An Undergraduate Internship/Project on
"**Online Bus Ticket Reservation System**"
By
Zaber Bin Quasem
Student ID: 1631029
Spring, 2021

Supervisor:
Subrata Kumar Dey
Internship Supervisor & Senior Lecturer
Department of Computer Science & Engineering
Independent University, Bangladesh

November 20, 2020

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

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

I, Zaber Bin Quasem, hereby certify that none of the work that has been done in this report is plagiarized or copied from anywhere. Any resources used are mentioned in the reference section of the report. No help was asked for during the completion of the report from a third-party organization except the one that I have worked for in the last 3 months as an intern.

For any information, my internship supervisor, Mahtab Uddin Khan, at my company, Bengal Software Limited, can be contacted on 01816811482

Sincerely

14th April 2021
Zaber Bin Quasem

Acknowledgement

I am grateful to Allah for keeping me safe in this pandemic and giving me the patience to work with my knowledge. I would like to express my gratitude to my honorable supervisor Mr. Subrata Kumar Dey, Internship Supervisor & Senior Lecturer, Independent University, Bangladesh, who has given me suggestions regarding the research that I conducted and writing this report. He has helped me go through the whole process of making this report.

It has been a great experience to work as an intern in a startup organization like Bengal Software Ltd. I would like to express my gratitude to Bengal Software firm for giving me a chance to work with them and for helping me work from home as well as giving me an opportunity to work at office to understand the office culture better and making the transition from a student to a software developer much smoother all during this COVID-19 pandemic.

I am also thankful to Mr. Mahtab Uddin Khan, Managing Director and CEO, Bengal Software Limited, MD. Abid Hossain (Project Manager, Bengal Software), Fahim Ashab (Product manager and Team Member) and Shuvo Bhowmik (Team Member) My sincere gratitude goes to Independent University. Bangladesh for having an internship program for students which really shapes and prepares us to enter the corporate world.

Zaber Bin Quasem
Student ID: 1631029
May 2021
Dhaka, Bangladesh

Letter of Transmittal

15th May 2021

Subrata Kumar Dey

Internship Supervisor & Senior Lecturer

Department of Computer Science and Engineering

School of Engineering, Technology and Sciences

Independent University, Bangladesh

Subject: Internship report on 'Web application on Bus Ticket Reservation System', a generic product for Bengal Software Limited.

Dear Sir,

I am very much thankful to have that opportunity of submitting you my internship report on 'Web application of Online Bus Ticket Reservation System' for Bengal Software Limited. This report has been prepared based on my four month internship period at Bengal Software Limited and the project that I had been working on during that time. The purpose of this report was to fulfill the requirements of the bachelor's degree of Computer Science and Engineering and to gain an insight on how the organizations are dealing with the ongoing COVID-19 pandemic.

It was always my intention to give the best effort to make this report successful. It has been an corporate and knowledgeable experience for me to work along with development team in Bengal Software Limited. I would be glad if the report that I have created is able to serve its purpose. I am grateful to you for dedicating your valuable time, expertise, guidance and support. I have tried my best to complete the report appropriately as much as possible. I would be available to explain any kind of queries related with this report.

Thank you.

Yours sincerely,

Zaber Bin Quasem

ID: 1631029

Student, SECS

Evaluation Committee

. . . .

Signature

. . . .

Name

. . . .

Supervisor

. . . .

Signature

. . . .

Name

. . . .

Internal Examiner

. . . .

Signature

. . . .

Name

. . . .

External Examiner

. . . .

Signature

. . . .

Name

. . . .

Convener

Abstract

Online Bus Ticket Reservation System is a Web based application that works within a centralized network. This project presents a review on the software program "Online Bus Ticket Reservation System" as should be used in a bus transportation system, a facility which is used to reserve seats, cancellation of reservation and different types of route enquiries used on securing quick reservations. The system is built for managing and computerizing the traditional database, ticket booking, and tracking bus and travel made. It maintains all customer details, bus details, reservation details. This web application can connect to respective servers for accessing data which will surely help users to purchase the bus ticket or reserve their seats online without waiting on queue. Moreover, in recent decays peoples are like to travel to get some relief from their monotonous life. So, travelers want to travel without any hesitations. In this modern tech era they want a system that will enhance the portability, accessibility as well as user friendly. Hence the implemented web system having all the features that will make it more user friendly and accessible.

This report is broadly categorized in 8th chapter. In first chapter there is an introduction about the project, background of the project, objectives, scope of the project and about the organization where I worked. Chapter two describes the literature review where I discussed about market analysis both in local and global market, about similar products and how my undergraduate studies help me to do this project. Chapter three describes the project management and financing of the project where I describe work breakdown structure, time distribution show in critical map diagram, Gantt chart, activity wise resource allocation and about the budget. Chapter four describes about methodology where I describes about waterfall methodology which I used here; I also describe why use waterfall methodology. Chapter five describes body projects, where I describe in detail about work description, six element analysis, feasibility analysis, problem, effects and constraints analysis. I also give here rich picture, ERD diagram, activity diagram, use case diagram and class diagram. Functional, nonfunctional requirements, input, output and architecture of the project are also described in this section. Chapter six describes about survey results and analysis. Chapter seven describes project as engineering problem analysis which includes sustainability of the project, social and environmental effects of the project, addressing ethics and ethical issues. In chapter eight I have included the problems I have faced during the project period and how I solved those. Chapter nine describes about the future work for this project and finally the conclusion. This software will save a lot of time and money for company.

Table of Contents

List of Figures

List of Tables

Chapter 1
1.   Introduction

The Online Bus Ticket Reservation System is a web-based application that allows visitors check bus ticket. availability, buy bus ticket and pay the bus ticket online. Online Bus Reservation System provides bus transportation system, a facility to reserved seats, cancellation of seats and different types of enquiries which need an instant and quick reservation. This system can be used by the users in performing online reservation via internet for their all-business purposes. Users can use this program directly on their websites and no need to install it. The use of bus traveling is a large growing business in Bangladesh and other countries. Hence bus ticket reservation system deals with maintenance of records of each passenger who had reserved a seat for a journey by bus. It also includes maintenance of information like schedule and details of each bus (e.g., Greenline 107 AC, 2016). Also, we get to know that there are many operations, which they have to do manually. It takes a lot of time and causes many errors. Due to this, sometimes a lot of problems occur, and they were facing many disputes with customers. To solve the above problem, and further maintaining records of items, seat availability for customers, price of per seat, bill generation and other things, I am offering this proposal of reservation system. The reservation system has some facilities that helps the customer to enquire the availability of seats in a particular bus on a date, the second module helps him to reserve a ticket and with the third module he can cancel a reserved ticket.

However, since the current reservation system is still buggy, and it might happen that the experience of the journey to any particular passenger is not good, and he wants to complain instantly. But there is no such feature in existing bus ticket reservation system. My project can fill up this lacking and this ensures a sound experience for every passenger.

1.1 Overview/Background of the Work

Bus ticket booking during the offline era posed various difficulties to the customers as well as the bus operators. Offline ticket booking reduced the scope of customers to choose different options based on their travel criterion. It also increased the franchising cost for the bus operators. At the same time, the bus operators were also finding it difficult to monitor their bus seat filling information. Many small and medium bus service organizations do not have their own online bus ticket booking system. Online Bus ticketing system web application is a total online ticketing operation offering the benefit of total in-house management of bus schedules, ticket bookings, ticket sales, report generation, and other business functions associated with ticket sales. It also offers the power of decision making to customers to make a ticket booking through bus operators' popularity, performance and ranking. This powerful Online based ticket booking system that allows a full control of not only on the ticketing inventory, but also the site's content.

In my report, a detailed discussion of the development of online bus ticket reservation system is given. The proposed bus ticket reservation system is developed using Hypertext Markup Language (HTML), PHP Hypertext Preprocessor (PHP), Structure Query Language (SQL), Cascading Style Sheet (CSS), and JavaScript. The relational database was adopted because is made up of a group of logically connected tables (data that has a relationship to other data).

1.2 Objectives

The main purpose of this study is to automate the manual procedures of reserving a bus ticket for any journey made through the bus companies. This system is said to be an automatic system and customers can select seats by themselves. Specifically, objectives of this project will consist of:

- Providing a web-based bus ticket reservation function where a customer can buy bus ticket through the online system without a need to queue up at the counter to purchase a bus ticket.
- Enabling customers to check the availability and types of busses online. Customer can check the time departure for every company bus through the system.
- Easing bus ticket payment by obtaining a bank pin after payments is made to the various designated banks.
- Ability of customers to cancel their reservation.
- Admin user privileges in updating and canceling payment, route and vehicle records.

1.3   Scopes

This System is helpful to the business owner to maintain their business by using this web application. Owner every moment checks their departure information and seats booking information and also helps to keeping record of every transaction by using this application. General user does not need to go to bus counter to book ticket rather, they can book ticket remotely anywhere in the world by fulfill this instruction. This system is helpful to reduce the time and complexity of maintaining the records. It also helps in accurate maintenance of customers and owners.

Chapter 2
2. Literature Review

2.1 Relationship with Undergraduate Studies

Throughout the undergraduate studies, from 'Hello World' to solving complex mathematical equations, were the basics of understanding how the real-world applications work in general. To have the opportunity to do that and find the relevance of the project with some of the courses that are taught throughout the 4-year undergraduate course in IUB was simply exemplary. Since the project is a web-based applications courses such as the CSE 203- Data Structure, CSE 211- Algorithm were the building blocks of understanding how a project data can be handled. The tools learnt from courses such as CSE 309- Web Application and Internet, CSE 317 – System Analysis, CSE 303 – Database Management and CSE 213- Object Oriented Programming helped me to build and code the entire project. Finally courses like CSE 451- Software Engineering helped me how to handle a project from start to bottom. It should be said most of the courses that has been taught had some sort of contribution to my knowledge in the building part of the project.

2.2 Related Works

Up growing uses of internet and dependency of web applications is the source of the idea to make an application for the travel support. Huge number of users are regularly travelling inter cities for their business and recreations are the prime target of this sort of application. Moreover, due to incredible traffic hours this a time demanding approach to our communication industry to simpler the ticket management and supply chain [1].

Some of our reputed communication /transport companies has already been started their operation, specifically in ticketing and payment management. Due to the procedure and lack of marketing approaches mass community is still managing this task in physical manner (U.F. Eze, 2009). Recently some service provider solutions are introduced with the bus ticketing solutions like BD tickets, these platforms are operating with the small scale in terms of huge user demand due to lack of users' friendliness and payment complexity. This project is to carry out a better solution for the end users, whose are the most frequent travelers inter cities [2]. Causes with simple and secured service this type of application could be an ideal solution for the mass community. This project "Online Bus ticket Booking System" is designed to simplify bus ticket purchasing through use of information Technology and internet. With the bus ticket booking system, you can manage bookings and purchase from home with a comparatively simply system. Even the service providers will also be able to store client data, and passenger lists for their further offers.

2.3   Market Analysis

Online Bus Ticket Reservation System is very popular nowadays in modern area as it has eased the overall ticketing system for travelling. Many of the companies worldwide has been shifted into online ticketing system. As we can see there are global and local markets of this product where we can analyze the overall features and functionalities and get an idea to implement the project.

2.3.1 Global Market

First class countries around the world have already taken the opportunity of using online ticketing system and they found it useful, effective and hassle free.

Greyhound:

Greyhound's iconic brand is synonymous with affordable long-distance travel in North America and a unique national network. Founded in 1914, Greyhound Lines, Inc. is the largest provider of intercity bus transportation, serving 2400 destinations across North America with a modern, environmentally friendly fleet.[3] It has become an American icon, providing safe, enjoyable and affordable travel to nearly 16 million passengers each year in the United States and Canada as they provide reliable purchasing of bus tickets via online providing facilities like finding bus stops throughout the bus route, selecting destination spot and departure spot including returning date and time, adding promo codes coupon and giving discounts to their passengers, and so on. They used jQuery UI, Moment.js, React, Microsoft ASP.NET to build the system.
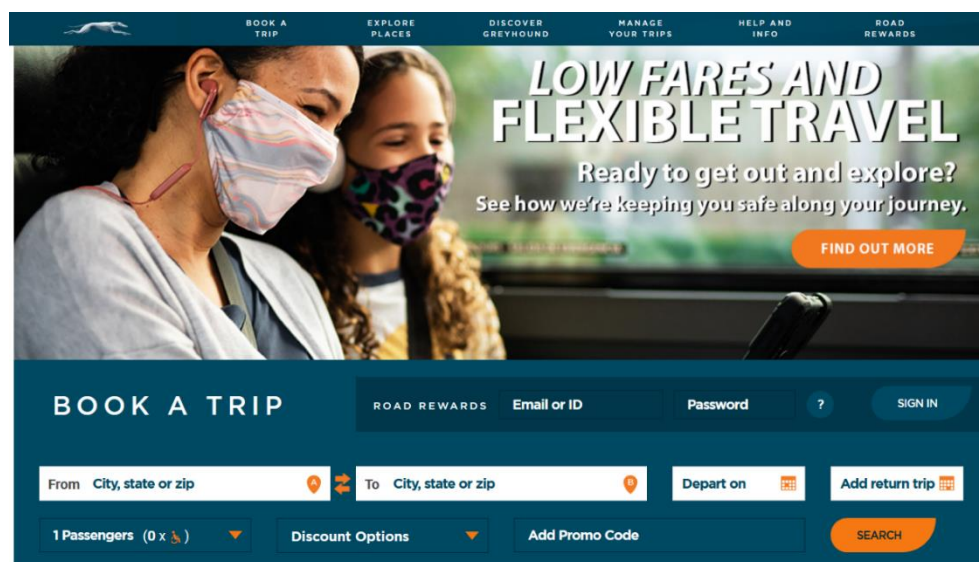

Figure 2. 1 Greyhound Interface Screenshot

redBus:

redBus is India's largest online bus ticketing platform that has transformed bus travel in the country by bringing ease and convenience to millions of Indians who travel using buses. Founded in 2006, redBus is part of India's leading online travel company MakeMyTrip Limited (NASDAQ: MMYT).[4] By providing widest choice, superior customer service, lowest prices and unmatched benefits, redBus has served over 18 million customers. redBus has a global presence with operations across Indonesia, Singapore, Malaysia, Colombia and Peru apart from India. They even provide a description of the places you are going from and to. They have a huge number of customers who are being served by the system by purchasing easy tickets via online. They offer even hiring a dedicated bus for anyone individual or corporates. redBus has all the import features a bus ticket reservation system should have. Customers can buy tickets by getting a view of the seat arrangements according to every single different bus, cancel tickets and get refunds.

Figure 2. 2 redBus Screenshot

Kallada Travels:

Kallada Tours & Travels is a part of the Suresh Kallada Concern and is one of the largest bus operators in South India, operating bus services across the country, they connect communities in over most of the towns in South India.[5] They offer all the import features a bus ticket reservation system should have. Customers can buy tickets by getting a view of the seat arrangements according to every single different bus, cancel tickets and get refunds. They built their system over Ruby, Moment.js, jQuery, Bootstrap, Amazon web Services and so many technologies.

Figure 2. 3 Kallada Tour and Travels Screenshot

2.3.2 Local Market

In Bangladesh, there are some bus companies who are already using their own system where passengers can get al the facilities of purchasing online bus tickets along with all the necessary features.

Desh Travels:

Desh Travels is one of the leading bus companies in Bangladesh. Their online ticketing system is medium standardized. They built the system over PHP, Apache, jQuery and few other technologies. They offer purchasing tickets, refunding nor canceling them withing a certain time period before the journey starts. Customers can find buses with available seat views.[6]

Figure 2. 4 Desh Travels Screenshot

Chapter 3
3.   Project Management & Financing

3.1   Work Breakdown Structure (WBS)

Breaking work into smaller tasks is a common productivity technique used to make the work more manageable and approachable. For projects, the Work Breakdown Structure (WBS) is the tool that utilizes this technique and is one of the most important project management documents.[7] It integrates scope, cost and schedule baselines ensuring that project plans are in alignment. A good WBS is simply one that makes the project more manageable.
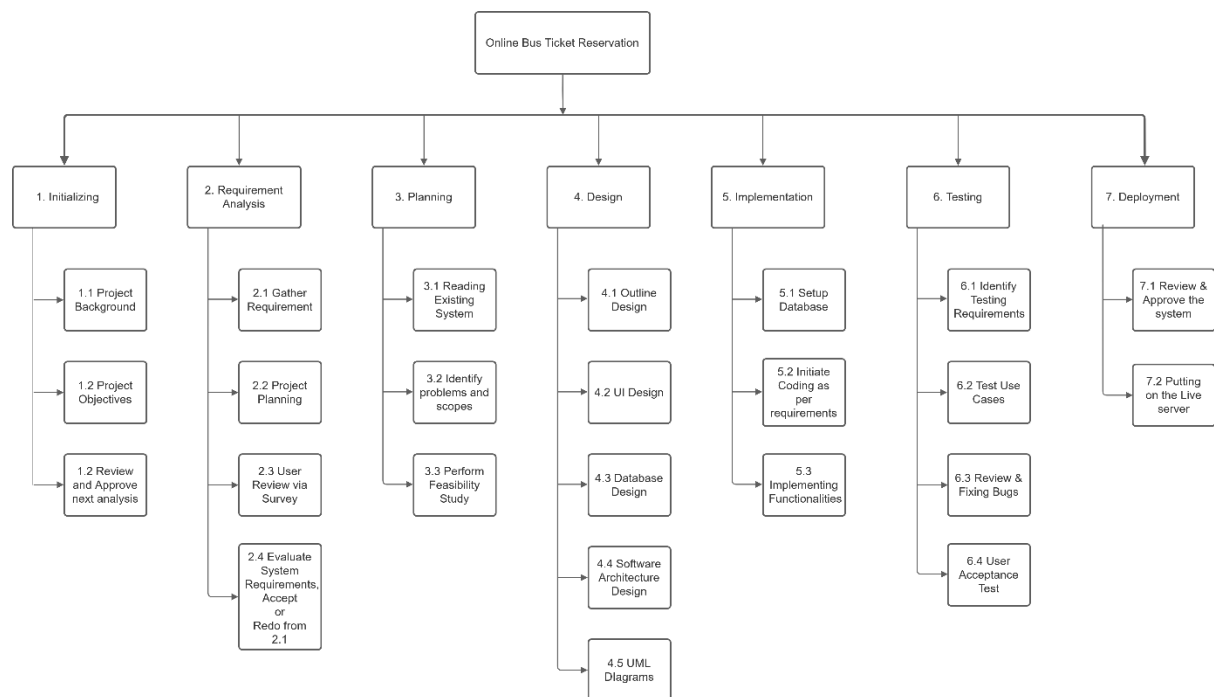
Figure 3. 1 Work Breakdown Structure

3.2   Process/Activity wise Time Distribution

The time allocation for the 3 months project is shown on a chart using the critical path method. The critical path is the longest sequence of activities in a project plan which must be completed on time for the project to complete on due date. An activity on the critical path cannot be started until its predecessor activity is complete; if it is delayed for a day, the entire project will be delayed for a day unless the activity following the delayed activity is completed a day earlier.
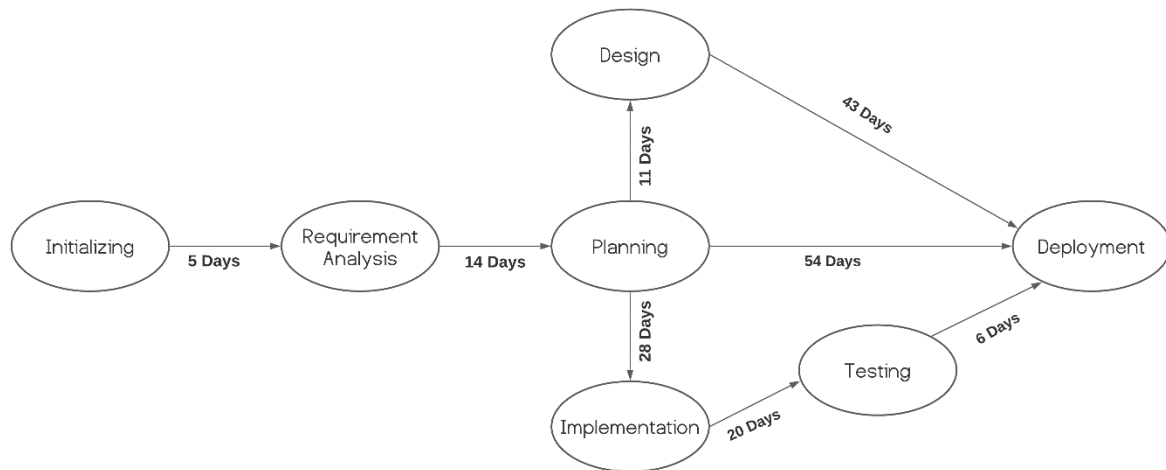
Figure 3. 2: Activity Wise Time Distribution

3.3   Gantt Chart

For this project, a Gantt chart was used in the planning phase of the application. Gantt charts are commonly used for tracking project schedules, and they are especially useful in project management. To put it simply, they illustrate and allow us to know what needs to be done, and when it needs to be done. Gantt charts are also able to show us additional information regarding the different tasks or sections of a project, such as how far have tasks progresses, how a group of tasks might depend on or other groups of tasks, how important several tasks are, and resources are being used within a project.
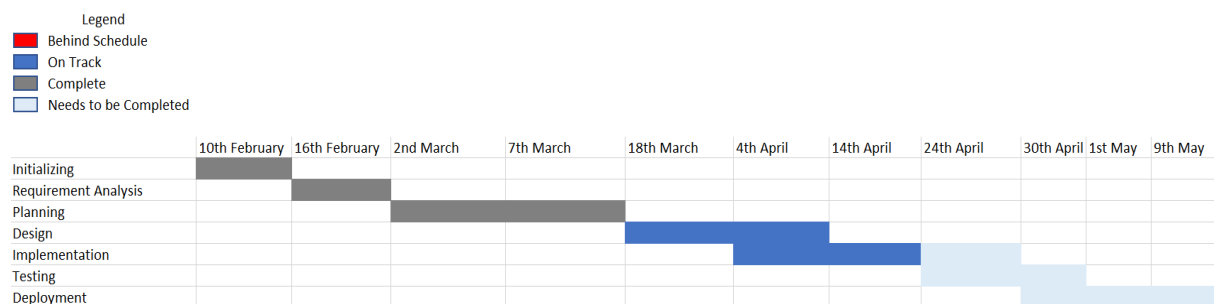
Figure 3. 3: Gantt Chart

3.4   Process/Activity wise Resource Allocation

Online Bus Ticketing System is used by mainly the users who need a real travelling pass from the system. Hence behind the scenes is all the resources I was working in order to make this a reality. So, it was very important for me to allocate every resource needed for the project to fit in its position. My primary resource of the project are my developers, then comes everything else needed for the development to the process, Computers, server, telemedicine equipment's and even chair/table are considered as resources here.

- **Initiating:** This is the first step of the Development, where a few orders were proposed by several bus Company for Online Bus Ticket Reservation System and we, the development team planned for a generic product.

- **Requirement Analysis:** A Small team had worked on the predictions of what the requirement is for the Web application will be. For example: Computer specifications required, Employees needed, Features & etc.

- **Planning:** The planning phase is when all the team employees were involved and brainstormed on how we are going to set goals and the approaches we are going to take to develop the Application.

- **Design:** The designing phase is where we designed the features, users and functionality of the system to a few mainstream diagrams to show us the bigger picture of the whole scenario.

- **Implementation:** This is where the development started every team member were assigned to their part of the development. Every week there were goals to reach, however due to the Global pandemic COVID-19 our development process was slow as in the beginning of development the employees worked from home. So, it slowed down our process bit by bit. And of course, in usual development there are always new implementations which are required to make.

- **Testing:** Testing was done simultaneously as we proceeded to develop the Application because we could predict that the implementation phase was taking longer than usual. The errors were being fixed as we were also developing new features in the Application

- **Deployment:** The software deployment was delayed but as the software development was in house, so not much problem was faced. We aimed for a development in good quality software rather than meeting deadlines.

3.5   Estimated Costing

Table 3. 1 Estimated Costing of the Project

Requirements	Quantity	Amount
Salary Payments (3 months)	3	70000
Printer	1	13500
Electricity bill (3 months)	1	3500
Domain/Server/Hosting (1 year)	1	4500
Internet Bill (3 months)	1	3000
Subtotal	-	94500

Chapter 4
4. Methodology

For any project to be completed, it must go through stages called Development Life Cycles. System Development Life Cycle (SDLC) is the process of understanding how an Information System (IS) can support business needs, designing the system, building it and delivering it to users. The SDLC composes of four phases: Planning, Analysis, Design and Implementation. We know there are few methodologies that developers choose according to the project needs such as-

- Waterfall
- Prototyping
- Iterative and Incremental Development
- Spiral Development
- Rapid Application Development
- Extreme Programming

4.1 Waterfall Methodology

Waterfall model is an example of a Sequential model. In this model, the software development activity is divided into different phases and each phase consists of a series of tasks and has different objectives.

Waterfall model is the pioneer of the SDLC processes. In fact, it was the first model which was widely used in the software industry. It is divided into phases and output of one phase becomes the input of the next phase. It is mandatory for a phase to be completed before the next phase starts. In short, there is no overlapping in the Waterfall model. [8]
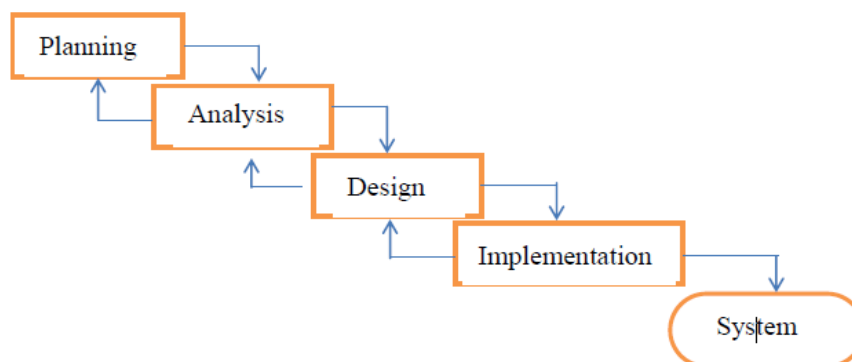
Figure 4. 1: Waterfall Development Methodology

4.2 Why Waterfall Methodology for this project?

As we are developing this as a web-based application, for this project to be developed, the methodology that will be used is the System Structured Analysis and Design Methodology. The SSADM is classified as a Waterfall Development. With Waterfall Development, analyst and users proceed sequentially from one phase to the next and each phase can be mapped out and evaluated (Hevner, 2004) [9]. Besides, we know that waterfall methodology is applicable when Requirements are stable and not changed frequently and there is no requirement which is not understood or not very clear. And our resources were well trained and are available. Since the phases are rigid and precise, one phase is done one at a time, it is easy to maintain.

4.3 Waterfall Implementation

From requirement analysis, we started the project working. Then we went for designing the UI for the application and database as well as. Then the main development part began with coding and simultaneous testing as needed. As the team members were given instructions and development parts, we needed to combine the whole every day.

Chapter 5
5.Body of the Project

5.1   Work Description

As a member of the development for the project, I had contributed to both the front end and the backend of the application. The front end was built with HTML5, CSS3, BOOTSTRAP 4. jQuery Framework of JavaScript language was used for the backend. MySQL was used in the database. Day to day tasks needed to be completed and at the end of the workday those tasks were needed to be fulfilled and explained accordingly.

5.2   Requirement Analysis

The requirement definition is concerned with the analysis of the existing system with the aim of determining and structuring the requirement of the proposed system. It is achieved with the aid of user requirement. The Analysis stage was specifically carried out in focus of the functionality dataflow in the developed system.

System Design is the most creative and challenging phase in the system life cycle. Design is the first step into the development phase for any engineered product or system. Design is a creative process. A good design is the key to effective system. System design is a solution how to approach the creation of a new system. System design transforms a logic representation of what is required to do into the physical specification. The specification is converted into physical reality during development.

Hence, I had to conduct a survey to know the needs of users who will be buying tickets according to their needs. And thus, I designed the system as such:

- The system shall incorporate mechanism to authenticate its users
- The system shall verify and validate all user input and should notify in case of error detection and should help the user in error correction
- The system shall allow sharing of files in the system
- The system shall allow quick messages to be exchanged without face-to-face interaction.

5.3   Overview of the System

This process supports existing infrastructure requirements and provides specific recommendations for hardware and network solutions based on existing and projected user needs. Application requirements, data resources, and people within an organization are all important in determining the optimum hardware solution. It is represented using a three-tier architecture that comprises of user interface, process management and Database Management System (DBMS). It shows the components of the system, the services they provide and the way they communicate to bring about the system functionality.

UML Use Case Diagram of the bus ticket reservation system is shown in the diagram below. In this figure, details of the various participants are also detailed.
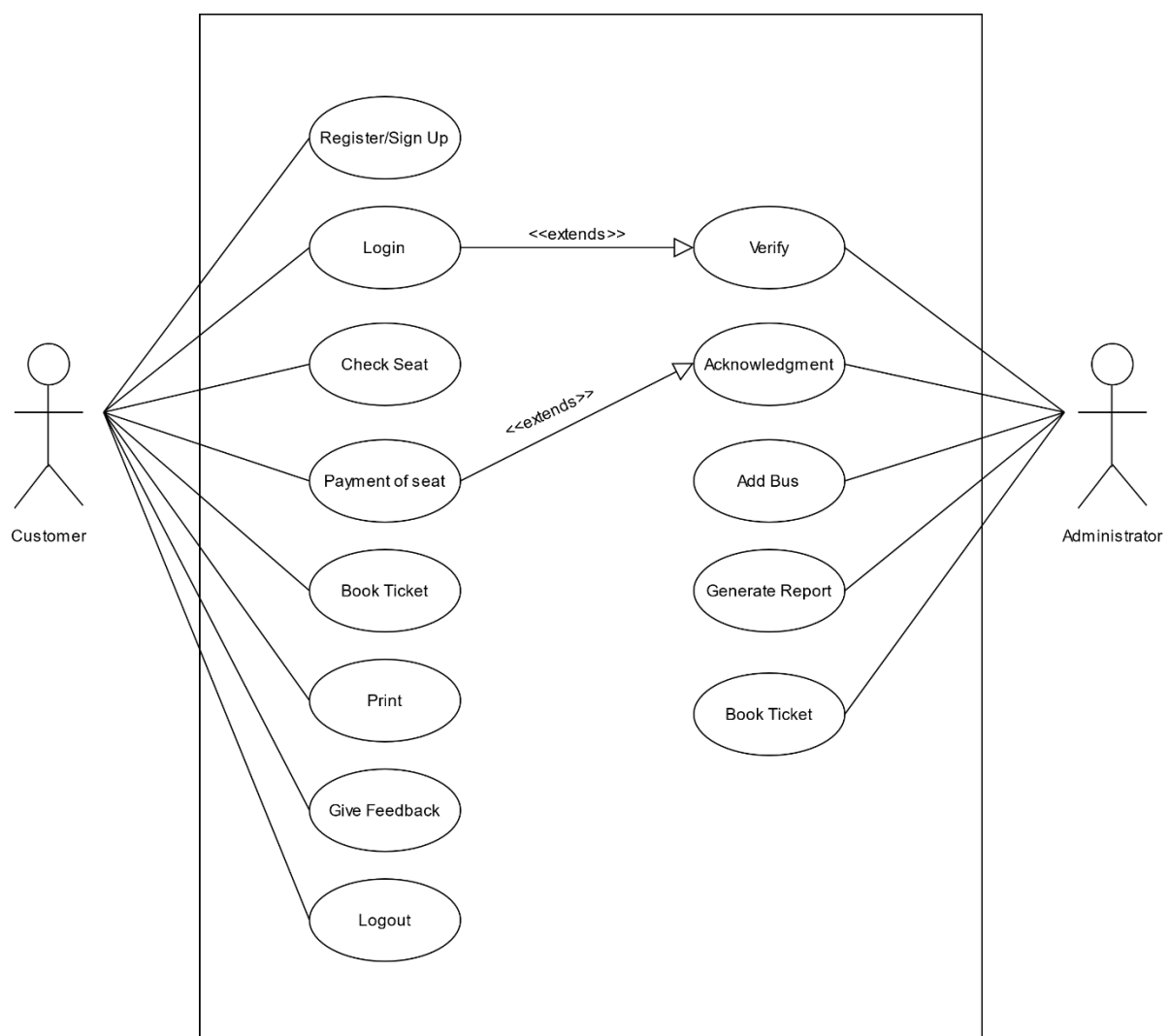
Figure 5. 1 Use Case Diagram of the System

5.4   System Analysis

5.4.1 Six Element Analysis

Table 5. 1 Six Element Analysis

Process	Human	Non-Hardware	Hardware (Computing)	Software	Database	Communication Network
Login/ Register	Users enters email and password	Mobile Number when registered	Keyboard, Mouse and Computer	Web Browser	Stores register data and retrieves login data	Internet
Find Buses	User filters destination, from, date, view seats searches		Keyboard, Mouse and Computer	Web Browser	Retrieves data according to search filtering	Internet
Make /Cancel Reservation	User Clicks Cancel Ticket if the journey needs to be canceled		Keyboard, Mouse and Computer	Web Browser	Modify Booking information	Internet
Purchasing Ticket	User goes through to the checkout process and gateway	Credit Card information / Mobile Banking	Keyboard, Mouse and Computer	Web Browser, Payment Gateway	Stores data if payment successful	Internet

Update/ Manage Bus /Schedule	Admin Panel manages Bus Route, adding or modifying bus information	Bus ID/ License No	Keyboard, Mouse and Computer	Web Browser	Stores / Update data	Internet
Manage Account	User Manages Account Information	Credit Card No/ Mobile Number	Keyboard, Mouse and Computer	Web Browser	Stores / Update data	Internet

5.4.2 Feasibility Analysis

An important outcome of the preliminary investigation is the determination that the system requested is feasible. Feasibility study is carried out to select the best system that meets the performance requirements.

Feasibility study is both necessary and prudent to evaluate the feasibility of the project at the earliest possible time. It involves preliminary investigation of the project and examines whether the designed system will be useful to the organization. Months or years of effort, thousand for millions of money and untold professional embarrassment can be averted if an in-conceived system is recognized early in the definition phase.

The different types of feasibility are: Technical feasibility, Operational feasibility, Economical feasibility.

- **Technical Feasibility**

Technical Feasibility deals with the hardware as well as software requirements. Technology is not a constraint to type system development. We have to find out whether the necessary technology and the proposed equipment have the capacity to hold the data, which is used in the project, should be checked to carry out this technical feasibility. This technical feasibility study gives report whether there exists correct required resources and technologies which will be used for project development. Along with this, feasibility study also analyzes technical skills and capabilities of technical team, existing technology can be used or not, maintenance and up-gradation is easy or not for chosen technology etc.

Our Web Application is highly occupied with resources and humans for development of the system.

- **Operational Feasibility**

The proposed system offers greater level of user-friendliness. The user needs to have a web interface with reliable connection which through he/she will get access to the application. Users can easily look up for the real view of the available seats' layout. The proposed system produces best results and gives high performance. It can be implemented easily. So, this project is operationally feasible.

- **Economic Feasibility**

Economic Feasibility deals about the economic impact faced by the organization to implement a new system. Financial benefits must equal or exceed the costs. The cost of conducting a full system, including software and hardware cost for the class of application being considered should be evaluated. By evaluating the overall application system, we came to learn that the cost to conduct a full system investigation is possible. There is no additional manpower requirement. There is no additional cost involved in maintaining the proposed system.

5.4.3 Problem Solution Analysis

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

Problem 1: Few numbers of defined requirements.

Definition: At the start of the project, when the requirements for the project was set, the survey and questionnaire did not involve too many people for the project. The sample size for the survey was low since only university students and established freelancers were surveyed.

Solution: More participants needed to participate in the survey that was conducted, the application must be viewed through the eyes of any possible freelancers for example housewives, retired personal etc.

Problem 2: Choosing the type of hosting to be used.

Definition: While developing the project, we had a confusion if the team had to go with a dedicated hosting server (Digital Ocean) or to work in localhost server in the device.

Solution: Both server would have worked. But as we were working in pandemic and the development process of the application was interrupted, so we agreed to test our development phases on localhost desktop server.

5.4.4 Effects and Constraints Analysis

A constraint is a restriction on the degree of freedom a company can have in providing a solution. Constraints are effectively global requirements, such as limited development resources or a decision by senior management that restricts the way the development team develop a system. Constraints can be economic, political, technical, or environmental and pertain to project resources, schedule, target environment, or to the system itself. Some of the constraints and its effects are described below:

Constraint 1: Budget

Effect: This constraint has critical effect on for how long the project can continue to be developed before reaching a conclusion to deadline and employees were changed due to COVID-19 situations as some were infected and been replaced with higher rate.

Constraint 2: Time

Effect: Budget and time both constraints are interrelated to each other. Time strictly depends on the budget of the company for the project. The project was given a time of 4 months but due to coronavirus pandemic and Ramadan, the development was delayed.

5.5 System Design

Designing is very crucial for the software development field because it guides you throughout the process of how the workflow will be. In this project, we have contributed to designing and held design as one of the major operations of the project. However, over time as predicted the designs had to be changed and re-constructed while facing many changes in the system. Basically, there are a few steps that are needed to be followed in the Development stage.

5.5.1 Rich Picture

Rich picture is a drawing of a situation that illustrates the main elements and relationships that need to be considered in trying to intervene in order to create some improvement. It consists of pictures, text, symbols and icons, which are all used to illustrate graphically the situation.

In the following rich picture, we have four different users sets: Customer, Admin, Manager and Staff. All the users have to login and register except admin who can willingly remove or add a

user from the group and has all the main power. Admin adds manager for a bus company and that Manager can further has ability to add some staffs to run some activities. Manager can add and manage bus which can be found by searching and can be booked through the application system by a Customer who later purchases tickets. Purchasing information are stored in database. Besides all the users' account information are stored in database. Manager can generate reports from where he can have a view of all the purchasing records and business growth graphs.
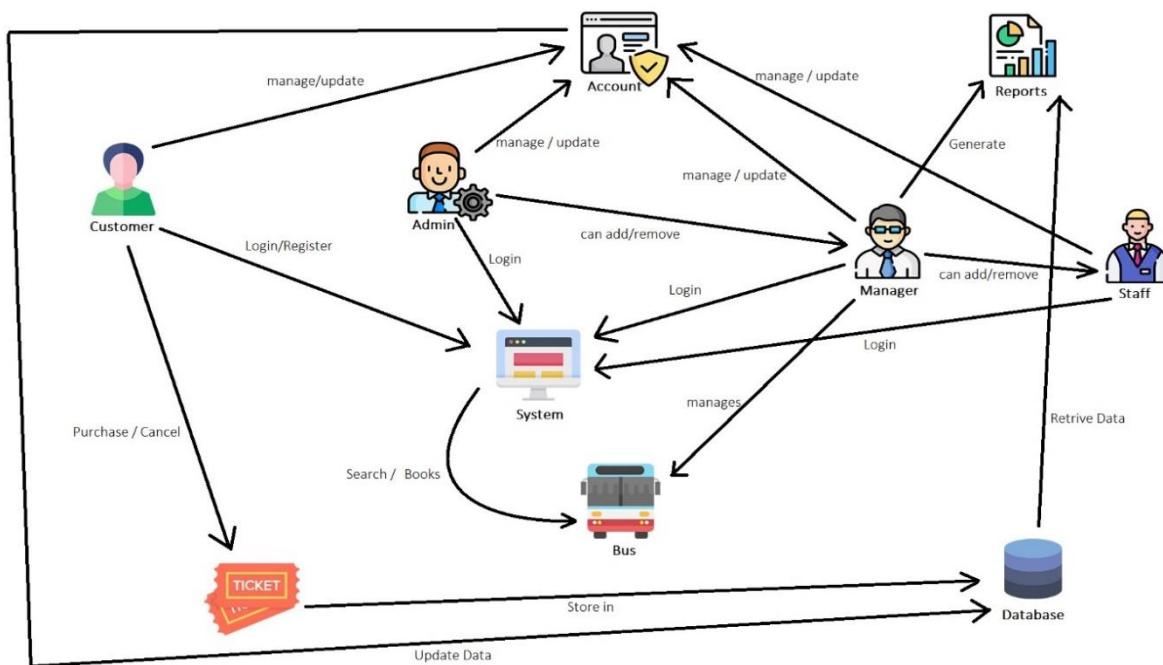
Figure 5. 2 Rich Picture of the System

5.5.2 UML (Unified Modelling Language) Diagrams

A UML diagram is a diagram based on the UML (Unified Modeling Language) with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, in order to better understand, alter, maintain, or document information about the system.[10]

Software development is a complex process. It is more complicated than writing a usual program. Therefore, it is not possible to directly develop the code. First, it is essential to design the system. UML helps to model the system. Later, the developers can write the code according to the designed UML diagrams. There are various UML diagrams. Some common diagrams are as follows.

5.5.2.1 Activity Diagram

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.

Activity Diagram for Admin / Staff:
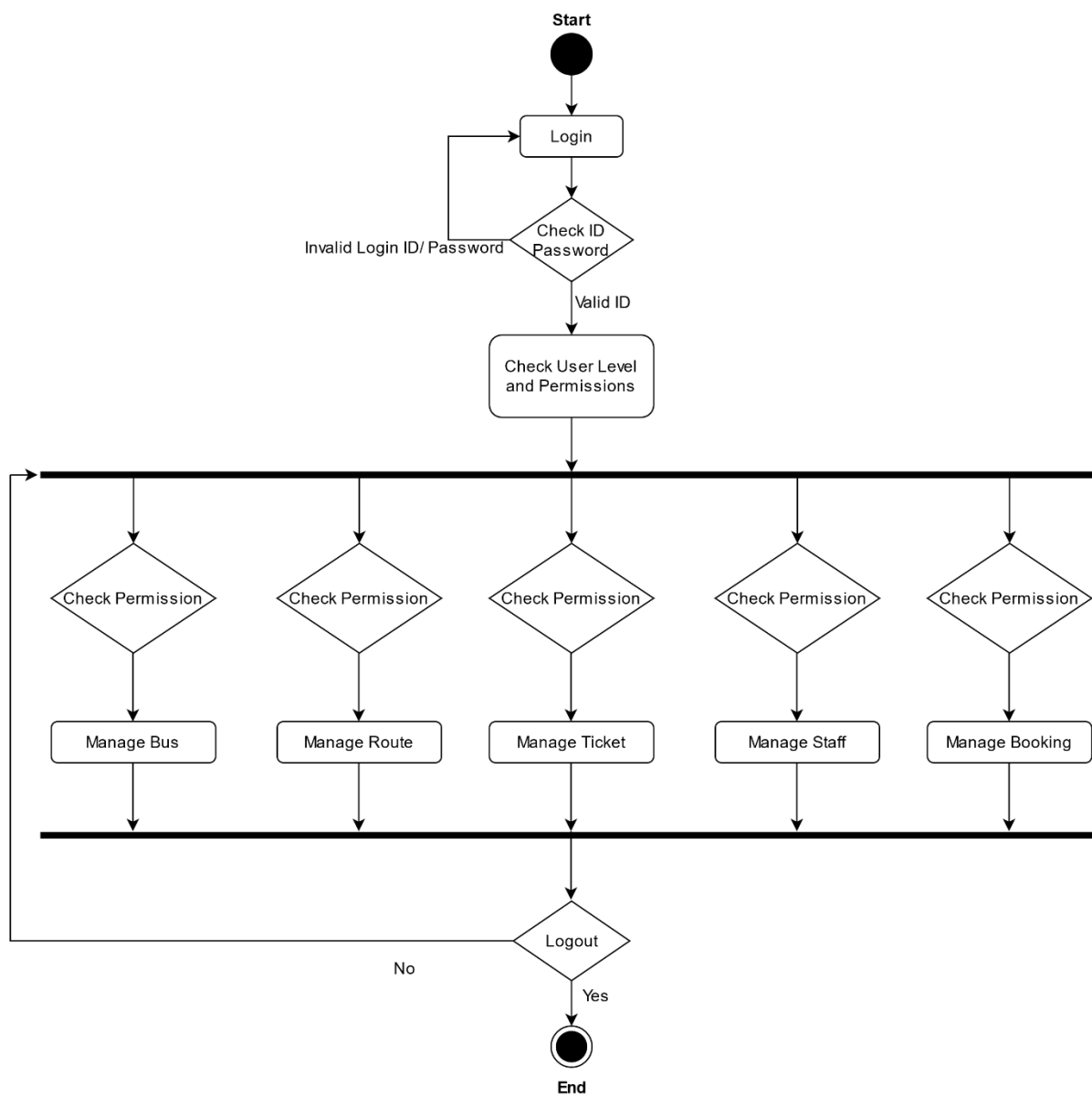
Figure 5. 3 Activity Diagram for Admin / Staff

Activity Diagram for User:
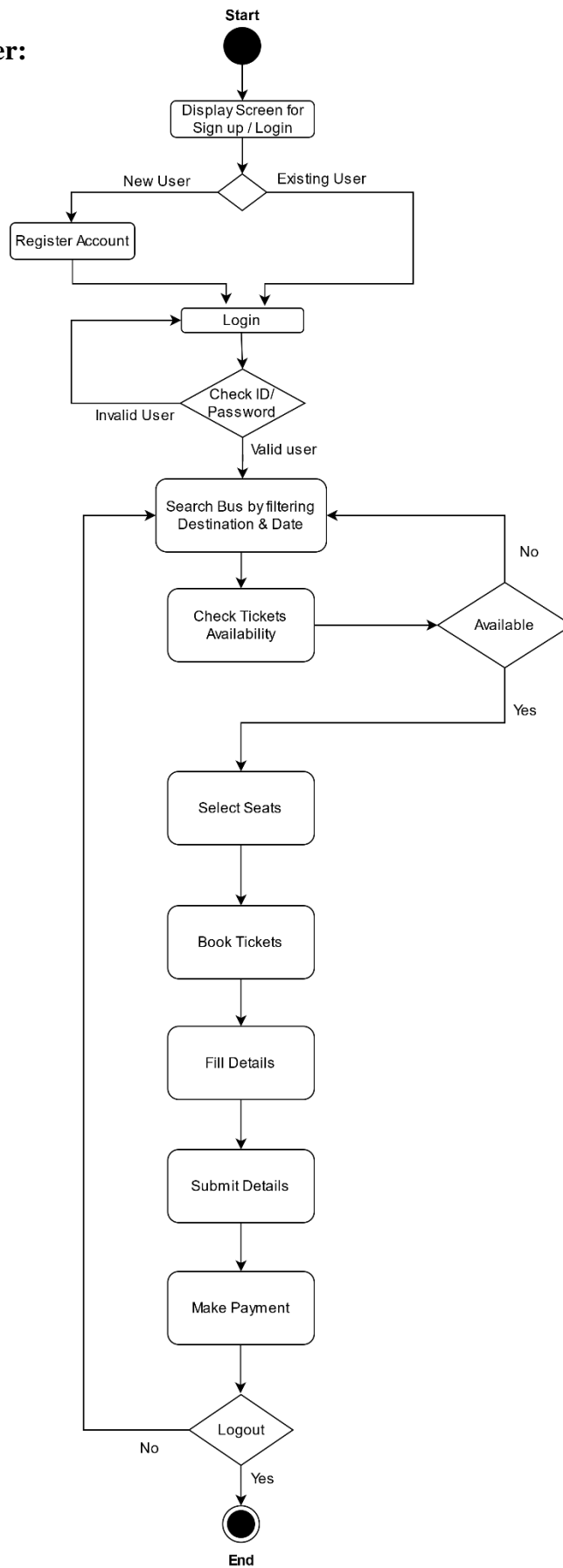
Figure 5. 4 Activity Diagram for User

5.5.2.2 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. A class consists of its objects, and also it may inherit from other classes.[11] A class diagram is used to visualize, describe, document various aspects of the system, and also construct executable software code.
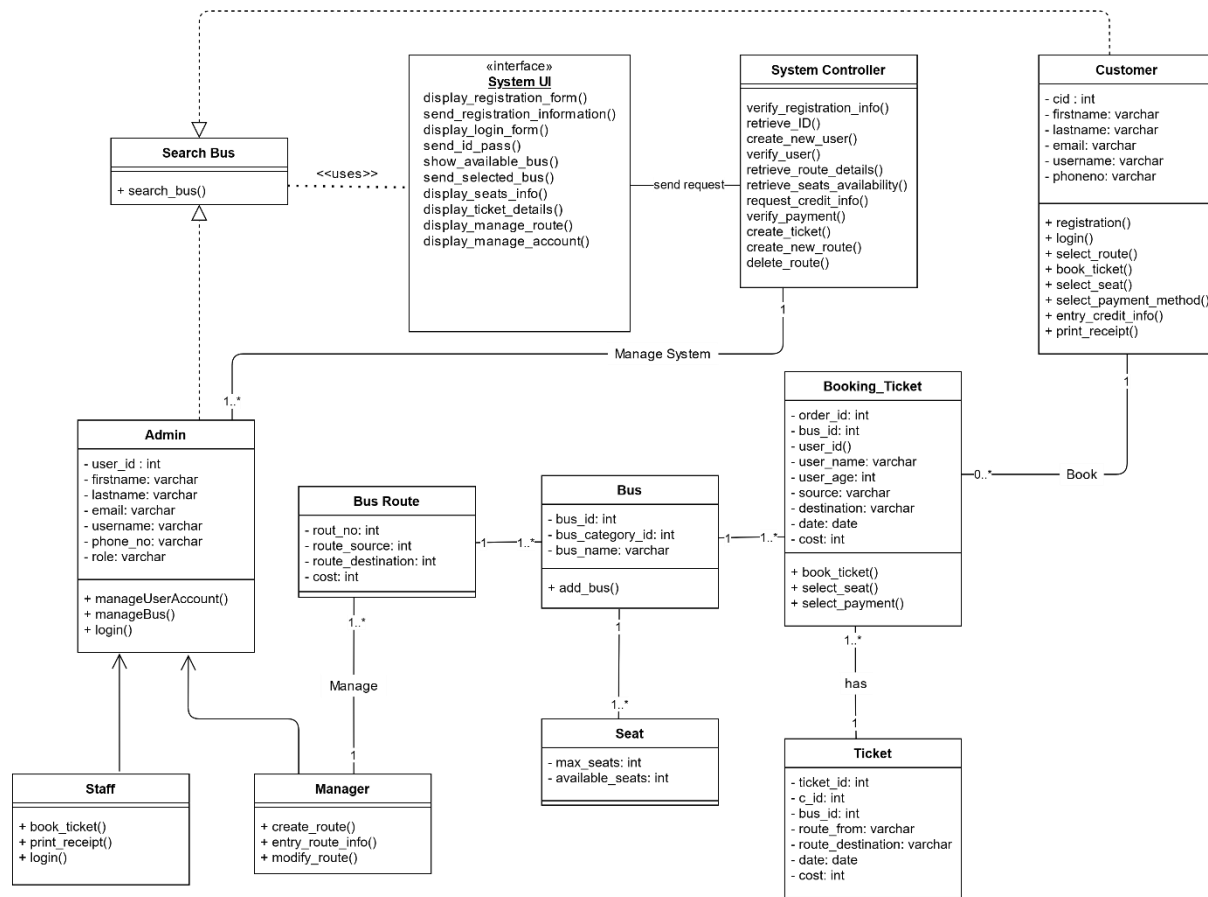
Figure 5. 5 Class Diagram of the system

5.5.2.3 Use Case Diagram

Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors). Each use case should provide some observable and valuable result to the actors or other stakeholders of the system. [12]

25
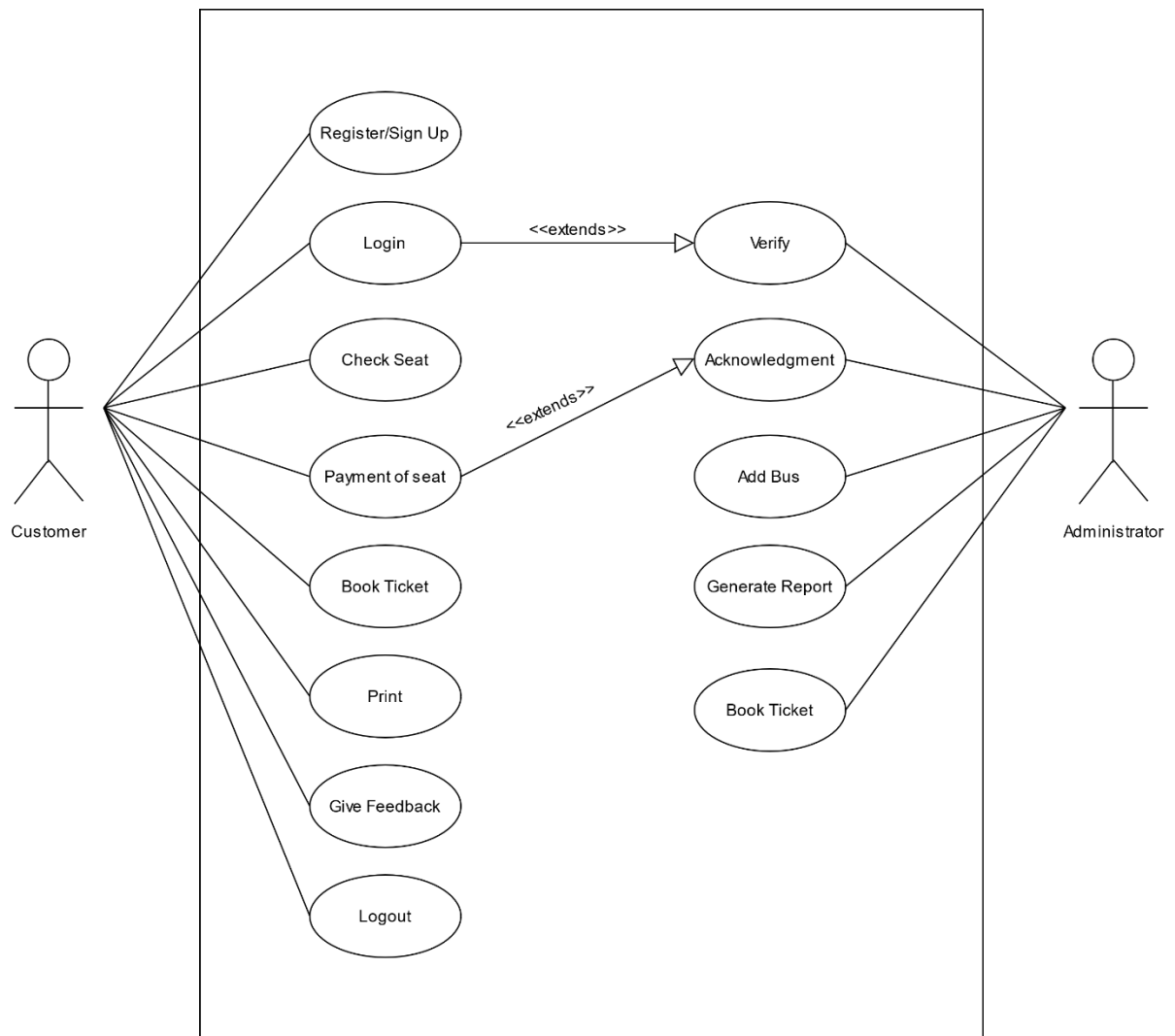
Figure 5. 6 Use Case Diagram of the whole system
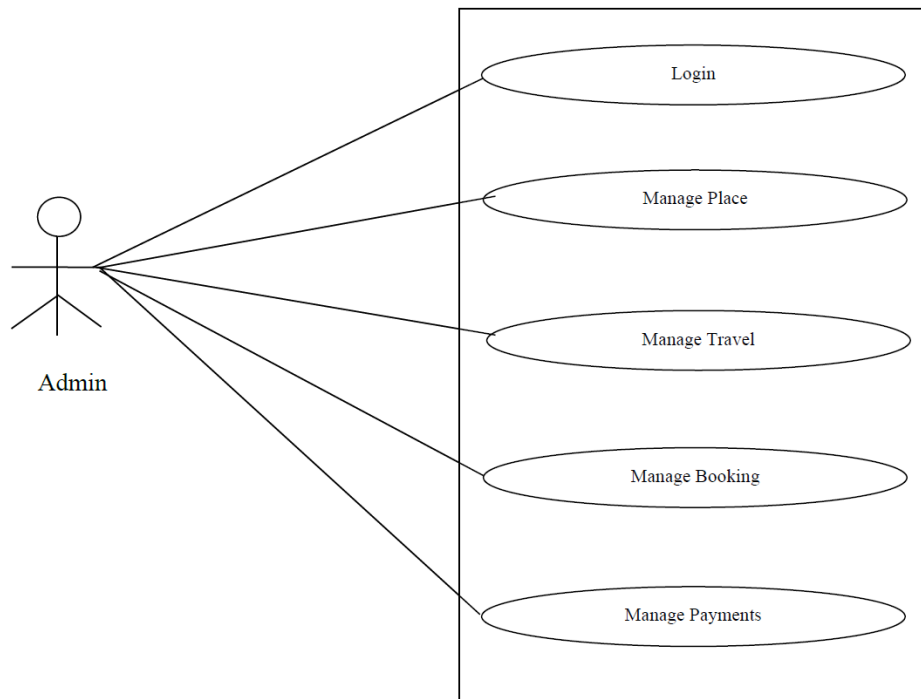
Figure 5. 7 Use Case Diagram of Admin
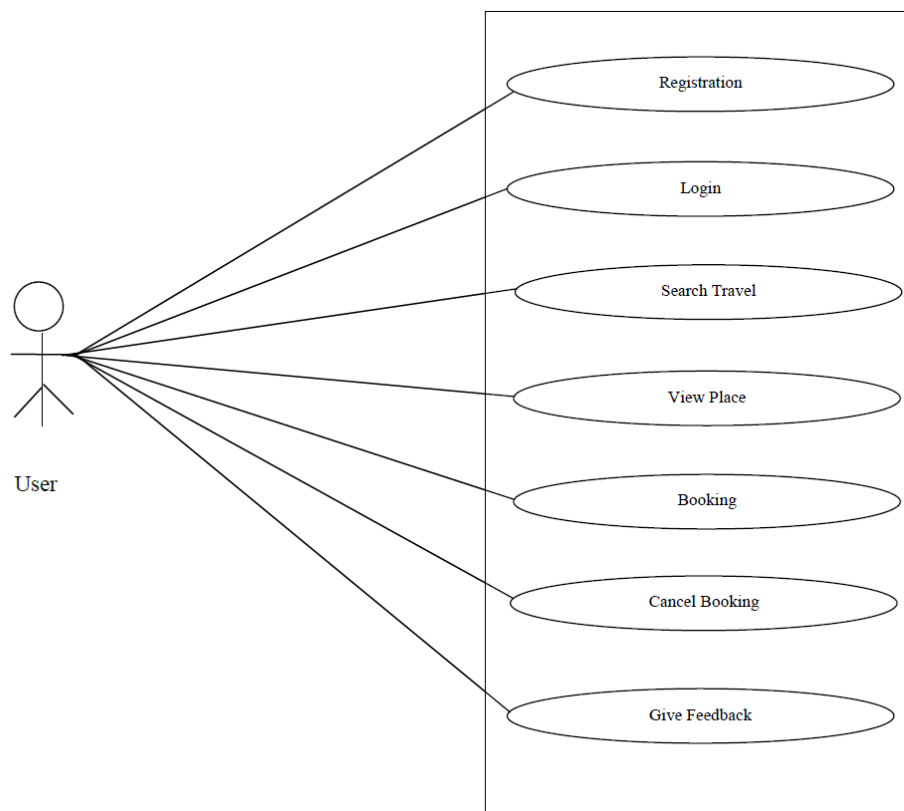
Figure 5. 8 Use Case Diagram of User

27

5.5.3 ERD (Entity Relationship Diagram)

Entity Relationship Diagram separates the information we need for each table and shows how the tables link together. It is a great way to see the overall design of the database. ERD is a graphical representation of the data requirements for a database. It means it takes all the data from the database and puts them in a box in line form.
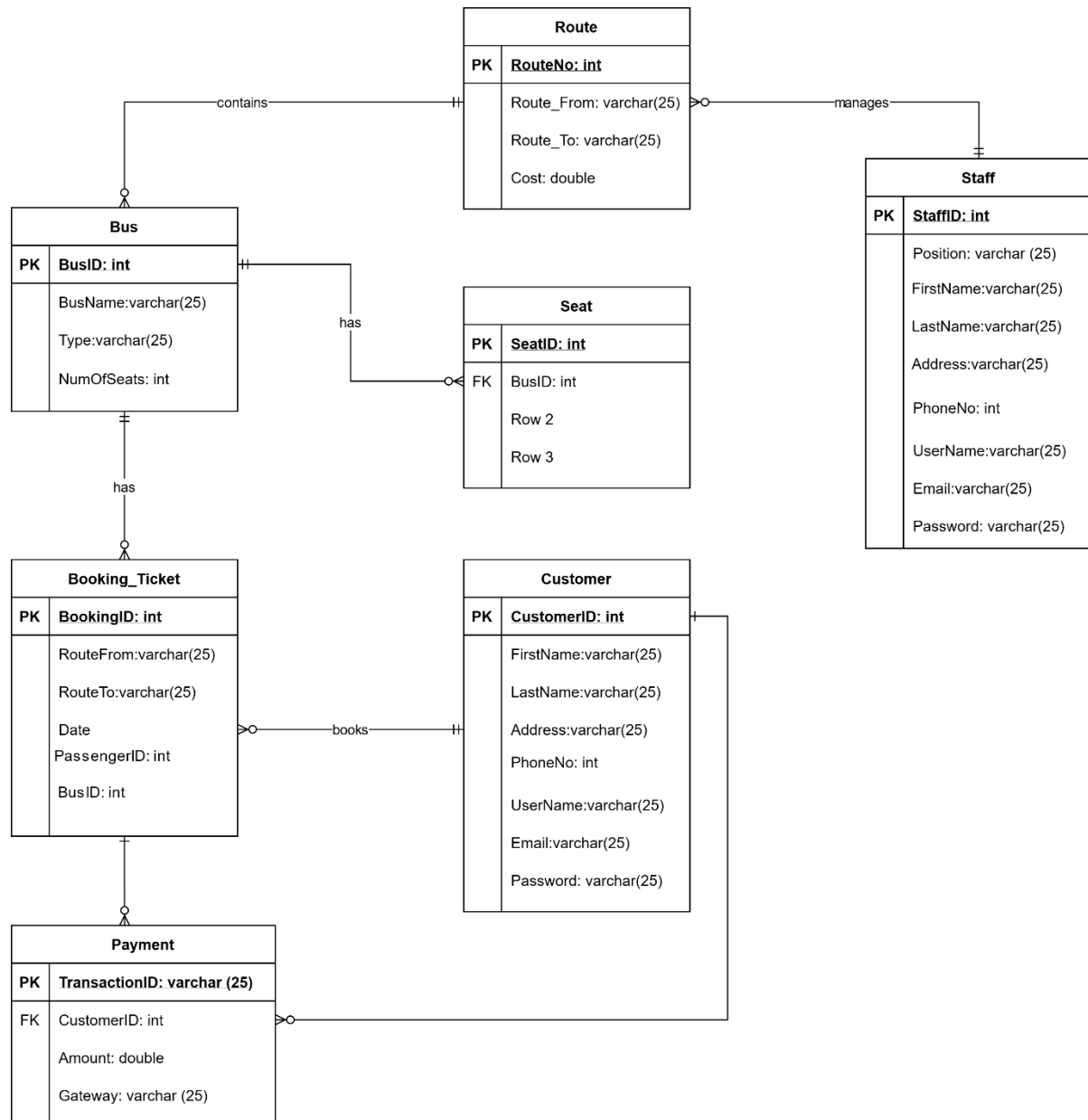
Figure 5. 9 Entity Relationship Diagram

5.5.4 Functional and Non-Functional Requirements

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks. So, it is important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system behavior under specific conditions. Any requirement which specifies what the system should do. In other words, a functional requirement will describe a particular behavior of function of the system when certain conditions are met.

In other hand, a non-functional requirement will describe how a system should behave and what limits there are on its functionality. Non-functional requirements cover all the remaining requirements which are not covered by the functional requirements. They specify criteria that judge the operation of a system, rather than specific behaviors.

Functional Requirements:

- When the user enters information for registration and login, the application sends approval if information is correct and redirects to user dashboard per role.
- Forms filled in every ticket purchase, editing details, cancel booking, on success the user is redirected towards the corresponding display page.
- On every purchase, the user is sent a confirmation mail along with the purchase receipt.
- In every 2 minutes during passenger seat selection, if the user does not select any seat, the page automatically refreshes.
- The system allows admins to show the activity of every user ie: Booking History/Refund issues, Total report generate etc.

Non-Functional Requirements:

- On any POST request (Registration, Login, Booking) the database on receiving the data, saves the information on the database and responds with a status of 200, otherwise facing a problem saving, it responds with a status of 404.
- The layout shall allow users to reach their profile data from any page within 2 clicks from navbar.
- The background color for all screens shall be '#f2e9e9'
- After seat Booking the system sends a confirmation email to corresponding email address within 2 minutes.
- On payment receipt, the data will be saved in pdf.

5.6   Product Features

- **Login and Registration:** In a web application user systems, login and registration are the most common features of any application. After a valid registration user is prompted a message that the registration is successful, then user then can login to the system.

- **Manage Profile:** User can edit any kind of information related to his/her account at any time and stay updated with the system. Admin can manage staff and customers account and modify or delete them.

- **Managing Bus / Route:** Admin and staff can add, remove or modify new or existing buses, their routes, fares, category from dashboard according to their permission level.

- **Manage Payment:** Admin and staff can manage customer payment and work on refund issues related to cancellation of any ticket.

- **Manage Booking:** Admin and staff can manage or modify customers' ticket booking according to customer needs.

- **Cart System:** The system will have a cart associated with every customer account to complete any ticket booking.

- **Payment Gateway:** After booking for seat, the user needs to go through a payment gateway convenient for him like bkash, Nogod, Rocket Mobile Banking or Bank Card.

- **Storing Information:** The internal database stores all kinds of data ever inserted into the system regarding user profile or customers booking.

5.6.1 Input

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

Table 5. 2 Input table with their fields Process Fields

Process	Fields (Type)
Registration	Name – varchar Email – varchar Username – varchar Password - varchar
Login	Email – varchar Username – varchar Password - varchar
Edit Profile	Name – varchar Email – varchar Phone - int Username – varchar Password – varchar Profile Picture - File
Search	Destination From – varchar Destination To – varchar Date - DateTime
Add Bus	Bus Name – varchar Destination From – varchar Destination To – varchar Intermediate Stoppage – varchar Date – DateTime Time - DateTime Bus Image – File Fare - Double
Payment	Select Gateway – radio Credit Card Number – varchar Enter Captcha - varchar

5.6.2 Output

The outputs of the process are listed in the table below.

Table 5. 3 Output table with process

Process	Output
Registration	On Success – Message shown "Registration Successful" On Failure – Error shown under the field's input
Login	On Success – Direct redirect to user dashboard On Failure – Error shown under the field's input
Edit Profile	On Success – Message shown "Profile successfully edited" and redirect to user dashboard On Failure – Error shown under the field's input
Search	On Success – Show Available Buses with details including bus type, route, time, number of available seats, fare On Failure – Message Shown "No Bus Available"
Add Bus	On Success – Message Shown "Bus Added Successfully" On Failure – Error shown under the field's input
Payment	On Success – Message Shown "Payment make Successful" On Failure – Error shown under the field's input or for payment gateway issue, Message shown "Cannot process request at this moment. Please try again"

5.6.3 Architecture

In software engineering, a web-based application-sometimes called a webapp and much less frequently a web application-is an application that is accessed with a web browser over a network such as the internet or intranet. Web applications are popular due to the uniquity of the browser as a client. The ability to update and maintain web applications without distributing and installing software on potentially thousands of client computers is a key reason for their popularity. Though many variations are possible, a web application is commonly structured as a three-tiered application. In its most common form, a web browser is the first tier, an engine using some dynamic web content technology (e.g., PHP, Java servlets or Active Server Pages) is the middle tier, and a database is the third tier. The web browser sends requests to the middle tier, which services them by making queries and updates against the database and generating a user interface. Therefore, the web-based application is chosen in the development of this system. In this online bus ticket reservation system, JavaScript is used for the front-end decoration. MySQL database is used here. Functionalities were done in backend with PHP.

Front-end:

Simple HTML, CSS and few JavaScript are used for the front-end decoration in this system. JavaScript runs interactive web pages effectively. The UI is simple and user friendly. User can easily understand what he/she has to do. In future, developer team will try to improve the interface as much as possible according to UX.

Backend:

PHP is used in full backend to run the system smoothly as it is reliable. PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely used open-source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script but would not know what the underlying code was. PHP is very much popular in web development due to smooth understanding and reliability. Though some functionalities are not yet done due to the unavailability of the developer team during COVID-19 outburst and unwanted shutdown of offices. We will complete the whole project as soon as the situation restores to a stable level.

Database:

Simple database was created in this primary phase. And MySQL is used for database. Database was accessed using localhost server.

5.7   Testing

5.7.1 Introduction

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect-free in order to produce a quality product. This involves the various ways required to verify whether the system is workable. Different specifications were used in testing the program. The test data were analyzed and fed into the computer. During testing, bugs found were debugged and the system was subjected to further testing. **I**t is an art to evaluate the functionality of a software application with an intent to find whether the developed software meets the specified requirements or not and to identify the defects to ensure that the product is defect-free in order to produce a quality product.

5.7.2 Testing Strategy

There are various ways of testing a system to check whether it works accordingly. Hence, designing the test is important to verify whether the system is running as it was meant to and finding any types of errors properly in time for the development of the system accordingly. So, we had to come up with following tests-

- The initial and updated requirements were gathered, understood and planned to work accordingly.
- Technical reviews were taken to evaluate the quality and nature of the test strategy and test cases as well as.
- User groups of the web application and their functionalities are identified.

5.7.3 Testing Analysis

5.7.3.1 Testing Synopsis

The functionalities of the application system that we discussed earlier needs to be tested to verify they work properly.

- Registration
- Login
- Users searching for Bus
- Users viewing selecting seats
- Users make reservation

- Users Editing their profile
- Users making payment
- Admin adding bus
- Admin managing route
- Admin viewing data on admin panel/ dashboard
- Admin managing users
- Admin viewing report and history of total ticket sell

5.7.3.2 Test Table

Table 5. 4 Test Table

Sr No	Test Case	Purpose	Precondition	Test Steps	Expected Results	Actual Results	Status	Remark
1	Registration	Check if a user can successfully register	i) Users need to have stable internet connection ii) Users must enter credentials	i) Enter credentials in the fields provided ii) Enter the Register button	Success- Message shown "Registration Successful" Failure – Error shown under the field's input	Message shown "Registration Successful"	Pass	none
2	Login	Check if user login is working	i) Users need to have stable internet connection ii) Users must enter credentials	i) Enter credentials in the fields provided ii) Enter the login button	After Successful login, redirect to user dashboard	After Successful login, redirect to user dashboard	Pass	None
3	Searching for Bus	Check if user can filter and search for bus	i) Must select destination and date	i) Enter Location "From" and "To", select date in the fields for	Available buses according to search shown. In case of bus unavailabi	Available buses according to search shown.	Pass	None

				journey. ii) Click on Search button	lity, message shown "No Bus Available"			
4	Viewin g, Selectin g Seats	Check if user can view and select seats of an available bus	i) Users need to have stable internet connectio n ii) Must select an available bus	i) Select available bus according to search ii) Enter number of seats needed	Success – User can view seats and enter number of seats needed.	Seats according to selected bus shown. Field to enter number of seats needed.	Pass	None
5	Make Reserva tion	Check if user can make a ticket reservati on	i) Users need to have stable internet connectio n ii) Must select seat numbers in available bus	i) Select available bus ii) Select Number of seats desired upon availabilit y iii) Click on "Book"	Success – User can book seats they need upon availabilit y. Failure – Being much time in booking menu, seats may be filled up and message shown "Server Timeout please proceed again"	User can book /make reservatio n for the seats they need upon availabilit y.	Pass	None
6	Editing user Profile	Check if a user can successf ully edit/mod ify profile informat ion	i) Users must be logged in ii) Must enter/cha nge informati on in Profile section.	i) Click on Edit option in Profile section. ii) Enter/mo dify credential s in the	Message shown "Profile updated Successful ly"	Message shown "Profile updated Successfu lly"	Pass	None

			fields provided. iii) Click on "Update"				
7	Make Payment	Check if user can successfully make payment for the booked ticket	i) i) Users need to have stable internet connection ii) Must book seats(s) in available bus	i) Proceed to "Make Payment" after Booking section ii) Select payment Gateway iii) Enter Bank credentials iv) Click "Submit" button before timeout	Success – Users can successfully make payment for their tickets

Failure— For Being late message shown "Server Timeout please proceed again" | Users can successfully make payment for their tickets | Pass | None |
| 8 | Adding Bus | Check if user can add new bus in the system | i) Must be logged in as an Admin ii) Must enter detailed information about the bus to be added | i) Go to "Add new Bus" from Admin Dashboard. ii) Enter bus data in fields shown iii) Click on the "Add Bus" button | Success – Message shown "Bus Added Successfully"

Failure – Error shown under the field's input | Message shown "Bus Added Successfully" | Pass | None |
| 9 | Managing Route | Check if user can manage bus route | i) Must be logged in as an Admin ii) Must enter information route that has buses | i) | | | | |

			running in					
10	Admin viewing all informa tion of users	Check if Admin can view all informat ion about all users	Must be logged in as Admin	i) Click on Manage Users from Admin dashboar d	Success— Views all the data about all users in the system	Views all the data about all users in the system	Pass	None
11	Admin manage s users	Check if admin can change role of users	Must be logged in as Admin	i) Click on Manage User from Admin dashboar d ii) Select Remove User / Make Admin from any user statistics	Success— Manage any user role in the system/ add new admin	Manage any user role in the system/ add new admin	Pass	None
12	Viewin g Report Statistic s of overall sale	Check if admin can view data report statistics of the bus ticketing business	Must be logged in as Admin	i) Click on Show Data Report from admin dashboar d	Success— User can see total sale records data Failure— Message shown "Cannot compile data"	User can see total sale records data	Fail	Need to work on databa se
13	Logout	Check if user can logout successf ully	i) Must be logged in as user ii) Must Click on logout	i) Click on logout button in navbar	Success— User logs out of his account Failure— No activity on logout click	User logs out of his account	Pass	None

Chapter 6
6. Results & Analysis

6.1 Overview

The overall project work started acquiring the requirement gathering. As it was a demanding system for most of the travel companies around the country, we focused to build it as a generic product and customize as per client companies furthermore. Hence, we the developer team had meeting with CEO about understanding the product we were trying to build. Later we had to conduct survey to make clear idea of the functionalities where university students and job holders participated. Also, the developer team discussed about the User Interface (UI) of the product according to possible client needs.

6.2 Results from surveys and interviews

From the meeting we had with the CEO, it was made clear about how the product is going to be a source of revenue. And from the survey we took, the functionalities of the system were being identified clearly. Simple questions about what the user expect from such a system was asked. Without knowing those from the users of the system, requirements gathering could be incomplete and system might have flaws.

6.3 Testing Result

Yet, the application is not fully developed. Several functionalities are being added regarding the requirements. So, many more test cases may be included later. Developer team worked on problems that has introduced earlier. We have not deployed the application yet. After completing all test case and debugging, a beta version would be released.

From the test case table, we can see that some of the test cases failed to pass. Our developer team is working on it. Due to the outbreak of COVID-19, several team members of the developer team were off duty and hence it was becoming tough to finish the development properly and lots of work were undone.

After the testing phase completion, our team will make a user manual though the system is much user-friendly.

Chapter 7
7.Project as Engineering Problem Analysis

7.1   Sustainability of the Project/Work

The company is planning on making revenue from the project. After the project is completed, the sustainability will be standard as we estimated. The initial outcome is estimated that the online ticket reservation system is to provide a travel company's passengers to purchase ticket online through the system efficiently without attending the ticket counter. Hence, People will be relieved from the physical hassle they have to go through every time they travel from one place to another. There is conveniency of paying the fare via online transaction. New technologies will be implemented in future.

7.2   Social and Environmental Effects and Analysis

Online Bus Ticket Reservation System being a web-based system that ensures that the company would be able to transform most of the processes carried out manually into automated, error-free and easy to use operations in the organization especially in the area of transportation; also, it would be able to generate report for the management decision purpose. There is a common problem that the passenger loses ticket copy and face hassle on the way of journey. As ours is a web application that can generate ticket copy, online soft copy of the ticket will be enough for the journey without any embarrassment.

As a matter of the environment, this automation of the e-ticketing system does not do any harm to it. The ticket copies are made online and thus passengers do not need the hard paper copy which causes pollution. Hence, the environment will remain neat and clean.

7.3   Addressing Ethics and Ethical Issues

The misuse or leak of personal information of a customer may cause collateral damage to someone personal. Therefore, the developer team has used minimum security from hacking the data. In future more layer of encryption technology will be used to ensure zero leakage of information throughout the system.

Chapter 8
8. Lesson Learned

8.1 Problems Faced During this Period

Nothing comes out successfully without problems. And during my project period, I also faced several problems. Collecting the price list of distance traveled was not so easy. We also faced problems while implementing functions in the project work as it was a resourceful project. Communicating with developer team was problematic during the outbreak of COVID-19. Some of them left work and the pressure of finishing the work was at me. So, the project yet not is complete.

8.2 Solution of those Problems

We faced above problems and tried to found ways of solutions. We had to undergo hassle to collect price list according to distance of travel. As our application was a generic product, we thought to add some functionalities later and finished our work as we could do during the pandemic. Office had not that privilege to work remotely and during lockdown, we could not even go to work as planned. Hence, we had to lose much of our times, and we finished as we could do at most.

Chapter 9
9.Future Work & Conclusion

9.1   Future Works

In future, additional functionalities will be implemented. New technologies will be introduced. Many features will be embedded in the system like purchasing additional foods during journey along with purchasing ticket. In future, Mobile application of this online bus ticket reservation system will be developed.

9.2   Conclusion

This report is based on the project "Online bus ticket reservation system" we worked as a team in Bengal Software limited. All the detailed criteria and designing are included in this report. But as there is a pandemic of COVID-19 outbreak in our country, and the developers were off duty, the project is incomplete during the creation of this report.

The team members were helpful in many aspects and the whole period of internship made me realize how to work in corporate office in difficult situations. The time period I spent in the company was truly an opportunity to have great experience.

References

[1]   Niteesh Joshi, M. W. (November 2016). Study of an Effective Online Bus Pass Generation and Renewal System. *International Journal of Advanced Research in Computer and Communication Engineering*.

[2]   S. Gayathry, 2013. TRAVELLING MADE EASY (A Case Study of redBus.in), Research Journal, SRM University, Vadapalani Chennai

[3]   Greyhound, 2021, Retrieved: 3rd March 2021, https://www.greyhound.com

[4]   redBus, 2021, Retrieved: 3rd April 2021, https://www.redbus.in

[5]   Kallada Travels, 2021, Retrieved: 3rd April 2021, http://www.kalladatravels.com

[6]   Desh Travels, 2021, Retrieved: 3rd April 2021, http://deshtravelsbd.com/en_US

[7]   Work Breakdown Structure, 2021, Retrieved: 7th April 2021, https://www.workbreakdownstructure.com

[8]   Software Testing Help, 2021, Retrieved: 9th April 2021, https://www.softwaretestinghelp.com/what-is-sdlc-waterfall-model

[9]   Hevner A., March S., Park J., and Ram, S. (2004): *Design Science in Information Systems Research. MIS Quarterly*

[10]   Tallyfy, 2014, Retrieved: 20th April 2021, https://tallyfy.com/uml-diagram

[11]   Microtool, 2020, Retrieved: 20th April 2021, https://www.microtool.de/en/knowledge-base/what-is-a-use-case-diagram

Appendix A (Questionnaire for Survey)

Q1. What is your Name?

Answer: ………………………………………………………….

Q2. Gender:

Answer: (a) Male (b) Female (c) Other

Q3. What is your Occupation?

Answer: ………………………………………………………….

Q4. What is your Bus Travel status?

Answer: (a) Frequent (b) Sometimes (c) Too less

Q5. How do you buy bus tickets?

Answer: (a) From Counters (b) Online

Q5. Do you get online bus ticket reservation facility everywhere?

Answer: (a) Yes (b) No

Q6. What kind of problem you have faced with the manual bus ticket reservation system?

Answer: ………………………………………………………….

Q7. Did you face any difficulties in the existing online bus ticket reservation systems in the market? If yes, please mention it in few words.

Answer: (a) Yes (b) No

……………………………………………………………………….………………….

Q. Do you want the implementation of a trusted Online Bus Ticket Reservation System?

Answer: (a) Yes (b) No

Q8. Which features do you think are important for such a system?

Answer: ………………….…………………….………………….……….

Q9. How do you want to make payment for the tickets?

Answer: (a) Bank-Transaction (b) Mobile Bank Transaction (c) On-Spot journey

Q10. Please give opinion on how you think about something new in the online bus ticket reservation system.

Answer: ……………………………………………………………….

Appendix B (UI Images)

Home Page

Registration Page

Searching for Bus

Book Tickets