesson Learned

8.1 Problems Faced During this Period

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. At first, I had to meet strict deadline along with studying for other courses also work on project from the company I am working in. Apart from all these, 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.

8.2 Solution of those Problems

The last 4 years as an undergraduate student has taught me valuable lessons. From these 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".

Chapter 9

Future Work & Conclusion

9.1 Future Works

*** Write about the future works of your work/project ***

9.2 Conclusion

*** Write the conclusion. ***

Bibliography

[1] "What is systems development life cycle." [Online]. Available: https://www.veracode.com/security/what-systems-development-life-cycle

[2] "Agile manifesto for software development: Agile alliance," Oct 2021. [Online]. Available: https://www.agilealliance.org/manifesto-download/?utm_source=PANTHEON_STRIPPED&utm_medium=PANTHEON_STRIPPED

[3] "What is scrum?" [Online]. Available: https://www.scrum.org/resources/what-is-scrum

[4] "Updates to the scrum guide: The 5 scrum values take center stage." [Online]. Available: https://www.scrum.org/resources/blog/5-scrum-values-take-center-stage

[5] [Online]. Available: https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_overview.htm

[6] "Uml class diagram - javatpoint." [Online]. Available: https://www.javatpoint.com/uml-class-diagram

[7] B. Donald, "Uml basics, part ii: Activity diagram," *Accessed online at http://www. ibm. com/developerworks/rational/library/con tent/RationalEdge/sep03/f_umlbasics_db. pdf*, 2003.

[8] "Research paper writing: 9. reference." [Online]. Available: https://wiu.libguides.com/c.php?g=295539&p=1970529