

“EASY BUS” Online Bus Booking & Tracking Mobile Application



GROUP A26
PUSL2021-COMPUTING GROUP PROJECT
Final Project Report

Name: Wedamulla Madusanka

Student Reference Number: 10899603

Module Code: PUSL2021

Module Name: Computing group project

Coursework Title: Final Report Submission

Deadline Date: 20/04/2024

Member of staff responsible for coursework: Dr Chaminda Wijesinghe

Programme: BSc (Hons) Software Engineering

Please note that University Academic Regulations are available under Rules and Regulations on the University website www.plymouth.ac.uk/studenthandbook.

Group work: please list all names of all participants formally associated with this work and state whether the work was undertaken alone or as part of a team. Please note you may be required to identify individual responsibility for component parts.

We confirm that we have read and understood the Plymouth University regulations relating to Assessment Offences and that we are aware of the possible penalties for any breach of these regulations. We confirm that this is the independent work of the group.

10899603- Wedamulla Madinage Thisara Madusanka

10899521- Navindu Nimsara Gamage

10899621- Chathupraba Devindi Munasinghe

10899556- Yaddehi Kishal Sankalpa Jayalath

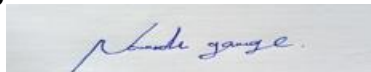
10899685- Kihaduwege Diduli Wijini Sahasra

10899600- Senanayake Dasili Liyanage Sameepa Pramuditha

Signed on behalf of the group:

Individual assignment: ***I confirm that I have read and understood the Plymouth University regulations relating to Assessment Offences and that I am aware of the possible penalties for any breach of these regulations. I confirm that this is my own independent work.***

Signed:



Use of translation software: failure to declare that translation software or a similar writing aid has been used will be treated as an assessment offence.

I *have used/not used translation software.

If used, please state name of software.....

Overall mark ____%

Assessors Initials ____

Date _____

Abstract

The goal of this project is to create a mobile application that will speed up bus seat reservations and tracking processes in Sri Lanka. The primary objectives were to improve the user experience, boost the operational efficiency of bus operators, and provide real-time bus tracking and seat reservation capabilities.

To achieve these objectives, a mix of user interviews, observations, and surveys was used to collect data on user preferences and pain points. In addition, existing records were reviewed to improve the data collection process. The Flutter framework and the Dart programming language were used to create the system, and dependencies were added to enhance features like local database management and Google Maps integration.

Notable results include the successful development of an easy-to-use mobile application that enables users to plan bus routes, track the location of buses in real-time, and make seat reservations fast. The system architecture was designed to ensure scalability and stability, and it is distributed to app stores to enable widespread accessibility.

In summary, the project provides a feasible solution to the ineffective bus seat reservation and monitoring problem in Sri Lanka. However, limitations like reliance on network connectivity and other security concerns should be addressed by future generations. Suggestions include making even more improvements to the user interface and monitoring user feedback to ensure ongoing progress.

Table of Contents

Introduction	5
Overview of the Project.....	5
Purpose of the project	5
Justification for the project.....	6
Scope and objectives	6
Background.....	7
It is essential to comprehend the theoretical foundations and empirical research findings in this area.	7
Literature study.....	8
Theoretical Framework for the Solution.....	9
User requirement	10
Users (Stakeholders):.....	10
Fact Gathering.....	10
Use Case Analysis.	11
Persona Development.....	12
Requirements Prioritization	12
Functional Requirements:.....	13
Non-Functional Requirements:.....	13
Verification and Validation of Findings:	13
Functional Specifications	14
Functional Requirement ID: RTB-001	14
Functional Requirement ID: RTB-002	14
Functional Requirement ID: RTB-003	14
Functional Requirement ID: RTB-004	15
Functional Requirement ID: RTB-005	15
Functional Requirement ID: RTB-006	16
Functional Requirement ID: RTB-007	16
Functional Requirement ID: RTB-008	16
Technical Specification	17
User Interface Design- UI and UX.	17
Firebase Firestore Database Tables	20
Data Model.....	23
System Architecture	23
Deployment and Infrastructure	24
Testing Strategy	24

Dependencies	24
Work breakdown.....	26
Project Phases:	26
Work Breakdown Structure (WBS)	27
Timeline:.....	28
Gnatt chart.....	29
Critical Path & total time duration.	29
The total time duration for completing the critical path tasks is:	29
Resource Allocation	29
Milestones alien with deliverables.	31
Results and Discussion.....	32
Discussion on Achievements.....	32
Test Cases/Test Results Summary	33
Findings and rectifications suggested /applied	35
Future improvements and development path	35
Appendix.....	36
Individual contribution Metrix	36
User requirement gathering data.....	38
References.....	47
GitHub Link	47
Conclusion	49

Introduction

Overview of the Project

Our project, "Easy BUS-The Digital Bus Tracking and Reservation Platform," is a smartphone application that we hope will revolutionize and revive the bus transportation sector. Having acknowledged Sri Lanka's current status and its vital role in social development, we have decided to concentrate only on intercity bus services. Because obtaining tickets for highway bus routes is a deeply ingrained traditional habit, there are currently long lines at bus stations before departure. Therefore, there is an urgent need for a cutting-edge solution that offers expedited ticket procurement and real-time bus status updates in order to meet the exacting expectations of customers.

This technology will drastically change bus booking and tracking while also greatly increasing the convenience, effectiveness, and usefulness of buses. The project's goal is to improve the overall experience by integrating safe payment methods, user-friendly interfaces, and real-time tracking for both bus drivers and passengers. Even though transportation companies have moved from a manual to an automated approach for managing the data of their drivers and passengers in the booking and tracking areas, some adjustments still need to be made. One of these upgrades is a feature that allows users to follow the whereabouts of the reserved bus, as well as its arrival and departure times and whether the route trip has been canceled.

In a fast-paced setting where accessibility and convenience are crucial, modern commuters have high expectations, and traditional bus seat reservation techniques frequently fall short of meeting those expectations. By introducing a clever mobile application made especially for bus seat reservations, the suggested concept seeks to transform this aspect of transportation. This software will function as a digital gateway, connecting passengers with available seats on various bus routes with the ease of a smartphone.

Purpose of the project

Closing the gap between the antiquated bus seat reservation processes and the changing needs of contemporary travelers is the main objective of this project. The project intends to eliminate the logistical challenges associated with traditional booking methods by using mobile technology, turning a tedious process into a straightforward and easy experience. Through this effort, the initiative hopes to rethink and improve the bus seat reservation paradigm, making it more efficient and user-friendly.

Justification for the project

From a strategic standpoint, the initiative is a proactive response to the shifting landscape of the transportation sector. By making an investment in a mobile application for bus seat booking, bus operators can increase the effectiveness of their operations and solidify their position in a fiercely competitive market. In addition, the idea has the potential to advance accessibility and inclusion in society by providing commuters from a variety of backgrounds with unparalleled comfort and convenience.

The project also tackles the need for safe and convenient transportation options in society, especially in rural and urban areas where public transportation is essential for fostering a sense of community. The program employs technology to increase accessibility and dependability of bus services, reduce traffic, and promote environmentally friendly transportation methods.

Scope and objectives

Scope:

The project's scope is broad; it includes everything from developing a feature-rich mobile application to seamlessly integrating it with bus management systems that are currently in use. This comprises the following:

- **Extensive Feature Set:** The mobile application offers a wide range of features, including real-time seat availability, safe payment methods, route research, and personalized booking options.
- **Sophisticated interaction:** By ensuring real-time data synchronization through seamless interaction with backend bus management systems, operators can efficiently manage reservations and enhance seat allocation.
- **Robust Testing Regimen:** Implementing a rigorous testing schedule to ensure the program's dependability, security, and usability across a range of user scenarios and operating environments.
- **Strategic Deployment:** Use targeted marketing strategies in conjunction with a strategic distribution of the application across the primary app distribution channels to maximize the number of users and engagement.

Objectives:

The project's many goals are designed to further the primary objective of streamlining the bus seat reservation process while also offering genuine advantages to interested parties. These objectives include:

- **User-Centric Design:** Booking is made easy for users of all demographics by offering a user-centric mobile application that prioritizes accessibility, ease of use, and intuitiveness.
- **Operational Efficiency:** Bus operators can increase their operational efficiency by increasing seat usage, automating crucial tasks, and offering real-time insights into customer preferences and booking patterns.
- **Customer Delight:** promoting an environment where users' opinions are actively sought after, problems are fixed right away, and the program is constantly improved to go above and beyond what users could ever hope for.
- **Income Growth:** Bus operators can boost revenue growth by implementing strategies such as expanding their clientele, enhancing value-added services and partnerships, and boosting booking frequency.
- **Market Leadership:** establishing the mobile application as the preferred method for bus seat reservations in the target market, thereby solidifying the brand's leadership position in digital transportation solutions.

By defining a clear scope and setting realistic yet challenging objectives, the project opens the door for revolutionary innovation in the bus seat reservation market, which is anticipated to have a significant impact on the transportation environment.

Background.

As digital technology has expanded and the demand for convenient transportation options has increased, online bus booking and tracking systems have grown in popularity. Conventional bus ticket purchasing and route tracking systems often have lengthy lineups, manual processes, and a lack of real-time bus position visibility. These features are inefficient and annoying for both customers and service providers.

Online booking and bus monitoring systems have the potential to revolutionize public transportation and enable sustainable mobility solutions in both urban and rural environments by driving operational effectiveness, improving the overall passenger experience, and streamlining the booking process. Consequently, in order to develop efficient, user-centric solutions that satisfy the changing needs of service providers and customers alike,

It is essential to comprehend the theoretical foundations and empirical research findings in this area.

Literature study

Summary of Current Research:

There has been a great deal of research on seat reservation systems and bus tracking, albeit with varying goals and methodologies. Technological developments in transportation have been examined, including the use of smartphone applications, GPS tracking, and online booking platforms. Studies have also examined the impact of these technologies on the transportation sector's capacity to enhance user experience, maximize resource utilization, and boost operational effectiveness.

Current Products or Solutions:

There are currently a wide range of goods and services on the market, ranging from standalone bus tracking applications to comprehensive bus management platforms. These solutions come with features like secure payment processing, real-time bus tracking, seat reservations, and route planning. Among the notable instances are:

- a) Google Maps Transit: users to plan their routes and view real-time arrival times and bus schedules.
- b) Moovit: Offers a feature-rich public transportation app with route planning, bus monitoring, and real-time arrival and departure bus updates.
- c) BusBud: An online resource where customers can check bus schedules, compare costs, and buy tickets.

Evaluation of Advantages and Disadvantages:

Advantages:

- Improved Accessibility: Passengers can easily view bus timetables, track the location of buses, and reserve seats from the comfort of their smartphones.
- Enhanced Efficiency: Real-time tracking and optimization algorithms enable the reduction of waiting times, the ease of traffic, and the overall operational efficiency.
- Better User Experience: Using user-friendly interfaces and efficient booking processes results in a more positive experience for passengers.

Disadvantages:

- Technology Dependency: Reliance on GPS signals and mobile networks may lead to service disruptions or erroneous bus tracking data.
- Connectivity issues: Individuals may experience difficulty completing online reservations or obtaining real-time information in locations with sporadic network connections.
- Security Problems: Online transactions and personal information stored on the system could be vulnerable to cybersecurity attacks if it is not properly secured.

Theoretical Framework for the Solution

Theories at the Development/Design Level Involved:

- a. User-Centered Design (UCD): The project makes use of UCD principles to ensure that the mobile application is developed with the end user in mind. The app prioritizes usability, accessibility, and user satisfaction in order to deliver a seamless and easy booking process.
- b. Information Systems Theory: Information systems theory, which emphasizes the value of data management, information flow, and system interoperability, is followed in the design and implementation of the bus tracking and booking system. By applying this theoretical framework, the research aims to develop a scalable and dependable system that can handle large volumes of data and facilitate seamless communication between various components.
- c. Users' attitudes about how to accept and use new technology are provided by the Technology Acceptance Model, or TAM. The project aims to ensure that the mobile application meets the needs and expectations of its target customers by identifying and overcoming potential adoption hurdles through the integration of TAM aspects into the design process.
- d. Agile development technique: This technique facilitates rapid prototyping, continuous feedback, and iterative development. The project team can promptly address changing needs and stakeholder feedback because this method allows for flexibility and adaptation throughout the development process.

Justification:

- UCD ensures that the application is user-friendly and meets the needs of the target audience, thereby boosting user satisfaction and adoption.
- Information systems theory provides a foundation for developing a scalable, interoperable system that can effectively manage bus tracking and booking data.
- TAM helps identify factors influencing user acceptability and adoption, which in turn directs the design process to maximize usability and reduce resistance to change.
- Agile development ensures that the application adapts to its stakeholders' and users' changing needs, allowing the project team to iteratively improve the application based on user feedback.

User requirement

Users (Stakeholders):

- ❖ Passengers: The main users of the bus tracking and reservation app are those who use it to find routes, reserve seats, and monitor the location of buses.
- ❖ Bus operators: These are the individuals responsible for overseeing the fleet, scheduling, and day-to-day operations of buses. To keep an eye on bus performance, figure out the best routes, and interact with passengers, they need the right equipment.
- ❖ Administrators: They are in charge of managing user accounts, keeping an eye on the overall functionality of the online booking platform, and guaranteeing the security and dependability of the system.

Fact Gathering

Questionnaires:

Stakeholders, bus operators, and commuters in Sri Lanka were sent structured questionnaires to gather data on preferences, issues, and behaviors related to bus transportation.

Observations:

thorough observations conducted during bus rides and at bus stops to get a firsthand understanding of user interactions, behavior, and experiences. Important contextual information is also provided by these observations.

Current Documents Searching:

selecting relevant data and insights about bus travel in Sri Lanka by going over the papers, research, and documentation that are currently available from governmental organizations, transportation authorities, and academic institutions.

Ex:

- MMC Kottawa Website : <https://www.mmck.lk/index-en.html>
- Article about Mobile Application for Smart Intercity Bus Tracking and Booking System in Sri Lanka by Nivesh Wanninayaka
- NTC Website : https://www.ntc.gov.lk/Bus_info/time_table.php

Use Case Analysis.



Persona Development

The process of designing and developing any product, including the Online Bus Tracking and Booking Mobile Application, must include the creation of personas. Personas are made-up characters designed to represent various user groups according to their behavioral, psychographic, and demographic traits. They help teams create user-centered solutions by assisting them in comprehending the requirements and preferences of users. Below is a summary of the steps involved in developing personas for the bus reservation and tracking app:

- **Identify User Segments:** Select the specific user segments that will initially use the program the most. Passengers, tourists, business travelers, students, and other groups of people can all be served by a bus tracking and reservation software.
- **Obtain User Information:** To learn about user demographics, preferences, and pain points, gather data through surveys, interviews, market research, and analytics.
- **Create Persona Profiles:** Using the gathered data, create persona profiles that correspond to various user categories. Personal information like name, age, profession, objectives, driving forces, difficulties, preferences, and actions connected to using the bus booking and tracking app should all be included in a persona.
- **In order to create persona scenarios,** outline common use cases or scenarios where each persona would communicate with the software. A few examples of these include purchasing a ticket, boarding the bus, making the payment, consulting the schedule, and getting alerts.
- **Verify and repeat:** To get input and confirmation, distribute the persona profiles to relevant parties such as product managers, designers, and developers. Rewrite the personalities of the characters based on the information acquired during the validation procedure.
- **Update Often:** Review and modify persona profiles on a regular basis in response to user feedback, shifts in industry trends, and modifications to user requirements. Updates to the persona make sure the application is always up to date and user-focused.

Requirements Prioritization

Requirements prioritization is a crucial stage in the software development process that involves ranking features and functionalities based on their value, significance, and impact on the project's objectives. Setting needs in order of importance expedites development, guarantees that users receive the most important features first, and facilitates resource allocation. An approach to ranking requirements that is generally used is as follows:

- Assemble Requirements
- Understand Stakeholder Needs
- Define Evaluation Criteria
- Apply Prioritization Techniques
- Facilitate Collaborative Decision-making
- Iterate and Refine
- Document and Communicate
- Monitor and Adjust

Functional Requirements:

These specify the desired functionality of the bus tracking and booking system, including features such as:

- User registration and login
- Route search and selection
- Seat selection and booking
- Real-time bus tracking
- Payment processing
- Notification alerts

Non-Functional Requirements:

These define the quality attributes and constraints of the system, including:

- Performance: Response times, scalability, and reliability of the system.
- Security: Data encryption, secure authentication mechanisms, and compliance with data protection regulations.
- Usability: Intuitive user interface, accessibility features, and support for multiple devices and platforms.

Verification and Validation of Findings:

Results will be validated through cross-referencing data from observations, surveys, user interviews, and use case analysis to ensure reliability and consistency. Project goals and stakeholder expectations will be taken into consideration when reviewing requirements to ensure alignment. Prototypes and mockups may be created to validate design decisions and gather user feedback

prior to proceeding with development. Frequent validation and verification checkpoints will also help ensure that, at every stage of the development lifecycle, the final product meets user needs and effectively delivers value.

Functional Specifications

Functional Requirement ID: RTB-001

Requirement Description: An email address, full name, and password must be required in order for users to create an account on the bus tracking and booking online system.

Dependencies: None

Acceptance Criteria:

- From the system homepage, users ought to be able to reach the registration page.
- Users should receive a confirmation email to confirm their email address after registering.
- Users ought to be able to access their accounts by entering their password and registered email address.

Priority: High

Functional Requirement ID: RTB-002

Requirement Description: It should be possible for users to look up bus routes according to their preferred travel dates, origin, and destination.

Dependencies: None

Acceptance Criteria:

- The homepage should have a search bar that is easily visible to users.
- Based on user input, autocomplete suggestions should be supported by the search functionality.
- Search results should be filterable by bus operator, arrival time, and departure time for users.

Priority: High

Functional Requirement ID: RTB-003

Requirement Description: Access to comprehensive information on bus routes that are currently available, including bus operators, departure and arrival times, and ticket pricing, must be provided to users.

Depending on: Functionality for searching RTB-002

- A clear and well-organized list of search results should be presented to users, according to the acceptance criteria.
- Relevant information regarding the bus route should be provided by each search result. It should be possible for users to examine more information by clicking on a certain route.

Priority: Very High

Functional Requirement ID: RTB-004

Requirement description: When purchasing bus tickets, customers should have the option to choose the seats of their choice.

Dependencies: nonexistent

Acceptance standards

- After selecting a particular bus route, users should be presented with an interface for selecting a seat, along with the cost of each seat.
- If necessary, users ought to be allowed to choose from a variety of chairs.

Middle-level Priority

Functional Requirement ID: RTB-005

Using a variety of payment options, including credit/debit cards, mobile wallets, and internet banking, users must be able to safely purchase the tickets they have reserved.

Depending on: Seat selection for RTB-004

Standards of Acceptance:

- Upon verifying their seat selections, users should be redirected to a secure payment gateway that offers a variety of payment methods and clear directions on how to finish the transaction.
- As soon as the money is successfully processed, users ought to receive an email including their ticket details.

Priority: Very High

Functional Requirement ID: RTB-006

The capability for users to follow the whereabouts of buses they have reserved in real time is described as a requirement.

There are no dependencies.

Recognition standards:

The account dashboard should include a "Track My Bus" option available to users.

In addition to the predicted arrival timings, the tracking interface need should provide the bus's present location on a map.

- Notice of any major delays or modifications to the route should be sent to users.

Priority: Very High

Functional Requirement ID: RTB-007

The requirement description states that users must be able to contact customer service with any questions, concerns, or comments they may have regarding their reservations.

Dependencies: Not present

Gratitude Requirements:

- The system's navigation menu should provide users with access to a "Contact Us" or "Support" area.
- A knowledge base, email support, and live chat should all be available through the support system.
- Inquiries from users should be promptly answered, and they should be able to escalate problems if necessary.

Medium-level priority

Functional Requirement ID: RTB-008

The capacity to handle user accounts, keep an eye on system performance, and provide data on booking patterns and income is a requirement description for administrators.

Dependencies: Nothing

Acceptance standards:

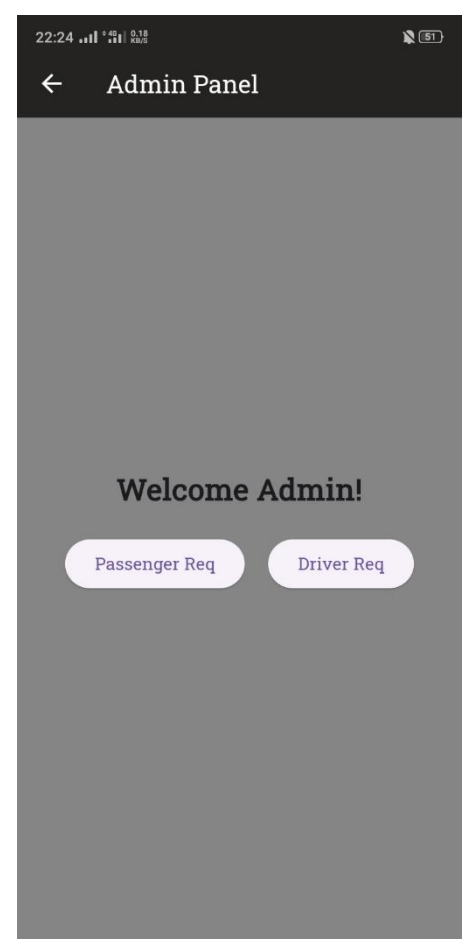
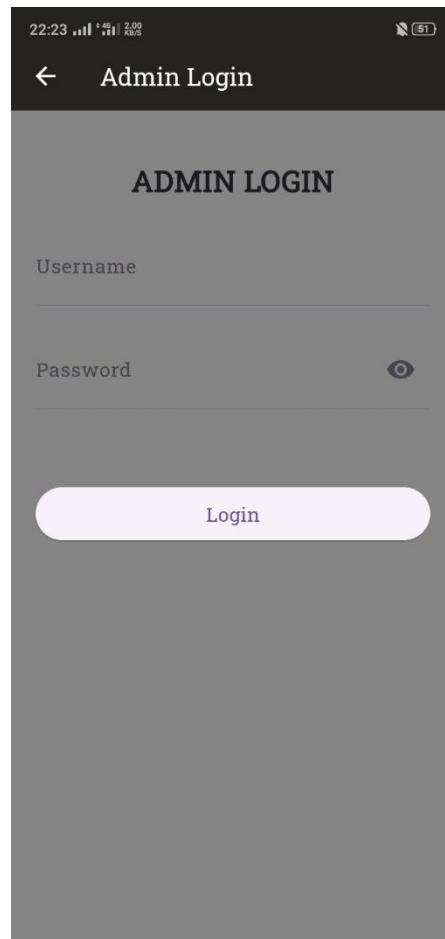
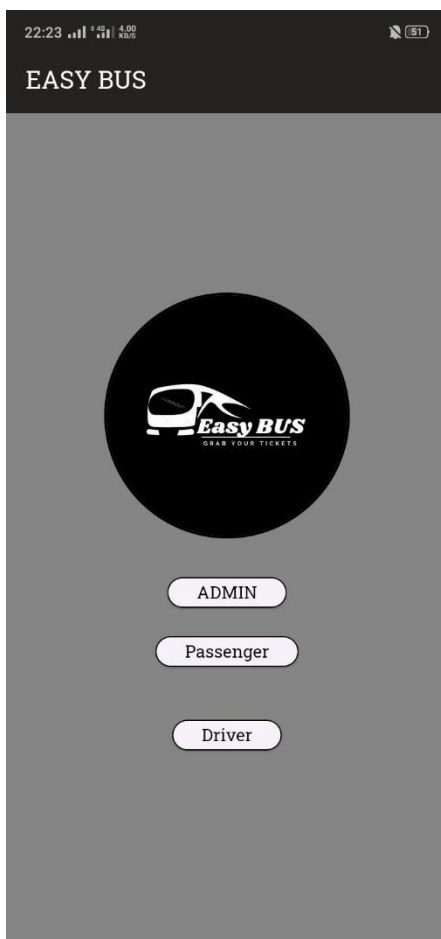
- An admin panel that is safe and has programmable user roles and permissions should be available to administrators.
- Features for checking booking data, changing passwords, and managing user accounts should be available in the admin panel.
- Key performance indicators including booking volume, income, and user demographics should be able to be reported on by administrators.

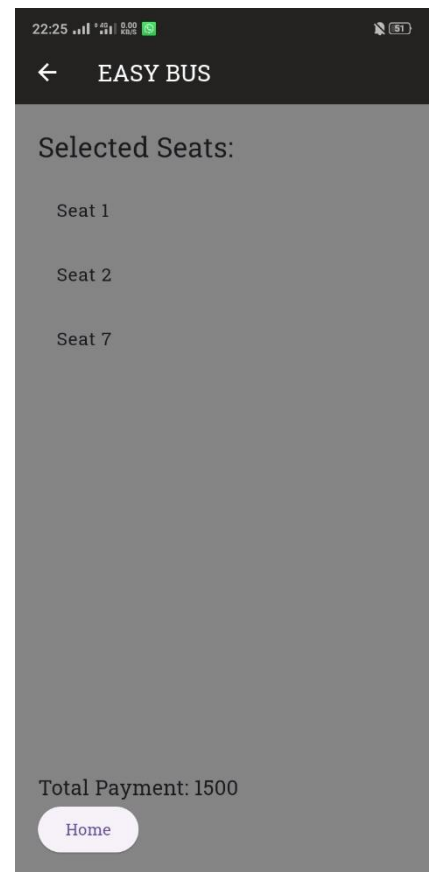
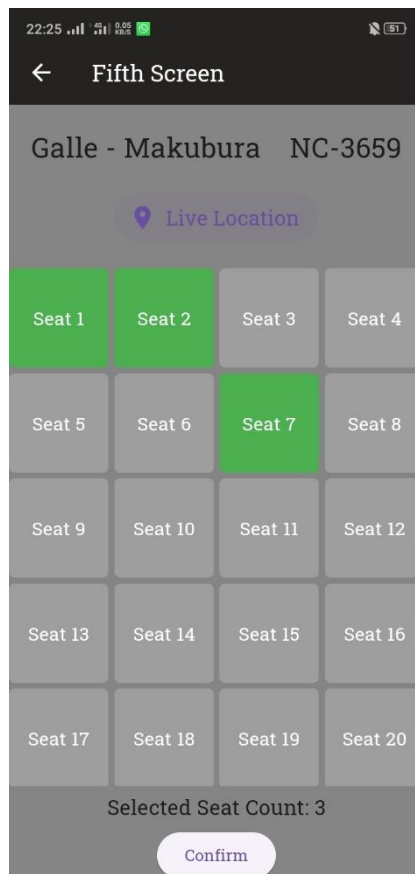
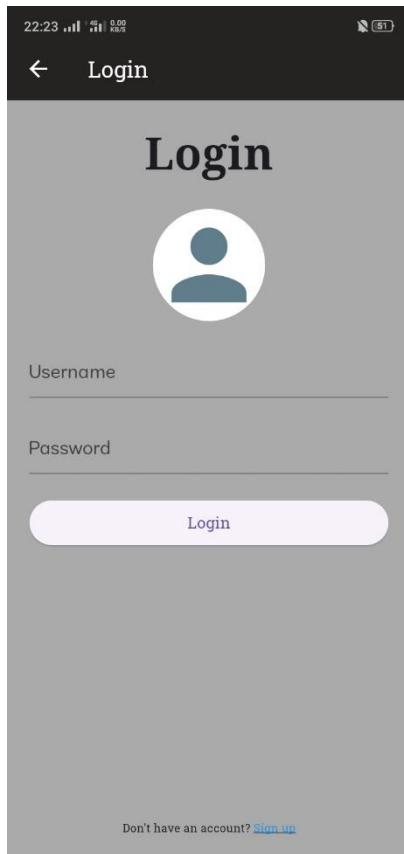
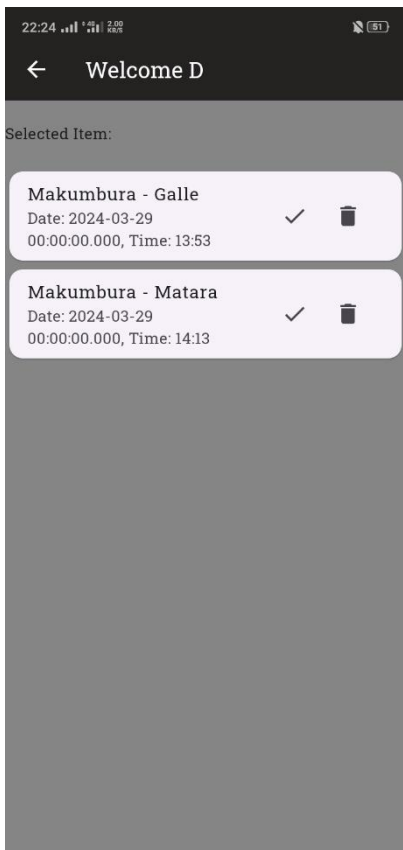
Priority: Very high

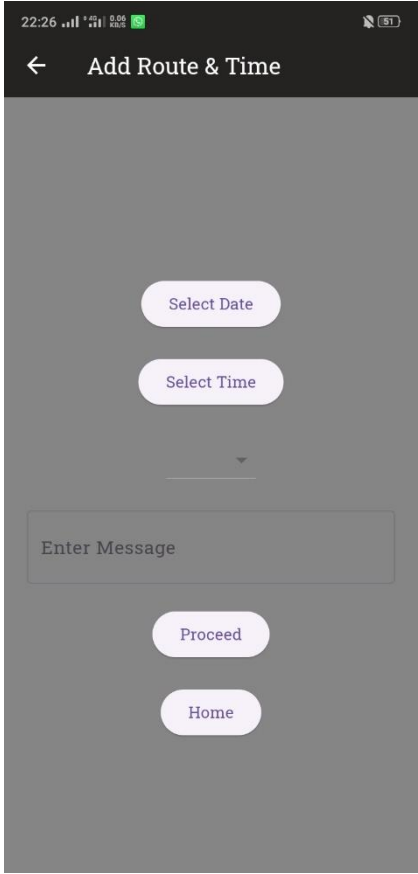
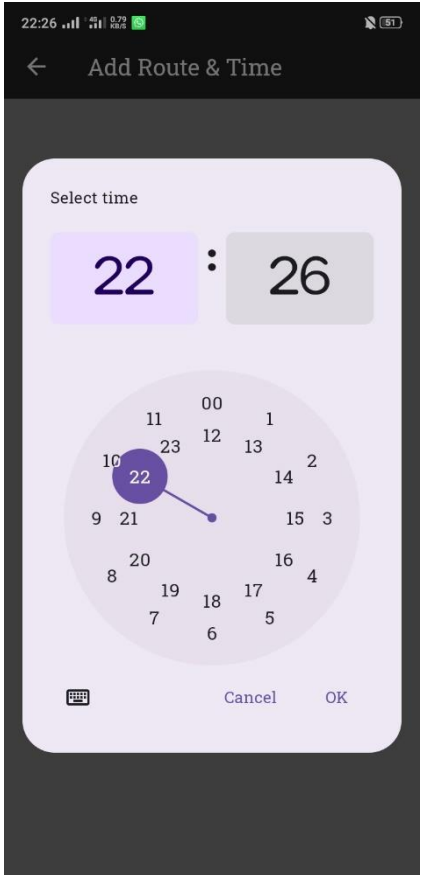
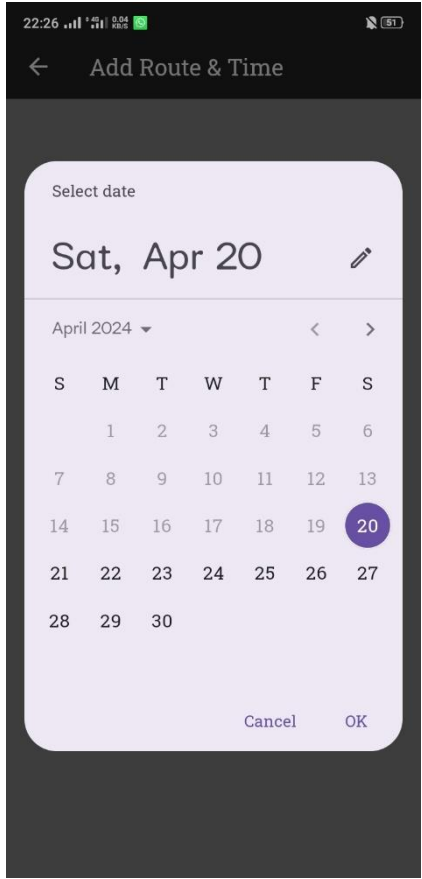
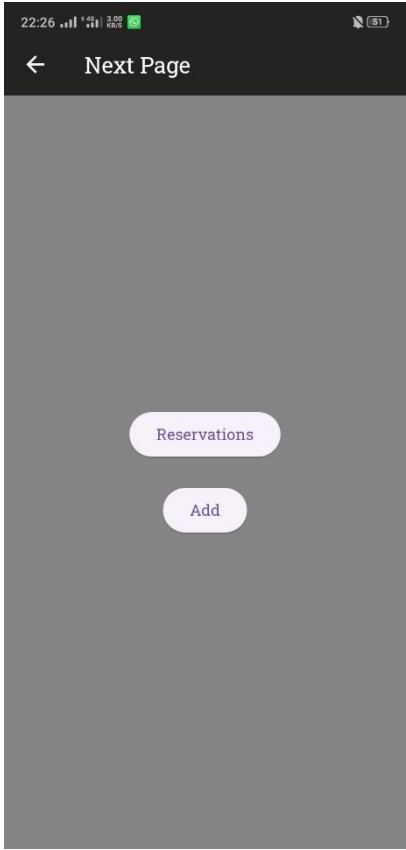
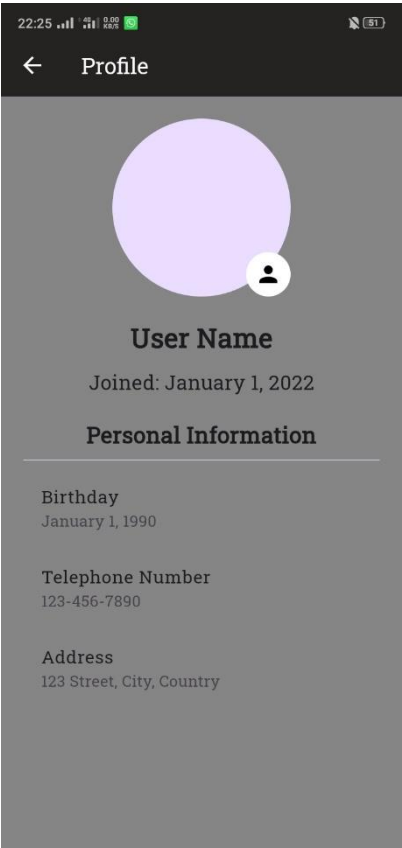
Technical Specification

User Interface Design- UI and UX.

The design strategy was focused on creating an intuitive and visually appealing user experience using Figma. It was vital to wireframe, prototype, and iterate on designs in order to ensure that users engaging with the mobile application could navigate the app simply and efficiently.







Firestore Database Tables

This screenshot shows the Firebase Firestore console for a project named 'Bus-Tracking-Application'. The left sidebar contains navigation options: Project Overview, Firestore Database (selected), Realtime Database, Authentication, Extensions, and Release Monitoring. The main area displays the 'drivers' collection under the path 'drivers > lbMICEGjS4mofK5UKak8'. The collection contains several documents, with the first document 'lbMICEGjS4mofK5UKak8' selected. The document fields are: busNumber: '2002', email: 'chathu@gmail.com', firstName: 'sunil', lastName: 'saman', password: 'Chathu5@', and phoneNumber: '0742963108'.

Collection	Document ID	Fields
drivers	lbMICEGjS4mofK5UKak8	busNumber: '2002', email: 'chathu@gmail.com', firstName: 'sunil', lastName: 'saman', password: 'Chathu5@', phoneNumber: '0742963108'

This screenshot shows the Firebase Firestore console for the same project, displaying the 'route' collection under the path 'route > Vs0eHotmJMhB'. The collection contains several documents, with the first document 'Vs0eHotmJMhBSeEaSTAP5' selected. The document fields are: date: 'March 29, 2024 at 12:00:00 AM UTC+5:30', item: 'Makumbura - Galle', and time: '13:53'.

Collection	Document ID	Fields
route	Vs0eHotmJMhBSeEaSTAP5	date: 'March 29, 2024 at 12:00:00 AM UTC+5:30', item: 'Makumbura - Galle', time: '13:53'

Project Overview

Project shortcuts

Firestore Database

Realtime Database

Authentication

Extensions NEW

Release Monit... NEW

Product categories

Build

Release & Monitor

Analytics

Engage

All products

Spark

No-cost \$0/month

Upgrade

Bus-Tracking-Application

Cloud Firestore

Panel viewQuery builder

>

route_plans

>

wF2nn6B68SQp.

More in Google Cloud

(default)

+

Start collection

drivers

route

route_plans

selected_seats

tickets

users

route_plans

+

Add document

5D0Fuf51oXs7S58D1hJs

66JLaQIOsMxcdU07t97

6YNZ1w5GhsJk1Biqkqrw

DriZhA1Yqrahh4WHe8hf

LQuTvXZ5dA15P8Ewd4U3

M2Wjyn1uanRmF399S49g

cCIArOKKBS315tsffAxC

eMxOngor0V1CUJRAtxDi

oj87v14TS9yL157DYC1t

ttP5p7LrRx7TMVEh6qtX

wF2nn6B68SQp.zJHKdgGp

wF2nn6B68SQp.zJHKdgGp

+

Start collection

+

Add field

date: March 28, 2024 at 12:00:00 AM UTC+5:30

item: "Item 1"

time: "22:41"

Project Overview

Project shortcuts

Firestore Database

Realtime Database

Authentication

Extensions NEW

Release Monit... NEW

Product categories

Build

Release & Monitor

Analytics

Engage

All products

Spark

No-cost \$0/month

Upgrade

Bus-Tracking-Application

Cloud Firestore

Panel viewQuery builder

>

selected_seats

>

FpCAyzJQjx0Tc...

More in Google Cloud

(default)

+

Start collection

drivers

route

route_plans

selected_seats

tickets

users

selected_seats

+

Add document

0TlnA035KI5kIJnuEy7j

5rQaKhZ4u3IUVRACTtCt

668dGDv3XrzJR82e9zxI

6cfyhF123t2DJtRJe0yo

9LKsib3rCHCo9iIvonfy

CpgLk1LCQxkKpQ3HBpNi

EBf6Me0kk37udZPLdHHu

E00vNhZvxhA0D83Kg1zv

FpCAyzJQjx0Tc5QehGN3

Gu2oWfoVjKcKq1QgG270

HUB1PfKBIDBQc8UVAiGY

HfjBs1qvQmLp7myGoAp3

I9yIGyz30ytj97UPCDTQ

JY1Ann8FLz2eRiMq42g4

FpCAyzJQjx0Tc5QehGN3

+

Start collection

+

Add field

selectedSeats

0 1

1 2

2 3

timestamp: March 29, 2024 at 12:34:33 PM UTC+5:30

Project Overview

Firestore Database

Realtime Database

Authentication

Extensions NEW

Release Monit... NEW

Build

Release & Monitor

Analytics

Engage

All products

Spark

No-cost \$0/month

Upgrade

Bus-Tracking-Application

Cloud Firestore

tickets

0zHTSrLwH93vVq3sKRT

(default)

Start collection

drivers

route

route_plans

selected_seats

tickets

users

tickets

0zHTSrLwH93vVq3sKRT

1B5PgKbKtFRPRmZD3kyY

VpnN0m17n150DNjHN9FJ

xfn8Dv00iR9e1zLXQ9AD

Start collection

Add field

referenceNumber: 125076

totalPayment: 1500

Database location: nam5

Project Overview

Firestore Database

Realtime Database

Authentication

Extensions NEW

Release Monit... NEW

Build

Release & Monitor

Analytics

Engage

All products

Spark

No-cost \$0/month

Upgrade

Bus-Tracking-Application

Cloud Firestore

users

xzc3nmrJaDoJ0Rh6KNxa

(default)

Start collection

drivers

route

route_plans

selected_seats

tickets

users

users

xzc3nmrJaDoJ0Rh6KNxa

98L38odYBzQABSgfrgN2

9o8J56xt1FndXgnCFROF

AUnpifQqr7K6EMxcXp9E

D5V1f3DkTCpZUlvI9x4s

JjsIb1oPbQRaBMBU6uap

V1vMHPxSckUs7I7wqAHY

dHFNUYPYvI66ja1CbqrY

f1HhYhX1V02j2V1gYS0j

foo20KY40N2Zg06I4wd6

iLCqj6P2gHs1NI1F5y86

kADS4LwJsbQ91fVC1lnZ

kHJ56B1v97PTmk2T91tq

kI1h0R2ueruVFCmjPRMs

xzc3nmrJaDoJ0Rh6KNxa

Start collection

Add field

email: "chathupraba2002@gmail.com"

firstName: "chathu"

lastName: "munasinghe "

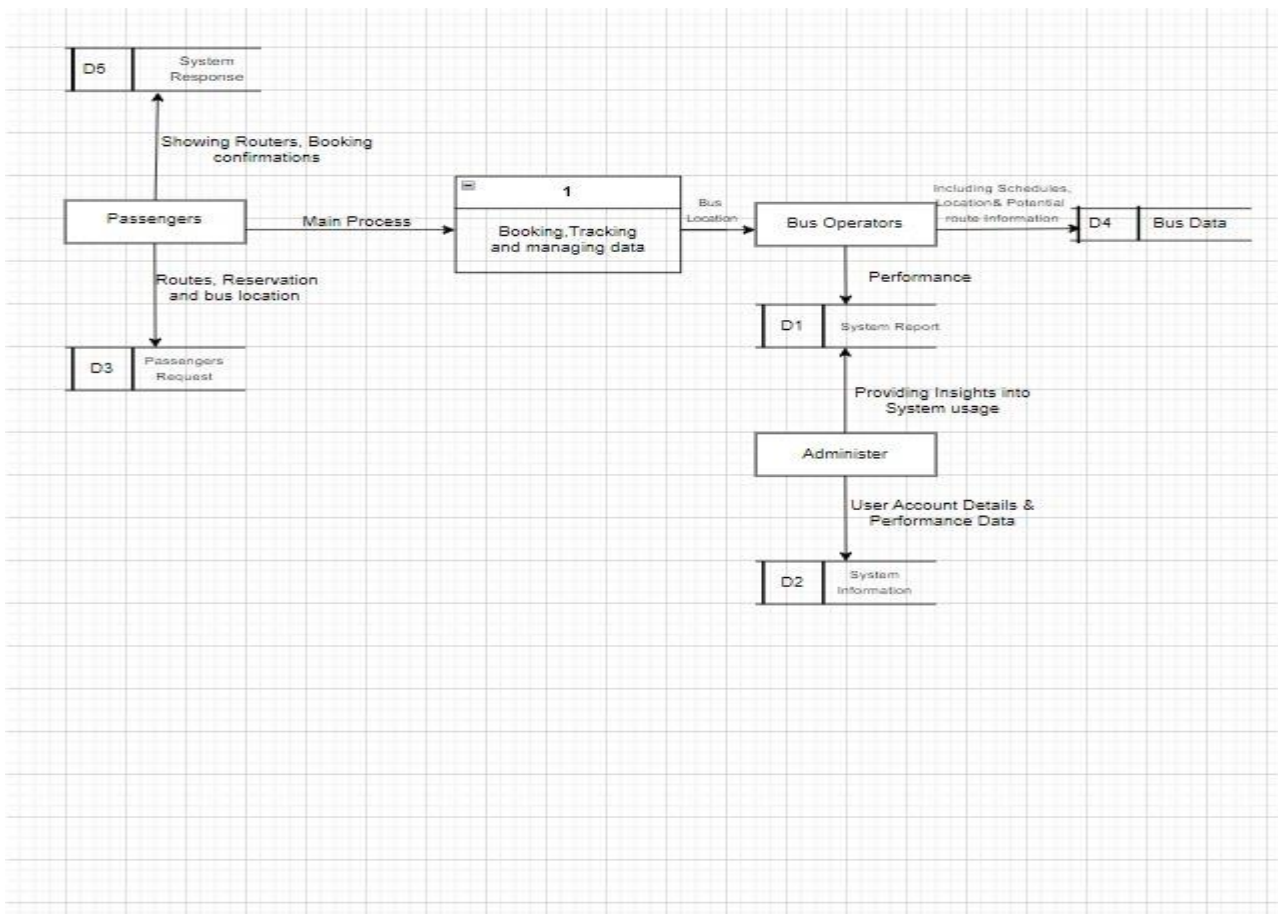
password: "Chathu5@"

phoneNumber: "0742963108"

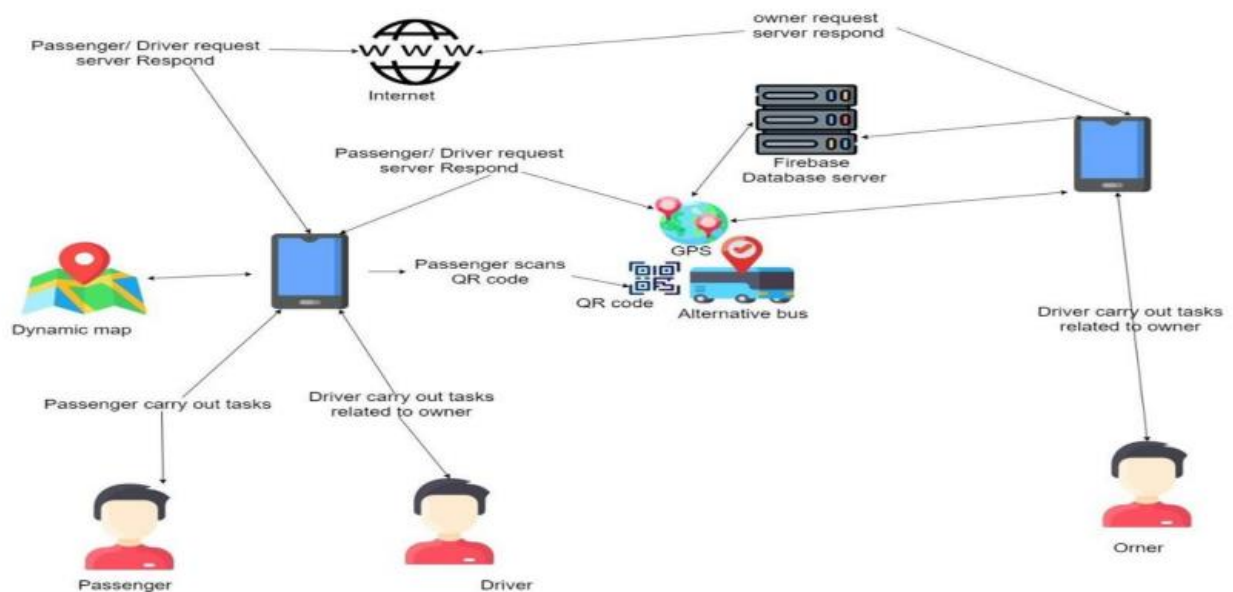
Database location: nam5

22

Data Model



System Architecture



Deployment and Infrastructure

The distribution strategy called for the mobile application to be uploaded to app stores in order to be made available to users. Hosting any backend services required for the application was part of the infrastructure's scalability and reliability. If Flutter and Dart development had been involved, this may have meant releasing to marketplaces like the Google Play Store for Android and the Apple App Store for iOS.

Testing Strategy

1. Unit testing: Create tests for the discrete, tiny parts of your code, such functions or methods, to ensure that it is operating as intended.
 - o Confirm that each and every part of your code performs as intended.
2. Integration testing: Verify that all of your system's components are compatible with one another.
 - o Verify that components like databases, external services, and APIs are compatible with one another.
 - o Verify that data flows through the various parts of your system in the correct sequence.
3. Functional testing: Evaluate how well the system performs in relation to the given parameters.
 - o Verify that users can do other essential tasks, such adding goods, adjusting amounts, and generating reports.
 - o Confirm that the system operates as expected for different user

Dependencies

1. Flutter SDK Synopsis:
The Flutter SDK is a prerequisite for developing cross-platform mobile applications with the Dart programming language.
Its objective is to provide a set of tools and a framework for developing user interfaces to developers and app logic managers.

Take flutter_sdk, for example: ~2.10.0
2. Overview of the HTTP Requests Library: Description: With the help of this library, Flutter applications may make HTTP requests to web services.
Its function is to make data retrieval and transmission interactions with backend APIs easier.
As an example: ~0.14.0

3. Overview of the UI Component Library:

Description: Pre-made widgets and components for interface design are available through user interface component libraries.

Purpose: By offering ready-to-use user interface components, they hope to accelerate development.

For example: flutter_material: about 0.6.0

4. Opting for Operating Systems:

Description: Flutter allows developers to target specific operating systems, such as Android and iOS.

Goal: By optimizing the software for each platform, it ensures that it has a native look and feel.

Consider flutter build apk.

5. Flutter Google Maps:

Description: This Flutter plugin allows you to easily include Google Maps into your Flutter application.

The purpose of this application is to enable users to utilize Google Maps functions such as adding marks, showing maps, and listening to map events.

For example: Version 2.1.0 of Google Maps Flutter

6. SQLite

This is SQLite, a lightweight database engine for Flutter that enables local data storage on the device.

Goal: It provides a rapid and simple method for doing database operations, such as creating tables, inserting data, querying data, and more.

For example: sqflite: about 2.0.0

Work breakdown.

Project Phases:

Phase of planning:

- Identify needs, goals, and scope of the project. Perform competition and market study.
- Identify the mobile application's major features and functions.
- Establish user personas and the intended audience.
- Make a project plan that includes a timeframe and work breakdown structure (WBS).

Phase of Design:

- Create mobile application prototypes and wireframes.
- Create interfaces and user experiences (UI/UX) for bus tracking, ticket purchasing, and other functions.
- Finalize the branding components, typography, and color palettes for the visual design.
- Make interactive prototypes and mockups to get feedback and conduct user testing.

Phase of Development:

- Establish the infrastructure and development environment. Deploy front-end development for the mobile application using the relevant frameworks (e.g., Flutter, React Native).
- Create backend services that manage bus tracking, booking transactions, user authentication, and other features.
- Combine external APIs for geolocation, payment processing, and more functions. To track and update buses, use real-time communication.
- As the development process progresses, carry out integration and unit testing.
- Phase of Testing: Carry out extensive testing, encompassing functional, usability, performance, and security assessments of the mobile application.
- Determine and fix mistakes, defects, and performance problems.
- Get input for future developments from stakeholders and beta testers.
- Achieve adherence to the rules set forth by mobile platforms (like Google Play and the App Store).

Phase of Deployment:

- Get ready to submit your software to the app store by making screenshots, descriptions, and marketing materials.
- Prepare the mobile application for iOS and Android devices.
- Upload the program to the appropriate app stores (Google Play Store, Apple App Store). Keep an eye on the deployment procedure and handle any problems or denials from app store review teams.
- Organize app launch marketing and promotion activities.

Phase of Maintenance and Support: —

- Track app usage and user input after launch.
- Issue updates and bug fixes as needed.
- Answer questions from users and deal with their problems by offering customer assistance.
- Constantly enhance the application by taking into account market trends and customer input.

Work Breakdown Structure (WBS)

1. Planning Phase

- 1.1- Define project scope and objectives
- 1.2- Conduct market research
- 1.3- Identify key features and requirements
- 1.4- Create project plan and timeline

2. Design Phase

- 2.1- Develop wireframes and prototypes
- 2.2- Design UI/UX
- 2.3- Create visual design elements
- 2.4- Finalize mockups and prototypes

3. Development Phase

- 3.1- Set up development environment
- 3.2- Front-end development
- 3.3- Back-end development
- 3.4- API integration
- 3.5- Real-time communication implementation

4. Testing Phase

- 4.1- Functional testing
- 4.2- Usability testing
- 4.3- Performance testing
- 4.4- Security testing

5. Deployment Phase

- 5.1- Prepare for app store submission
- 5.2- Package and submit the application
- 5.3- Monitor deployment process
- 5.4- coordinate with marketing efforts

6. Maintenance and Support Phase

- 6.1- Monitor app performance
- 6.2- Release updates and bug fixes
- 6.3- Provide customer support

Timeline:

Planning Phase: 4 weeks

Design Phase: 6 weeks.

Development Phase: 10 weeks

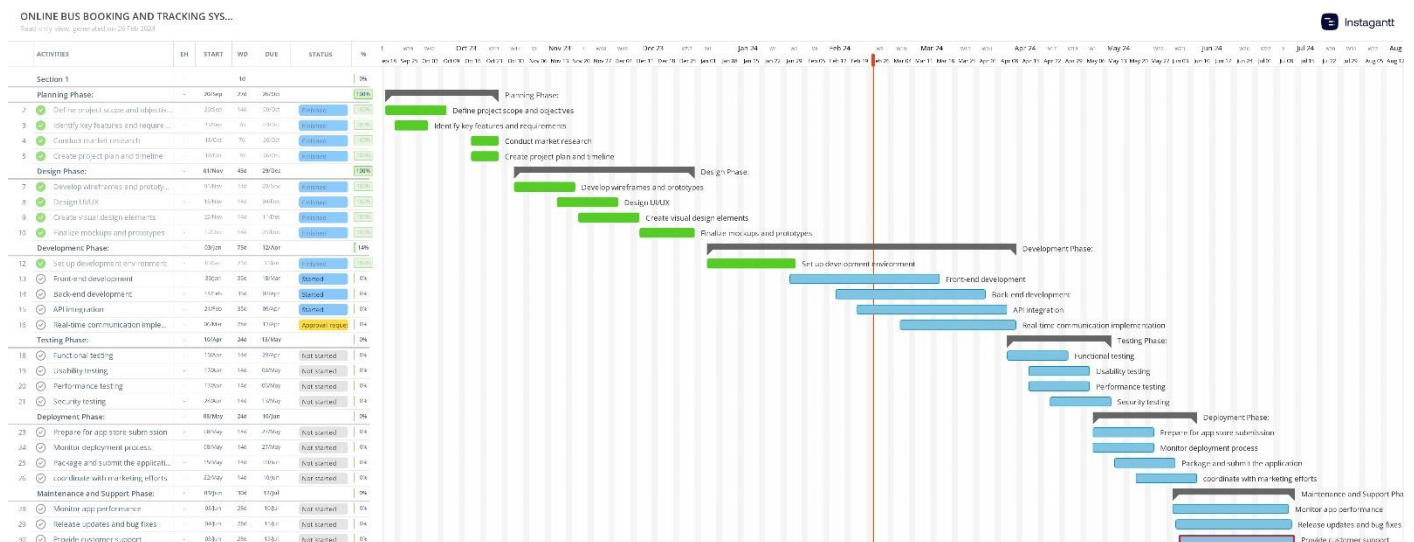
Testing Phase: 3 weeks

Deployment Phase: 3 weeks

Maintenance and Support Phase: Ongoing



Gantt chart



Critical Path & total time duration.

Project Kickoff -> Market Research -> Feature Definition -> Design and Prototyping -> Front-end Development -> Back-end Development -> Real-time Communication Implementation -> Testing Phase -> Deployment Readiness -> Launch -> Maintenance and Support

The total time duration for completing the critical path tasks is:

4+6+10+3+3 = 26 weeks

Maintenance and Support Phase: Ongoing

Resource Allocation

1.1- Define project scope and objectives	Badal Gamage Wedamulla Madusanka Yaddehi Kishal Sankalpa Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe
1.2- Conduct market research	Kihaduwege Sahasra Wedamulla Madusanka
1.3- Identify key features and requirements	Kihaduwege Sahasra Senanayake Liyanage

1.4- Create project plan and timeline	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
2.1- Develop wireframes and prototypes	Wedamulla Madusanka Yaddehi Kishal Sankalpa Kihaduwege Sahasra
2.2- Design UI/UX	Yaddehi Kishal Sankalpa Chathupraba Munasinghe
2.3- Create visual design elements	Wedamulla Madusanka Senanayake Liyanage Chathupraba Munasinghe
2.4- Finalize mockups and prototypes	Badal Gamage Wedamulla Madusanka Yaddehi Kishal Sankalpa
3.1- Set up development environment	Badal Gamage Kihaduwege Sahasra Senanayake Liyanage
3.2- Front-end development	Yaddehi Kishal Sankalpa Badal Gamage Wedamulla Madusanka
3.3- Back-end development	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
3.4- API integration	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
3.5- Real-time communication implementation	Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe
4.1- Functional testing	Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe
4.2- Usability testing	Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe
4.3- Performance testing	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
4.4- Security testing	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
5.1- Prepare for app store submission	Kihaduwege Sahasra Senanayake Liyanage

	Chathupraba Munasinghe
5.2- Package and submit the application	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
5.3- Monitor deployment process	Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe
5.4- coordinate with marketing efforts	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
6.1- Monitor app performance	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
6.2- Release updates and bug fixes	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
6.3- Provide customer support	Kihaduwege Sahasra Senanayake Liyanage Chathupraba Munasinghe

Milestones alien with deliverables.

1) Project kickoff milestone:

Deliverables: A preliminary timetable, a scoping paper, and the project's objectives.

Description: Goals, objectives, and preliminary planning are established as part of the project's official start.

2) Features definition milestone:

Deliverables: a feature list, a requirements document, and user stories.

Determining and documenting the attributes and requirements required for the application.

3) Design and prototyping milestone:

Deliverables: consist of visual elements, wireframes, prototypes, and UI/UX designs.

Prototyping and visualizing an application to aid with its layout, flow, and functionality visualization is the approach described here.

4) Development kickoff milestone:

Deliverable: A development environment with a completed technology stack.

Official beginning of the development phase, which entails setting up the infrastructure and necessary instruments.

5) Testing phase milestone:

Deliverables: test plans, test cases, and bug reports.

The phase of testing has commenced and encompasses functional, usability, performance, and security testing.

6) Deployment Readiness Milestone:

Deliverable: A working deployment strategy and an application.

Description: The application is deemed ready for deployment upon satisfactory completion of testing and last-minute preparations.

7) Launch milestone:

Deliverable: The release of the application in app stores and promotional materials.

Description: Marketing and promotional activities will be conducted in conjunction with the official public release of the application.

8) Post launch evaluation milestone:

Deliverables: User input, performance data, and post-launch analysis.

This report evaluates the application's functionality and user feedback following its introduction and offers suggestions for further improvements.

Results and Discussion

Discussion on Achievements

Throughout the development process, our team successfully conquered the challenge of modernizing Sri Lanka's bus seat reservation and tracking systems. With the use of cutting-edge technology and innovative design principles, we have developed a mobile application that goes above and beyond the expectations of its users. The creation of an easy-to-use user interface that facilitates route searches, bus location tracking, and seat reservations is our greatest achievement. Because of this design's intuitiveness, both bus operators and commuters may experience a smooth and trouble-free experience.

In addition, the integration of real-time bus monitoring and seat reservation functionalities represents a significant breakthrough in augmenting operational efficiency within the transportation sector.

By providing users with access to current information and enabling quick, secure reservations, our software not only helps bus operators manage resources and enhance service performance, but it also helps customers plan their travels more effectively.

Test Cases/Test Results Summary

We meticulously prepared and executed a large number of test cases to ensure that our application's functionality and performance were confirmed via our rigorous testing procedure. Methodical testing was used to assess the system's reliability and robustness under a variety of scenarios. According to the test results, the program's main features were determined to be working as planned, and there weren't many obvious flaws. Performance testing confirmed the application's stability and responsiveness, demonstrating reasonable response times and consistent behavior under typical use conditions. Notwithstanding a few minor issues that came out during testing—for instance, errors in the real-time bus tracking data—they were rapidly fixed by little improvements and optimizations.

A	B	C	D	E
Test Case ID	Test Case Description	Steps	Expected Result	Pass/Fail
TC_01	Verify if the login page loads successfully	1. Open the passenger login page	The login page should load successfully and display the username, password, and login button	Pass/Fail
TC_02	Verify if the user can login with valid credentials	1. Enter a valid username in the username field 2. Enter the corresponding password in the password field 3. Click on the login button	The user should be successfully logged in and redirected to the home page	Pass/Fail
TC_03	Verify if the error message is displayed for an invalid username	1. Enter an invalid username in the username field 2. Enter a valid password in the password field 3. Click on the login button	An error message should be displayed stating that the username is invalid	Pass/Fail
TC_04	Verify if the error message is displayed for an invalid password	1. Enter a valid username in the username field 2. Enter an invalid password in the password field 3. Click on the login button	An error message should be displayed stating that the password is invalid	Pass/Fail
TC_05	Verify if the password is masked while entering	1. Enter a password in the password field	The password should be masked with asterisks or other characters	Pass/Fail
TC_06	Verify if the 'Forgot Password' link is functional	1. Click on the 'Forgot Password' link	The user should be redirected to the forgot password page where they can reset their password	Pass/Fail
TC_07	Verify if the 'Don't have an account?' link is functional	1. Click on the 'Don't have an account?' link	The user should be redirected to the sign-up page where they can create a new account	Pass/Fail

Test case ID	Test Case	Expected Results	Actual Result	Pass / Fail
TC_001	Attempt to book a seat that is available.	The system should successfully reserve the selected seat and display a confirmation message.	The selected seat is successfully reserved, and a confirmation message is displayed.	Pass
TC_002	Attempt to book a seat that is already reserved by another passenger.	The system should successfully reserve the selected seat and display a confirmation message.	The selected seat is successfully reserved, and a confirmation message is displayed.	Pass
TC_003	Attempt to book a seat that does not exist (e.g., out of range seat number).	The system should display an error message indicating that the selected seat is invalid.	The system correctly displays an error message indicating that the selected seat is invalid.	Pass
TC_004	Attempt to book a seat without selecting a specific seat.	The system should prompt the user to select a seat before proceeding with the booking.	The system prompts the user to select a seat before proceeding.	Pass
TC_005	Expected Results: The system should prompt the user to select a seat before proceeding with the booking.	The system should prompt the user to provide all necessary information before completing the booking process.	The system prompts the user to provide all necessary information before completing the booking process.	Pass
TC_006	Attempt to book a seat without providing required information (e.g., passenger details, payment information).	The system should display an error message informing the user about the technical issue and suggest trying again later.	The system prompts the user to provide all necessary information before completing the booking process.	Pass
TC_007	Attempt to book a seat while the system is experiencing technical issues.	The system should display an error message informing the user about the technical issue and suggest trying again later.	he system displays an error message informing the user about the technical issue and suggests trying again later.	Pass

Test Case ID	Test Case Description	Expected Results	Actual Results	Pass/Fail
TC_01	Booking with Valid Date and Time	System displays available buses for the selected date and time. Ticket information includes departure time, arrival time, bus number, and price.	System displays buses. Ticket information includes departure time, arrival time, bus number, and price.	Pass
TC_02	Booking for Past Date	System displays an error message indicating the selected date cannot be in the past.	System displays error message or disables past date selection.	Pass
TC_03	Booking for Future Date with No Availability	System displays a message indicating no buses are available for the selected date and time.	System displays message about no availability.	Pass
TC_04	Ticket Price Validation	Ticket price should be a positive number and cannot be zero.	System validates price and prevents booking with zero or negative price.	Pass
TC_05	Invalid Bus Number	System rejects the booking with an invalid bus number.	System detects and rejects booking with invalid bus number.	Pass

Test Case ID	Test Case Description	Steps	Expected Result	Pass/Fail
TC_01	Verify if the Amin login page loads successfully	1. Open the Amin login page	The login page should load successfully and display the username, password, and login button	Pass/Fail
TC_02	Verify if the user can login with valid credentials	1. Enter a valid username in the username field 2. Enter the corresponding password in the password field 3. Click on the login button	The user should be successfully logged in and redirected to the Amin dashboard	Pass/Fail
TC_03	Verify if the error message is displayed for an invalid username	1. Enter an invalid username in the username field 2. Enter a valid password in the password field 3. Click on the login button	An error message should be displayed stating that the username is invalid	Pass/Fail
TC_04	Verify if the error message is displayed for an invalid password	1. Enter a valid username in the username field 2. Enter an invalid password in the password field 3. Click on the login button	An error message should be displayed stating that the password is invalid	Pass/Fail
TC_05	Verify if the password is masked while entering	1. Enter a password in the password field	The password should be masked with asterisks or other characters	Pass/Fail

Test Case ID	Test Case Description	Steps	Expected Result	Pass/Fail
TC_01	Verify if the sign up page loads successfully	1. Open the passenger sign up page	The sign up page should load successfully and display the sign up form	Pass/Fail
TC_02	Verify if a user can sign up with valid data	1. Enter a valid first name in the First Name field 2. Enter a valid last name in the Last Name field 3. Enter a valid phone number in the Phone Number field 4. Enter a valid email address in the Email field 5. Enter a strong password in the Password field 6. Confirm the password in the Confirm Password field 7. Click on the Sign Up button	The user should be successfully registered and redirected to a confirmation page or dashboard	Pass/Fail
TC_03	Verify if all required fields are marked	1. Leave all fields blank 2. Click on the Sign Up button	An error message should be displayed indicating that all required fields must be filled	Pass/Fail
TC_04	Verify if error message is displayed for an invalid email address	1. Enter an invalid email address (e.g., missing "@", missing ".", etc.) in the Email field 2. Enter a valid password in the Password field 3. Confirm the password in the Confirm Password field 4. Click on the Sign Up button	An error message should be displayed indicating that the email address is invalid	Pass/Fail
TC_05	Verify if error message is displayed for a weak password	1. Enter a valid last name in the Last Name field 3. Enter a valid phone number in the Phone Number field 4. Enter a valid email address in the Email field 5. Enter a weak password in the Password field (e.g., short password, password without a mix of characters) 6. Confirm the password in the Confirm Password field 7. Click on the Sign Up button	An error message should be displayed indicating that the password is weak	Pass/Fail
TC_06	Verify if password is masked while entering	1. Enter a password in the Password field	The password should be masked with asterisks or other characters	Pass/Fail
TC_07	Verify if the 'Sign In Instead' link is functional	1. Click on the 'Sign In Instead' link	The user should be redirected to the login page	Pass/Fail

Test Case ID	Test Case Description	Expected Results	Actual Results	Pass/Fail
TN_001	Valid Driver Registration	System allows registration with valid driver details (name, license number, etc.) and prompts for bus information.	Driver registers successfully. System prompts for bus details.	Pass
TC_02	Missing Driver Information	System displays an error message for any missing required driver information during registration.	System identifies missing information and prevents registration.	Pass
TC_03	Invalid Driver License Number	System rejects registration with an invalid or non-matching driver license number format.	System detects invalid license number and prevents registration.	Pass
TC_04	Bus Details Registration	System allows entering valid bus details (bus number, model, capacity, etc.) after driver registration.	Bus details are saved successfully.	Pass
TC_05	Missing Bus Information	System displays an error message for any missing required bus information.	System identifies missing information and prevents saving details.	Pass
TC_06	Duplicate Bus Number	System rejects registration of bus details with a duplicate bus number already in the system.	System detects duplicate number and prevents saving details.	Pass

Findings and rectifications suggested /applied

- Throughout the whole development process, active user input collection and integration took place.
- Stakeholder participation and usability testing sessions were used to collect feedback.
- One area identified for improvement was data synchronization optimization for real-time bus tracking.
- To enhance user comprehension and navigation, usability problems with certain UI elements were fixed.
- The results of the feedback sessions served as the basis for an iterative development process.
- Issues were fixed promptly, and the software was updated often.
- Meeting the evolving needs and expectations of users was the aim of development.

Future improvements and development path

- Subsequent research endeavors will primarily focus on executing predictive analytical algorithms for the purpose of estimating bus arrival times by utilizing past data and present traffic conditions.
- Security procedures that safeguard user data and payment information will be reinforced in order to boost user confidence and trust.
- The application's feature set will be expanded with the addition of new services including loyalty programs, bus ticket discounts, and interactivity with other forms of transportation for seamless multi-modal excursions.
- Our continuous innovation and development is the foundation of our commitment to delivering an exceptional customer experience and encouraging positive change in Sri Lanka's transportation environment.
- Furthermore, we are currently working on an IoT tracking device project that will include bus tracking functionality once it is completed. As a consequence, users will get significantly more accuracy and dependability in real-time bus tracking.
- The aim is to broaden the scope of the service to encompass all buses in the country, enabling patrons to look up and book tickets for any bus route. Upon the implementation of an extensive reservation system, patrons will have the convenience of reserving seats on numerous bus routes through a unified platform.
- In order to provide broad coverage and ticket availability for a range of places, we will work to link with bus operators around the nation.
- To give customers a simple and efficient booking experience, upgrades such as fare comparison, route planning, and real-time updates will be added.

Appendix

Individual contribution Metrix

Plymouth ID	Name (as appeared in DLE)	Contributed Section
10899521	Badal Gamage	1.1- Define project scope and objectives 1.4- Create project plan and timeline 2.4- Finalize mockups and prototypes 3.1- Set up development environment 3.2- Front-end development 3.3- Back-end development 3.4- API integration 4.3- Performance testing 4.4- Security testing 5.2- Package and submit the application 5.4- coordinate with marketing efforts 6.1- Monitor app performance
10899603	Wedamulla Madusanka	Gather information from team members and develop and finalize the final project report 1.1- Define project scope and objectives 1.2- Conduct market research 1.4- Create project plan and timeline 2.1- Develop wireframes and prototypes 2.3- Create visual design elements 2.4- Finalize mockups and prototypes 3.2- Front-end development 3.3- Back-end development 3.4- API integration 4.3- Performance testing 4.4- Security testing 5.2- Package and submit the application 5.4- coordinate with marketing efforts 6.1- Monitor app performance

		6.2- Release updates and bug fixes
10899685	Kihaduwege Sahasra	1.1- Define project scope and objectives 1.2- Conduct market research 1.3- Identify key features and requirements 2.1- Develop wireframes and prototypes 3.1- Set up development environment 3.5- Real-time communication implementation 4.1- Functional testing 4.2- Usability testing 5.1- Prepare for app store submission 5.3- Monitor deployment process 6.3- Provide customer support
10899556	Yaddehi Sankalpa	1.1- Define project scope and objectives 1.4- Create project plan and timeline 2.1- Develop wireframes and prototypes 2.2- Design UI/UX 2.4- Finalize mockups and prototypes 3.2- Front-end development 3.3- Back-end development 4.3- Performance testing 4.4- Security testing 5.2- Package and submit the application 5.4- coordinate with marketing efforts 6.1- Monitor app performance 6.2- Release updates and bug fixes
10899621	Chathupraba Munasinghe	1.1- Define project scope and objectives 2.2- Design UI/UX 2.3- Create visual design elements 3.5- Real-time communication implementation 4.1- Functional testing 4.2- Usability testing 5.1- Prepare for app store submission 5.3- Monitor deployment process

		6.3- Provide customer support
10899600	Senanayake Liyanage	1.1- Define project scope and objectives 1.3- Identify key features and requirements 2.3- Create visual design elements 3.1- Set up development environment 3.5- Real-time communication implementation 4.1- Functional testing 4.2- Usability testing 5.1- Prepare for app store submission 5.3- Monitor deployment process 6.3- Provide customer support

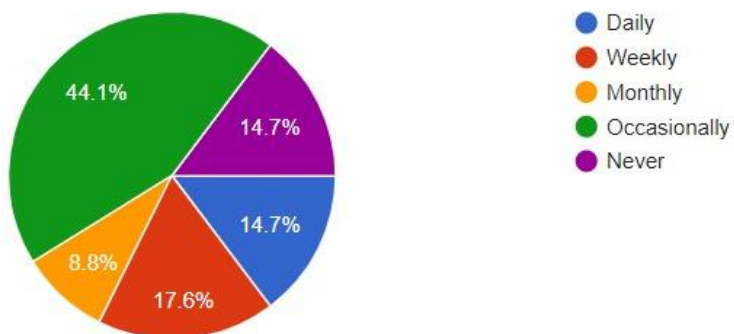
User requirement gathering data

Questionnaire:

How often do you use online platforms for booking bus tickets?

 Copy

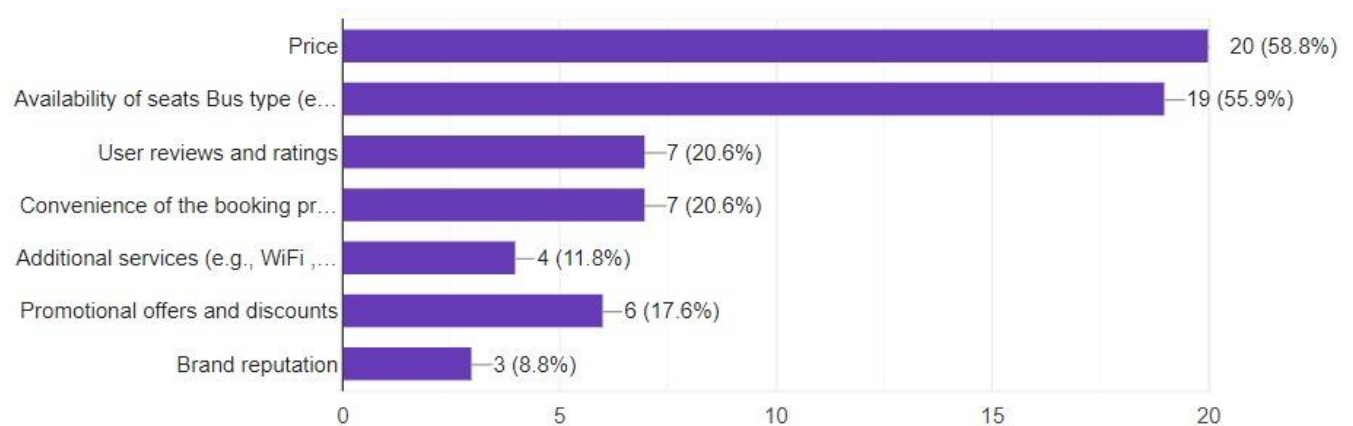
34 responses



What factors influence your decision when choosing a bus booking platform? (Select all that apply)

 Copy

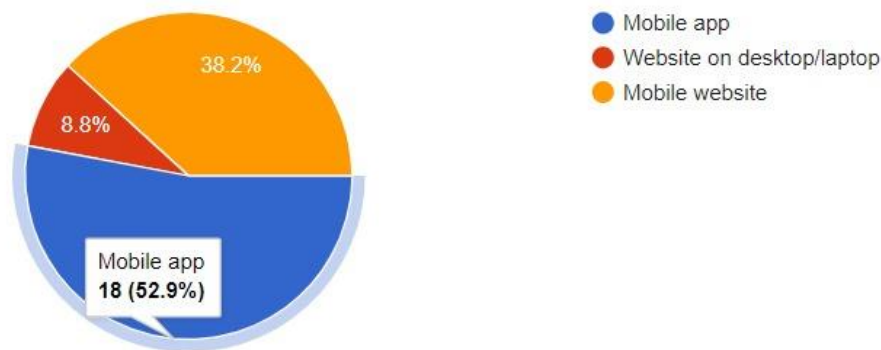
34 responses



How do you typically access online bus booking platforms?

 Copy

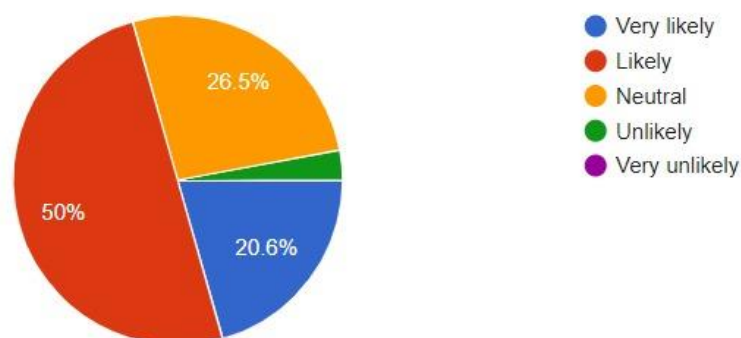
34 responses



How likely are you to recommend our bus booking tracking system app to others?

 Copy

34 responses



Please provide any additional feedback or comments about your experience with our app.

34 responses

Users appreciate the ability to personalize their experience within the app whether through customizable settings preferences or content options

It's very good for all peoples

It's very good idea for bus booking systems

It's good

Super

Nothing special

Did not experience.

This is good

Make it user friendly as possible

Please provide any additional feedback or comments about your experience with our app.

34 responses

Good

Good

Ya

.

NO

no

This application is an important application that can be used very easily

No

What improvements or additional features would you like to see in our app?

34 responses

I have no idea

Design a simple and intuitive interface for users to easily navigate through the booking process. Implement clear instructions and guide users effectively.

Integrate a feature to display real-time seat availability, preventing overbooking and providing users with up-to-date information.

I think this app is good for highway bus system but we use this app for sri lankan normal way bus system we have to face different type of problems , it is just only my idea

Which people use daily bus

24/7 Customer Service

Non

Good

Please provide any additional feedback or comments about your experience with our app.

34 responses

The Bus tickets may sell out quickly, especially during peak travel times or for popular routes, leading to disappointment for travelers who arrive late and Long queues at the ticket counter can result in delays and frustration for passengers, particularly if they have limited time or need to catch a specific bus.therefore, was able to avoid following difficulties by usibg this app with best customer satisfaction.

This is a good app

Attractive

very easy to use and also give all the details about time and ability

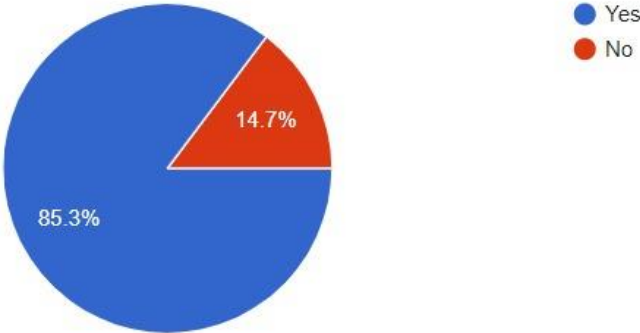
Very gd

Great

Nice app

Would you be interested in participating in future beta testing or surveys to help improve our app?

34 responses



What improvements or additional features would you like to see in our app?

34 responses

- Nothing

Ya

.

Option to select seats

GOOD

good

The details of the coloration here should be slightly different.

Yes

Make the app run faster

What improvements or additional features would you like to see in our app?

34 responses

A features for Sending push notifications to users regarding bus delays, changes in routes, or other relevant updates to keep them informed.

Regular updates with new features, bug fixes, and performance enhancements

Accuracy

Be more simple

Responsive customer support to address user queries and concerns in a timely manner

Live location

Chat function

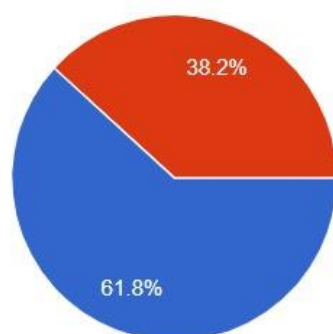
Bus roots and numbers

User friendly features

Have you encountered any issues or challenges while using online bus booking platforms?

 Copy

34 responses



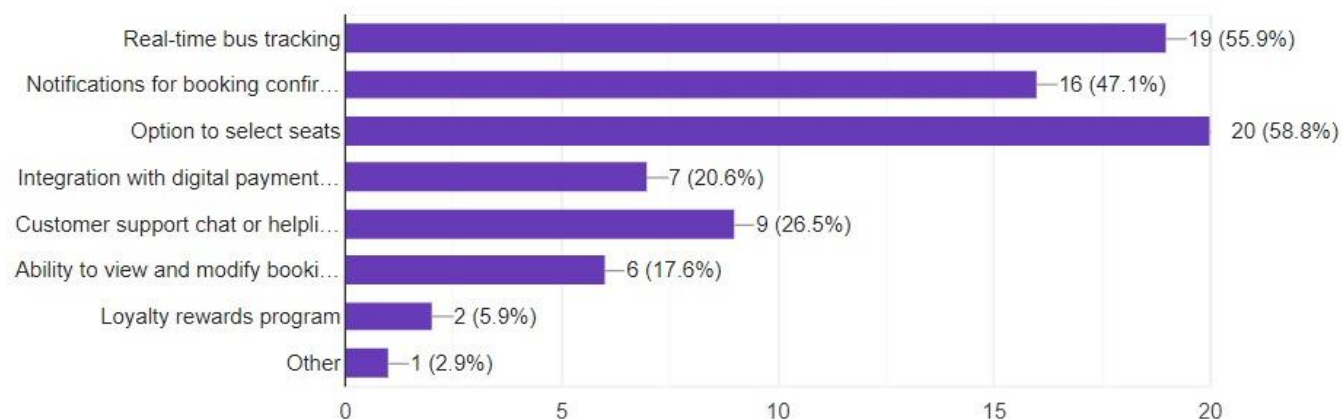
● Yes, I have encountered issues:

● No, I have not encountered any issues.

Which features do you consider essential in a bus booking tracking system app? (Select all that apply)

 Copy

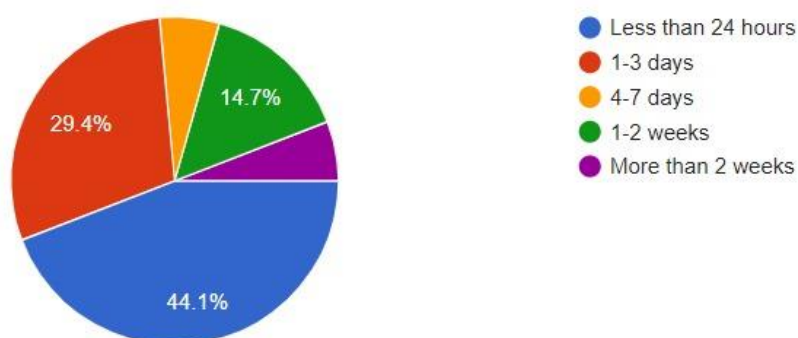
34 responses



On average, how far in advance do you book your bus tickets?

 Copy

34 responses



What improvements or additional features would you like to see in our app?

34 responses

Quickness

Speed service

No

A features for Sending push notifications to users regarding bus delays, changes in routes, or other relevant updates to keep them informed.

Regular updates with new features, bug fixes, and performance enhancements

Accuracy

Be more simple

Responsive customer support to address user queries and concerns in a timely manner

Live location

Observation:





References

Manners, G., (1965). Book Review: The Expressway And The City By Lewis Mumford, Seeker & Warburg, 1964, Pp. 189, Urban Studies, 2(2)

Nuwan, G., (2020). Reservations. [online] Railway.gov.lk. at:
http://www.railway.gov.lk/web/index.php?option=com_content&view=article&id=61&Itemid=68&lang=en [Accessed 24 March 2024].

Department of Forestry and Environmental Science, University of Sri Jayewardenepura. (2016). "Proposed Central Expressway Project."

analysis of bus tracking system using GPS on smartphones. Available at:
[https://www.researchgate.net/publication/263582815 Analysis of Bus Tracking System Using GPS on Smartphones](https://www.researchgate.net/publication/263582815_Analysis_of_Bus_Tracking_System_Using_GPS_on_Smartphones) (Accessed: 20 April 2024).

online bus ticket reservation system to the National Transportation Service in Sri Lanka. Available at: [https://www.researchgate.net/publication/330576072 ONLINE BUS TICKET RESERVATION SYSTEM TO THE NATIONAL TRANSPORTATION SERVICE IN SRI LANKA](https://www.researchgate.net/publication/330576072_ONLINE_BUS_TICKET_RESERVATION_SYSTEM_TO_THE_NATIONAL_TRANSPORTATION_SERVICE_IN_SRI_LANKA) (Accessed: 20 April 2024).

GitHub Link

<https://github.com/thisara02/Bus-Tracking-System.git>

Conclusion

In conclusion, the development of the seat reservation and tracking system is a significant step toward modernizing Sri Lanka's bus transportation industry. Through the application of state-of-the-art technology, a user-centered approach, and continuous feedback-driven iteration, we have successfully addressed the problem of enhancing user experience and maximizing operational efficiency. Customers may simply book seats, map out their itineraries, and obtain up-to-date bus information on a trustworthy and user-friendly platform by using the smartphone application. The project has been rather successful in its current scope, but there is still a lot of space for expansion and improvement.

By prioritizing user feedback, implementing technological advancements, and encouraging stakeholder involvement, we have established a strong foundation for further positive development and exceptional value delivery to users in Sri Lanka's transportation industry.