“EASY BUS”
Online Bus Tracking and Booking Mobile Application

GROUP A26

PUSL2021-COMPUTING GROUP PROJECT

Draft Report

IN PARTNERSHIP WITH PLYMOUTH UNIVERSITY

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Module Code: PUSL2021	Module Name: Computing group project
Coursework Title: Draft Report Submission	
Deadline Date: 24/03/2024	Member of staff responsible for coursework: Dr.Chaminda Wijesinghe
Programme: BSc (Hons)Software Engineering	

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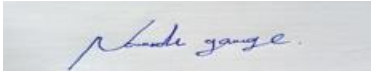
Signed: 

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Abstract

This project develops a mobile application to solve the problem of expediting bus seat booking and tracking procedures in Sri Lanka. Enhancing the user experience, increasing bus operators' operational efficiency, and offering real-time bus tracking and seat reservation capabilities were the main goals.

In order to accomplish these goals, information on user preferences and pain spots was gathered using a combination of user interviews, observations, and surveys. Furthermore, extant records were examined in order to enhance the process of gathering data. The system was implemented using the Flutter framework and the Dart programming language, with dependencies used to improve capabilities including local database management and Google Maps integration.

Prominent outcomes encompass the efficacious creation of an intuitive mobile application that facilitates users in exploring bus routes, monitoring bus whereabouts in real-time, and quickly reserving seats. Widespread accessibility is made possible by the system architecture's distribution to app stores, which was created to guarantee scalability and stability.

To sum up, the project offers a workable answer to Sri Lanka's inefficient bus seat reservation and monitoring issue. Future generations should, however, address restrictions like dependence on network connectivity and other security issues. To guarantee continuous progress, suggestions include enhancing the user interface even further and keeping an eye on user comments.

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Introduction

Overview of the Project

We're working on developing a smartphone application called “Easy BUS-The Digital Bus Tracking and Reservation Platform” that will transform and revitalize the bus transportation industry. As a result of our recognition of Sri Lanka's existing position and its critical role in social growth, we have chosen to focus exclusively on intercity bus services. At bus stations, there are currently long lines before departure due to the firmly ingrained traditional habit of getting tickets for highway bus routes. Thus, in order to meet the discriminating expectations of customers, there is an urgent need for a state-of-the-art solution that provides expedited ticket procurement and real-time bus status updates.

Bus booking and tracking will be radically altered by this technology, which will also significantly improve buses' usefulness, efficiency, and convenience. The project's objective is to enhance the entire experience for both passengers and bus drivers by implementing real-time tracking, user-friendly interfaces, and safe payment mechanisms. Certain changes still need to be made, even if transportation companies have switched from a manual to an automated strategy for managing their drivers' and passengers' data in the areas of booking and tracking. One of these improvements is a function that lets customers track the location of the bus they have reserved, as well as when it arrives and departs and whether the route trip has been canceled.

Modern commuters have high expectations, and traditional bus seat reserving techniques frequently fall short of satisfying those expectations in a fast-paced environment where accessibility and convenience are critical. The proposed concept aims to introduce a smart mobile application specifically designed for bus seat bookings, revolutionizing this element of transportation. With the convenience of a smartphone, this software will operate as a digital gateway, quickly and easily matching travelers with open seats on a variety of bus routes.

Purpose of the project

This project's primary goal is to close the gap between the outdated bus seat reservation procedures and the evolving demands of modern travelers. Through the utilization of mobile technology, the project aims to remove the logistical obstacles related to conventional booking techniques, thus converting a laborious procedure into a simple and easy experience. The initiative aims to rethink the bus seat reservation paradigm through this effort, making it more user-friendly and efficient.

Justification for the project

The initiative is a proactive reaction to the transportation industry's changing terrain from a strategic perspective. Bus operators may boost their operational efficiency and strengthen their position in a highly competitive market by investing in a mobile application for bus seat booking. Furthermore, the concept has the potential to promote inclusion and accessibility from a social standpoint, enabling commuters from many backgrounds to travel with unmatched comfort and convenience.

The project also addresses the need for dependable and easily available transportation alternatives in society, particularly in urban and rural regions where public transit plays a critical role in promoting community ties. By making bus services more dependable and accessible, the initiative uses technology to improve mobility, lessen traffic, and support sustainable transportation practices.

Scope and objectives

Scope:

The project's scope is multifarious, ranging from the creation of a feature-rich mobile application to the smooth integration of such application with already-in-use bus management systems. This includes,

- Extensive Feature Set: Including a wide range of features in the mobile application, such as route research, secure payment methods, real-time seat availability, and customized booking options.

- Sophisticated interaction: Operators may effectively manage reservations and improve seat allocation thanks to the seamless interaction with backend bus management systems that ensures real-time data synchronization.

- Robust Testing Regimen: Putting in place a strict testing schedule to guarantee the security, usability, and dependability of the program in a variety of user situations and operating settings.

- Strategic Deployment: To optimize user acquisition and engagement, strategically distribute the application across the main app distribution channels while utilizing focused marketing techniques.

Objectives:

The project's objectives are varied and intended to provide real benefits to interested parties while furthering the main goal of improving the bus seat reservation process. Among these goals are:

- User-Centric Design: Providing a mobile application that is user-centric in nature, with accessibility, simplicity, and intuitiveness given first priority, enables users across all demographics to book with ease.

- Operational Efficiency: Improving seat usage, automating critical operations, and providing real-time insights into booking patterns and customer preferences are ways to improve operational efficiency for bus operators.

- Customer Delight: Fostering a culture in which users are actively sought after for input, issues are immediately resolved, and the application is continually improved to surpass users' expectations.

- Income Growth: Increasing booking frequency, growing the client base, and opening up new income streams through partnerships and value-added services are the strategies that bus operators should use to drive revenue growth.

- Market Leadership: Consolidating the brand's position as a leader in digital transportation solutions by making the mobile application the go-to option for bus seat bookings in the target market.

Through the establishment of a well-defined scope and attainable, yet ambitious, goals, the project paves the way for revolutionary innovation in the bus seat reservation space, which is expected to have a profound impact on the transportation environment.

Background.

Online bus booking and tracking systems have become increasingly popular due to the spread of digital technology and the growing need for convenient transportation choices. Long lines, manual procedures, and a lack of real-time bus position visibility are common features of traditional bus ticket buying and route tracking systems, which cause inefficiencies and annoyance for both customers and service providers.

By streamlining the booking process, boosting operational effectiveness, and enhancing the overall passenger experience, online booking and bus monitoring systems have the potential to revolutionize public transportation and enable sustainable mobility solutions in both urban and rural environments. Therefore, in order to create effective, user-centric solutions that meet the

evolving demands of both service providers and passengers, it is imperative that one understand the theoretical underpinnings and empirical study findings in this field.

Literature study

Summary of Current Research:

A wide range of research, albeit with different objectives and approaches, have been done on the topics of bus tracking and seat reservation systems. Advancements in transportation technology, such as the incorporation of online booking platforms, smartphone applications, and GPS monitoring, have been studied. Research has also looked at how these technologies affect the transportation industry's ability to optimize resource usage, improve user experience, and increase operational efficiency.

Current Products or Solutions:

A variety of products and solutions, from stand-alone bus tracking apps to all-inclusive bus management platforms, are presently available on the market. Features like seat reservations, route planning, real-time bus tracking, and secure payment processing are all included in these solutions. Among the noteworthy examples are:

a) Google Maps Transit: users can check bus timetables and predicted arrival times in real-time and plan their routes.
b) Moovit: Provides a feature-rich public transportation app with real-time arrival and departure bus updates, route planning, and bus monitoring.
c) BusBud: An online platform that lets users look up bus routes, evaluate prices, and purchase tickets.

Evaluation of Advantages and Disadvantages:

Advantages:

- Enhanced Accessibility: From the comfort of their smartphones, users can conveniently view bus timetables, track the position of buses, and reserve seats.
- Enhanced Efficiency: The reduction of waiting times, the ease of traffic, and the general operational efficiency are all made possible by real-time tracking and optimization algorithms.
- Improved User Experience: Passengers have a more positive experience when using interfaces that are easy to use and booking procedures that are streamlined.

Disadvantages:

- Dependency on Technology: Service interruptions or inaccurate bus tracking data may result from reliance on GPS signals and mobile networks.

- Problems with connectivity: People in places with spotty network connection can have trouble getting real-time information or completing online reservations.
- Security Issues: If the system is not sufficiently secured, online transactions and personal data kept within may be subject to cybersecurity attacks.

Theoretical Framework for the Solution

Theories at the Development/Design Level Involved:

I. UCD (User-Centered Design): In order to make sure that the mobile application is created with the end user in mind, the project uses UCD principles. In order to provide a smooth and simple booking experience, the application places a high priority on usability, accessibility, and user happiness.

II. Information Systems Theory: The bus tracking and booking system is designed and implemented in accordance with information systems theory, which emphasizes the significance of data management, information flow, and system interoperability. The research hopes to create a scalable and reliable system that can manage massive amounts of data and enable smooth communication between different components by utilizing this theoretical framework.

III. The Technology Acceptance Model, or TAM, offers perceptions on how users embrace and utilize new technology. The project intends to identify and overcome potential adoption hurdles by integrating TAM aspects into the design process, guaranteeing that the mobile application satisfies the requirements and expectations of its target customers.

IV. Agile Development technique: Iterative development, ongoing feedback, and quick prototyping are all made easier with the help of this technique. Throughout the development process, this method facilitates flexibility and adaptation, allowing the project team to promptly address evolving needs and stakeholder feedback.

Justification:

- UCD guarantees that the program is easy to use and fits the demands of the intended user base, hence increasing user contentment and uptake.
- A foundation for creating a scalable, interoperable system that can efficiently manage bus tracking and booking data is provided by information systems theory.
- TAM guides the design process to optimize usability and decrease resistance to change by assisting in the identification of variables impacting user acceptability and adoption.
- The project team may iteratively improve the application based on user input thanks to the agile development technique, which makes sure that it changes to suit the demands of its stakeholders and users as they change.

User requirement

Users (Stakeholders):

- Passengers: The primary users of the bus tracking and reservation app are those who use it to locate routes, book seats, and keep track of the whereabouts of buses.

- Bus operators: These are the people in charge of managing the fleet, scheduling, and operations of buses. They require the appropriate equipment in order to monitor bus performance, determine the optimal routes, and communicate with passengers.

- Administrators: Administrators are responsible for overseeing user accounts, monitoring the online booking platform's general performance, and ensuring that the system is safe and trustworthy.

Fact Gathering

Questionnaires:

To collect information on preferences, problems, and behaviors pertaining to bus transportation in Sri Lanka, structured questionnaires were sent to commuters, bus operators, and stakeholders.

Observations:

Methodical observations made at bus stops and throughout bus rides in order to obtain firsthand knowledge of user behavior, interactions, and experiences. These observations also provide important contextual data.

Current Documents Searching:

Extracting pertinent information and insights on bus transportation in Sri Lanka through the review of papers, studies, and paperwork that are currently available from government agencies, transportation authorities, and research institutes.

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

Persona creation is a crucial element in the design and development process of any product, including the Online Bus Tracking and Booking Mobile Application. Personas are fictional characters created to embody different user groups based on behavioral, psychographic, and demographic characteristics. They assist teams in understanding the needs and preferences of users, which helps them build user-centered solutions. An overview of the process for creating personas for the bus booking and tracking app is provided below:

- Identify User Segments: Choose which distinct user segments are most likely to utilize the program in the outset. A bus tracking and reservation software may cater to commuters, tourists, business travelers, students, and other groups of people.
- Obtain User Information: Collect information using surveys, interviews, market research, and analytics to discover user demographics, preferences, and pain issues.
- Create Persona Profiles: Make persona profiles that match different user categories using the information that has been collected. A persona should include personal details such as name, age, occupation, goals, motivations, challenges, inclinations, and behaviors related to utilizing the bus reservation and monitoring app.
- To develop persona scenarios, describe typical use cases or scenarios in which each persona would interact with the program. Think about things like buying a ticket, riding the bus, paying for it, looking at the timetable, and receiving notifications.
- Verify and repeat: Share the persona profiles with stakeholders, including product managers, designers, and developers, to get their feedback and confirmation. Rework the characters' personalities in light of the data gathered throughout the validation process.
- Update Often: Regularly review and edit persona profiles in response to feedback from users, changes in industry trends, and adjustments to user requirements. Persona updates ensure that the application remains current and user-focused at all times.

Requirements Prioritization

Requirements prioritization, which comprises rating features and functionalities according to their importance, worth, and effect on the project's goals, is an essential phase in the software development process. Prioritizing needs ensures that users receive the most crucial features first, speeds up development, and makes resource allocation easier. The following is a general approach to ranking requirements:

- 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:

Cross-referencing information gathered from user interviews, observations, surveys, and use case analysis will be used to validate findings in order to guarantee consistency and dependability. In order to verify alignment, requirements will be reviewed in relation to stakeholder expectations and project goals. Before moving forward with development, prototypes and mockups may be made to verify design choices and get user input. Regular validation and verification checkpoints will also assist guarantee that the finished product satisfies user demands and efficiently provides value throughout the development lifecycle.

Functional Specifications

Functional Requirement ID: RTB-001

Requirement Description: Users must be able to register for an account on the bus tracking and booking online system by providing their email address, full name, and password.

Dependencies: None

Acceptance Criteria:

- Users should be able to access the registration page from the system's homepage.
- Upon registration, users should receive a confirmation email to verify their email address.
- Users should be able to log in using their registered email address and password.

Priority: High

Functional Requirement ID: RTB-002

Requirement Description: Users should have the ability to search for bus routes based on their origin, destination, and preferred travel dates.

Dependencies: None

Acceptance Criteria:

- Users should find a search bar prominently displayed on the homepage.
- The search functionality should support autocomplete suggestions based on user input.
- Users should be able to filter search results by departure time, arrival time, and bus operator.

Priority: High

Functional Requirement ID: RTB-003

Requirement Description: Users must be able to view detailed information about available bus routes, including departure times, arrival times, bus operators, and ticket prices.

Dependencies: RTB-002 (Search functionality)

Acceptance Criteria:

- Users should see a list of search results displayed in a clear and organized manner.
- Each search result should provide relevant information about the bus route.

- Users should be able to click on a specific route to view additional details.

  Priority: High

Functional Requirement ID: RTB-004

Requirement Description: Users should be able to select their preferred seats when booking bus tickets.

Dependencies: None

Acceptance Criteria:

- Users should see a seat selection interface after choosing a specific bus route.
- The interface should display available seats and their corresponding prices.
- Users should be able to select multiple seats if needed.

Priority: Medium

Functional Requirement ID: RTB-005

Requirement Description: Users must be able to make secure payments for their booked tickets using various payment methods such as credit/debit cards, mobile wallets, or online banking.

Dependencies: RTB-004 (Seat selection)

Acceptance Criteria:

- Users should be directed to a secure payment gateway upon confirming their seat selections.
- The payment gateway should support multiple payment methods and provide clear instructions for completing the transaction.
- Users should receive a confirmation email with their ticket details after the payment is successfully processed.

Priority: High

Functional Requirement ID: RTB-006

Requirement Description: Users should have the ability to track the real-time location of their booked buses.

Dependencies: None

Acceptance Criteria:

- Users should find a "Track My Bus" feature accessible from their account dashboard.
- The tracking interface should display the current location of the bus on a map along with estimated arrival times.
- Users should receive notifications for any significant delays or route changes.

Priority: High

Functional Requirement ID: RTB-007

Requirement Description: Users must have access to a customer support system to address inquiries, issues, or feedback related to their bookings.

Dependencies: None

Acceptance Criteria:

- Users should find a "Contact Us" or "Support" section accessible from the system's navigation menu.
- The support system should include options for live chat, email support, and a knowledge base.
- Users should receive timely responses to their inquiries and have the option to escalate issues if needed.

Priority: Medium

Functional Requirement ID: RTB-008

Requirement Description: Administrators should have the ability to manage user accounts, monitor system performance, and generate reports on booking trends and revenue.

Dependencies: None

Acceptance Criteria:

- Administrators should have access to a secure admin panel with customizable user roles and permissions.
- The admin panel should provide functionality for managing user accounts, resetting passwords, and viewing booking details.

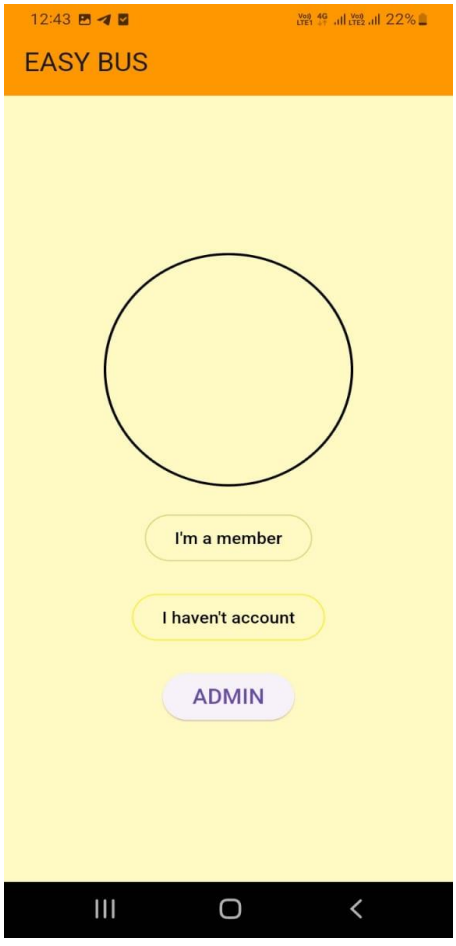
- Administrators should be able to generate reports on key metrics such as booking volume, revenue, and user demographics.

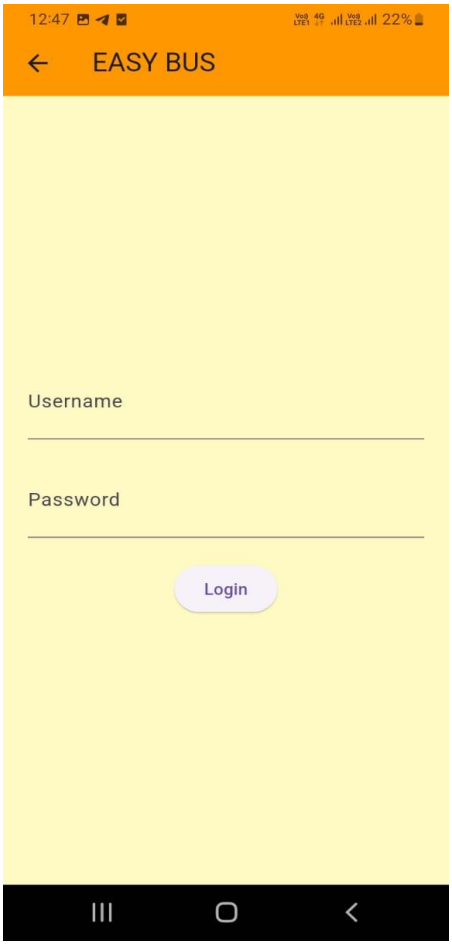
  Priority: High

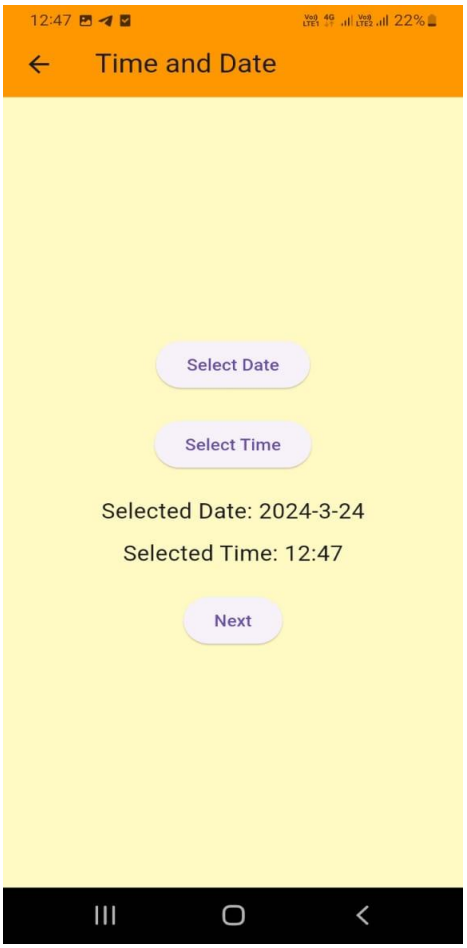
Technical Specification

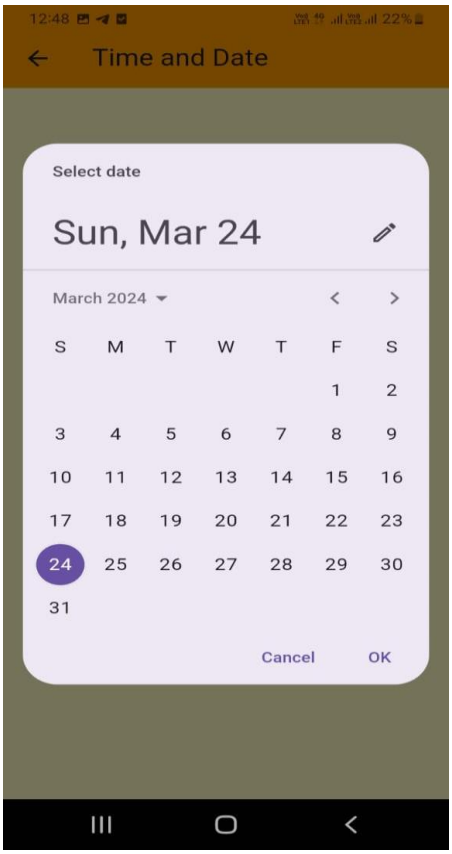
User Interface Design- UI and UX.

Using Figma, the design approach was centred on producing an aesthetically pleasing and simple user experience. To guarantee that users interacting with the mobile application could navigate the app easily and with ease, wireframing, prototyping, and iterating on designs were necessary.





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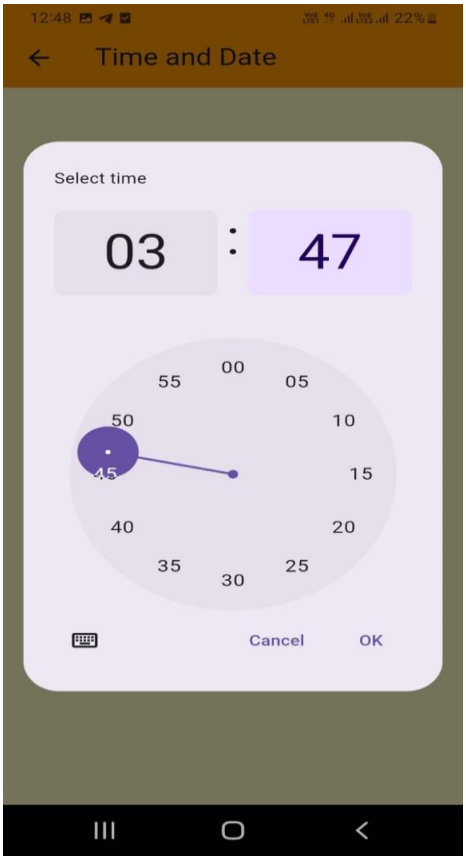
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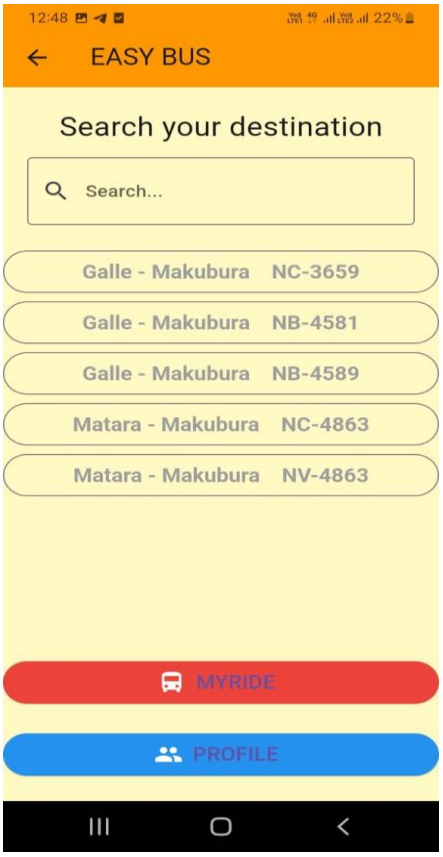
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Search your destination
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Matara - Makubura NC-4863
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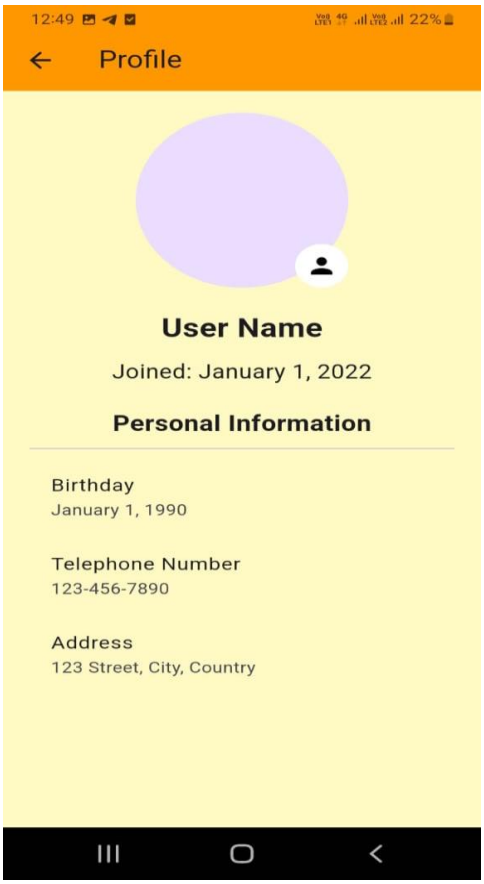
MYRIDE
PROFILE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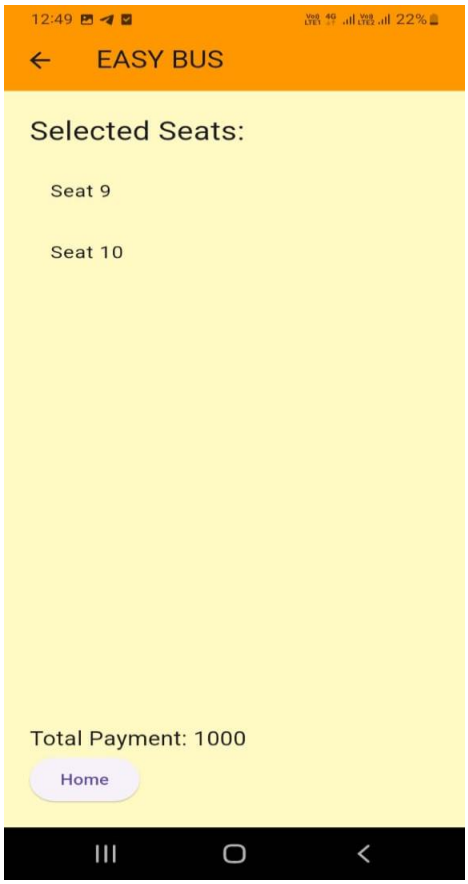
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Seat 10
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Fifth Screen
Galle - Makubura NC-3659
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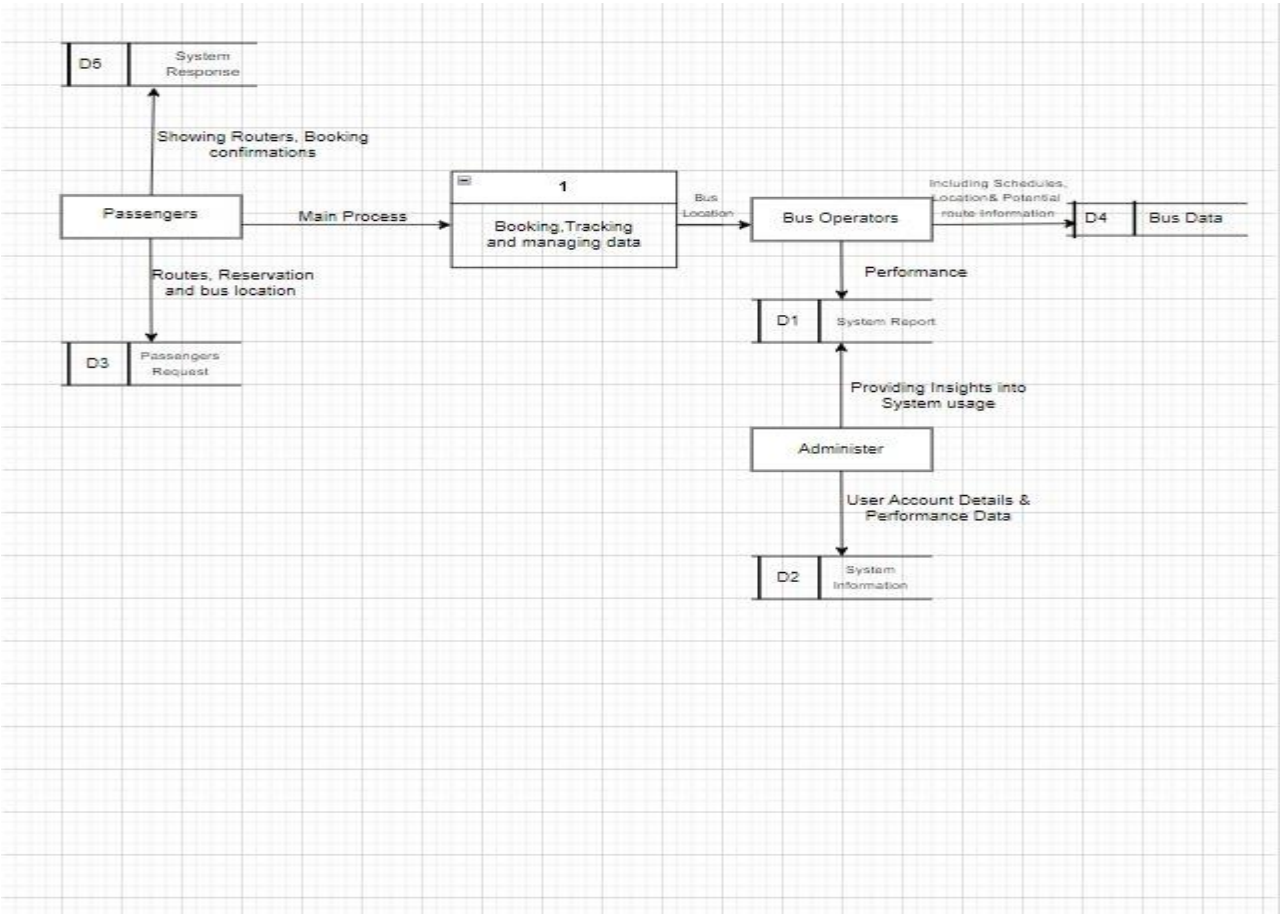
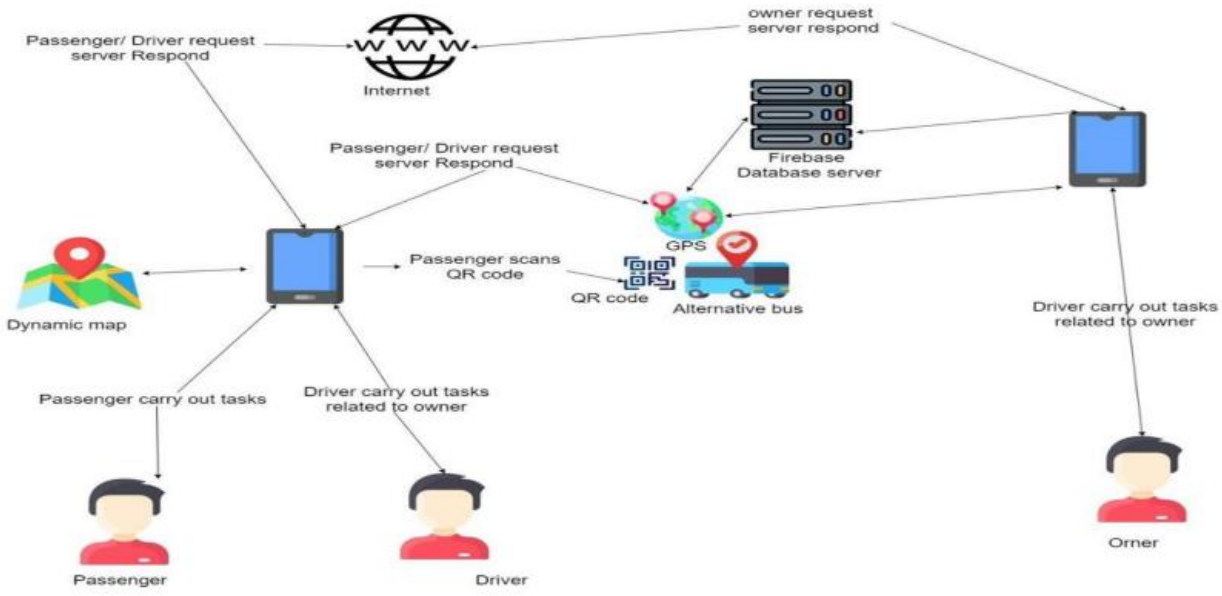
Data Model



System Architecture



Deployment and Infrastructure

In order to distribute the mobile application to customers, the deployment approach required deploying it to app stores. Scalability and dependability of the infrastructure included hosting any backend services needed for the application. This may have entailed deploying to stores like the Apple App Store for iOS and the Google Play Store for Android in the case of Flutter and Dart development.

Testing Strategy

1. Unit testing: To make sure your code is working as intended, write tests for the small, distinct components, such functions, or methods.
    - Verify that every single component of your code operates as it should.

2. Integration testing: • Confirm that the various components of your system are interoperable.
    - Check to see if parts such as databases, external services, and APIs work properly together.
    - Confirm that information moves through your system's components in the right order.

3. Functional testing: Assess the system's performance against the specified parameters.
    - Check that users are able to complete other necessary functions, such adding products, changing quantities, and producing reports.
    - Verify that the system performs as anticipated for various user

Dependencies

1. Flutter SDK Description:

Description :When utilizing the Dart programming language to create cross-platform mobile applications, Flutter SDK is the main need.

Purpose :Its goal is to give developers and app logic managers a collection of tools and a framework for creating user interfaces.

For instance: flutter_sdk: ~2.10.0

2. HTTP Requests Library Overview:

Description: This library enables Flutter apps to send HTTP requests to web services.

Purpose :It serves to facilitate data fetching and sending interactions with backend APIs.

For instance : http: ~0.14.0

3. UI Component Library Overview:

Description: User interface component libraries offer pre-made components and widgets for interface design.

Purpose: Their goal is to speed up development by providing ready-to-use user interface components.

For instance: flutter_material: ~0.6.0

4. Targeting Operating Systems

Description: Flutter gives developers the ability to target particular operating systems, such iOS and Android.

Purpose: It guarantees that the program has a native appearance and feel by optimizing it for every platform.

For instance: flutter build apk

5. Google_maps_flutter

Description: With the help of this Flutter plugin, you can integrate Google Maps straight into your Flutter application.

Purpose :Its goal is to give users access to Google Maps features including listening to map events, placing markers, and displaying maps.

For instance :Google Maps Flutter: ~2.1.0

6. SQLite:

Description: This is a lightweight database engine for Flutter that lets you save data locally on the device: SQLite.

Purpose: It offers a quick and easy approach to carry out database activities, including table creation, data insertion, data querying, and more.

For instance: sqflite: ~2.0.0

Work breakdown.

Project Phases:

Planning Phase:

- Define project scope, objectives, and requirements.
- Conduct market research and competitor analysis.
- Identify key features and functionalities of the mobile application.
- Define the target audience and user personas.
- Create a project plan, including WBS and timeline.

Design Phase:

- Develop wireframes and prototypes for the mobile application.
- Design user interfaces (UI) and user experience (UX) for booking tickets, tracking buses, and other features.
- Finalize the visual design, including color schemes, typography, and branding elements.
- Create mockups and clickable prototypes for user testing and feedback.

Development Phase:

- Set up the development environment and infrastructure.
- Implement front-end development for the mobile application using appropriate frameworks (e.g., React Native, Flutter).
- Develop back-end services for handling user authentication, booking transactions, bus tracking, and other functionalities.
- Integrate third-party APIs for payment processing, geolocation, and other services.
- Implement real-time communication for bus tracking and updates.
- Conduct unit testing and integration testing throughout the development process.

Testing Phase:

- Conduct comprehensive testing of the mobile application, including functional testing, usability testing, performance testing, and security testing.
- Identify and resolve bugs, errors, and performance issues.
- Gather feedback from beta testers and stakeholders for further improvements.
- Ensure compliance with mobile platform guidelines (e.g., App Store, Google Play).

Deployment Phase:

- Prepare for app store submission, including creating app listings, screenshots, and promotional materials.
- Package the mobile application for deployment on iOS and Android platforms.
- Submit the application to the respective app stores (Apple App Store, Google Play Store).

- Monitor the deployment process and address any issues or rejections from app store review teams.
- Coordinate with marketing and promotion efforts for the app launch.

Maintenance and Support Phase:

- Monitor app performance and user feedback post-launch.
- Release updates and bug fixes as necessary.
- Provide customer support and address user inquiries and issues.
- Continuously improve the application based on user feedback and market trends.

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.

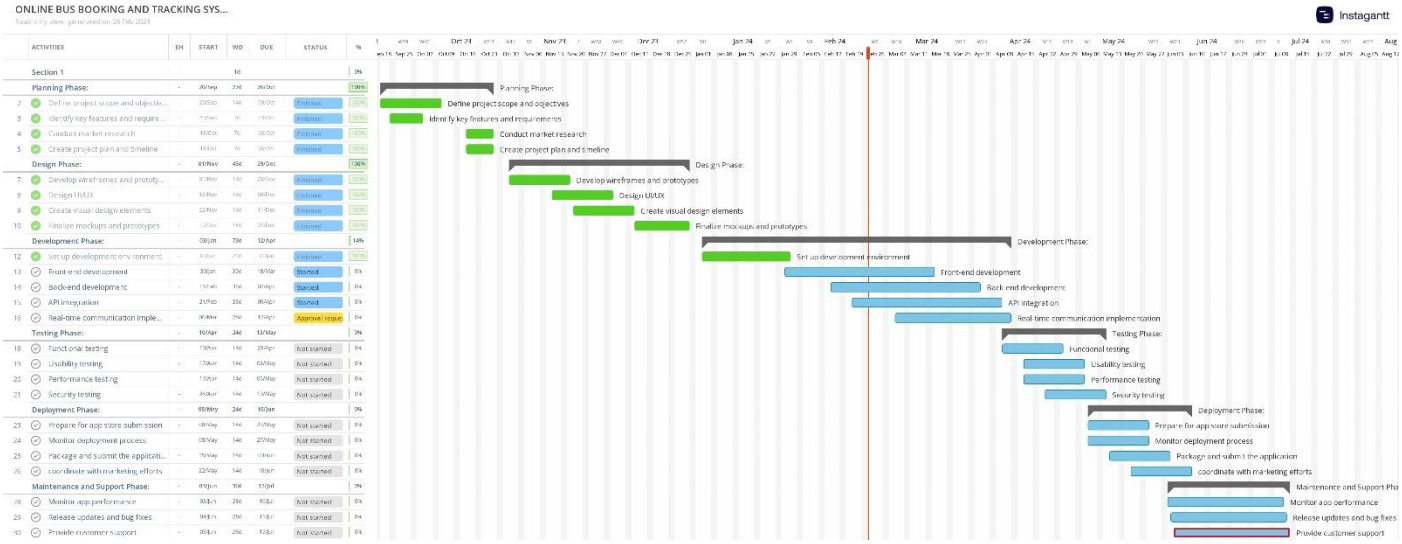
Development Phase: 10 weeks

Testing Phase: 3 weeks

Deployment Phase: 3 weeks

Maintenance and Support Phase: Ongoing

Gnatt 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 Kihaduwage Sahasra Senanayake Liyanage Chathupraba Munasinghe
1.2- Conduct market research	Kihaduwage Sahasra Wedamulla Madusanka
1.3- Identify key features and requirements	Kihaduwage 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 Kihaduwage 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 Kihaduwage 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	Kihaduwage Sahasra Senanayake Liyanage Chathupraba Munasinghe

4.1- Functional testing	Kihaduwage Sahasra Senanayake Liyanage Chathupraba Munasinghe
4.2- Usability testing	Kihaduwage 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	Kihaduwage Sahasra Senanayake Liyanage Chathupraba Munasinghe
5.2- Package and submit the application	Badal Gamage Yaddehi Kishal Sankalpa Wedamulla Madusanka
5.3- Monitor deployment process	Kihaduwage 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	Kihaduwage Sahasra Senanayake Liyanage Chathupraba Munasinghe

Milestones alien with deliverables.

1) Project kickoff milestone:

Deliverable: The project's goals, scoping document, and preliminary schedule.

Description :The official commencement of the project involves the establishment of goals, objectives, and preliminary planning.

2) Features definition milestone:

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

Description: Determining and recording the necessary features and specifications for the application.

3) Design and prototyping milestone:

Deliverables : include UI/UX designs, wireframes, prototypes, and graphic components.

Description :The process of creating prototypes and visual representations of an application to help with layout, flow, and functionality visualization.

4) Development kickoff milestone:

Deliverable: Completed technological stack and established development environment.

Description : Official start of the development phase, which includes putting in place the required tools and infrastructure.

5) Testing phase milestone:

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

Description :The testing phase, which includes functional, usability, performance, and security testing, has begun.

6) Deployment Readiness Milestone:

Deliverable: Deployment plan and application that is ready for use.

Description: After testing and final preparations are completed successfully, the application is considered ready for deployment.

7) Launch milestone:

Deliverable: Promotional materials and the launch of the application in app stores.

Description :The application will be formally released to the public along with marketing and promotional efforts.

8) Post launch evaluation milestone:

Deliverables: Post-launch analysis, performance analytics, and user feedback.

Description :This report assesses the performance of the application and user input after it is launched, along with recommendations for ongoing enhancements.

Results and Discussion

Discussion on Achievements

Our team successfully overcame the difficulty of updating Sri Lanka's bus seat reservation and tracking systems throughout the development phase. Utilizing state-of-the-art technology and creative design concepts, we have created a mobile application that not only satisfies user needs but beyond them. Our main accomplishment is the development of an intuitive user interface that makes it easy for users to search for routes, monitor bus positions, and easily reserve seats. Bus operators and commuters alike may enjoy a seamless and trouble-free experience because to this design's intuitiveness.

Moreover, the incorporation of real-time bus monitoring and seat reservation features marks a noteworthy advancement in enhancing operational effectiveness in the transportation industry. Our software helps consumers plan their trips more efficiently while helping bus operators to maximize resources and improve service performance by giving users access to up-to-date information and enabling rapid, secure reservations.

Test Cases/Test Results Summary

Our application's functionality and performance were verified throughout our rigorous testing process when we painstakingly created and carried out an extensive collection of test cases. The robustness and dependability of the system under many conditions were evaluated by means of methodical testing. The primary functionalities of the program were found to be operating as intended, and there were not many noticeable bugs, according to the test findings. The application's responsiveness and stability were further validated by performance testing, which showed respectable reaction times and steady behavior under normal usage circumstances. Even though a few small problems arose during testing—for example, inaccuracies in the real-time bus tracking data—they were quickly resolved by incremental enhancements and optimizations.

Findings and rectifications suggested /applied

- Active user input gathering and integration occurred throughout during the development process.
- Feedback was gathered through usability testing sessions and stakeholder involvement.
- Optimizing data synchronization for real-time bus tracking was one of the areas for improvement that were found.
- Usability issues with certain UI components were resolved to improve user understanding and navigation.
- An iterative development method was guided by the findings from feedback sessions.
- Problems were resolved quickly, and the program was improved often.
- The goal of development was to satisfy changing user expectations and demands.

Future improvements and development path

- ❖ Future work will mostly concentrate on implementing predictive analytic algorithms for bus arrival time estimation based on historical data and current traffic circumstances.
- ❖ To increase user confidence and trust, security measures that secure user data and payment information will be strengthened.
- ❖ Additional features including bus ticket reductions, loyalty programs, and interaction with other modes of transportation for smooth multi-modal trips are planned to be added to the application's feature set expansion.
- ❖ Our dedication to providing an outstanding user experience and promoting constructive change in Sri Lanka's transportation environment is centered on our ongoing innovation and improvement.
- ❖ In addition, We are working on an IoT tracking device project is now in progress, and once it is finished, the program will have bus tracking features. Users will benefit from even greater precision and dependability in real-time bus tracking as a result.
- ❖ It is intended to expand the service to include all buses in the nation, giving customers the ability to search and reserve tickets for any bus route in the country.
- ❖ When a comprehensive booking system is put into place, customers will be able to easily reserve seats on many bus routes using a single platform.
- ❖ We will endeavor to integrate with bus operators around the country in order to guarantee extensive coverage and ticket availability for a variety of locations.
- ❖ Upgrades including fare comparison, route planning, and real-time updates will be included to provide consumers with an easy and effective booking experience.

Appendix

Individual contribution Metrix

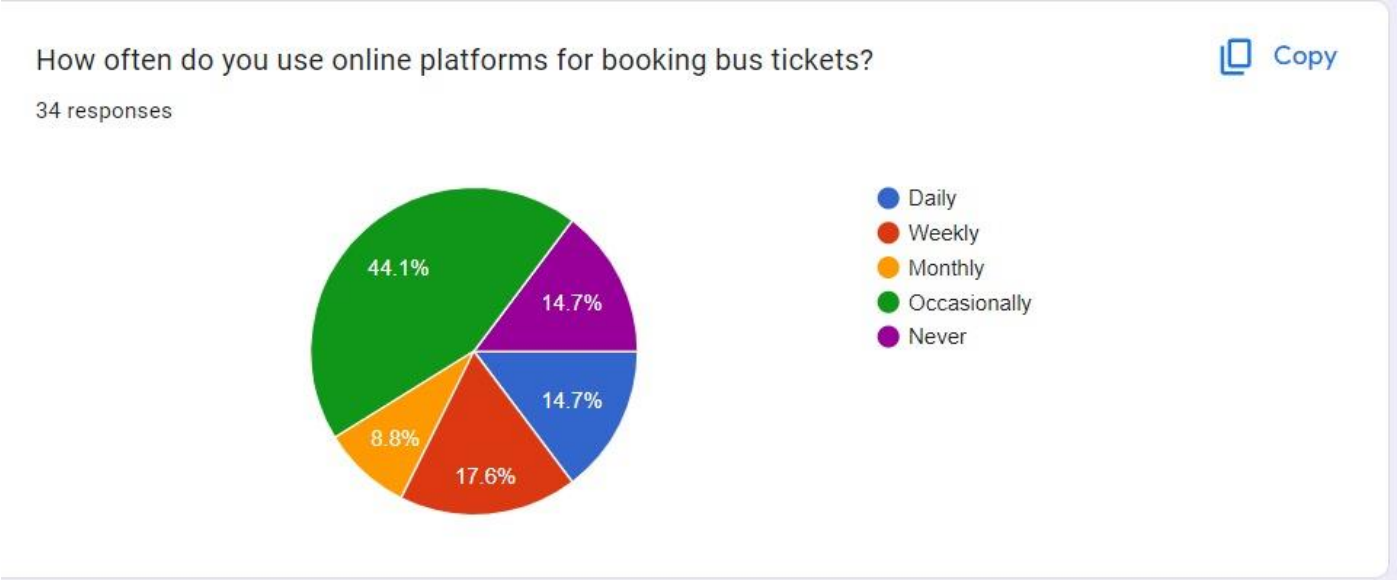
Plymouth ID	Name (as appeared in DLE)	Contributed Section
10899521	Badal Gamage	1.1- Define project scope and objectives 1.4- Create project plan and timeline 2.4- Finalize mockups and prototypes 3.1- Set up development environment 3.2- Front-end development 3.3- Back-end development 3.4- API integration 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 6.2- Release updates and bug fixes
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	Kihaduwage 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 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
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

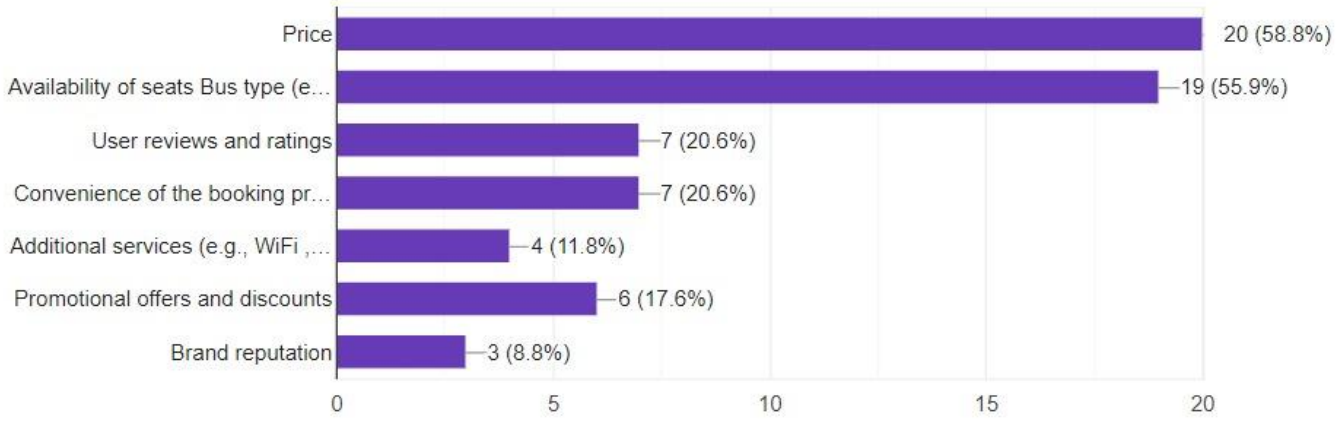
Questionnaire:



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

Copy

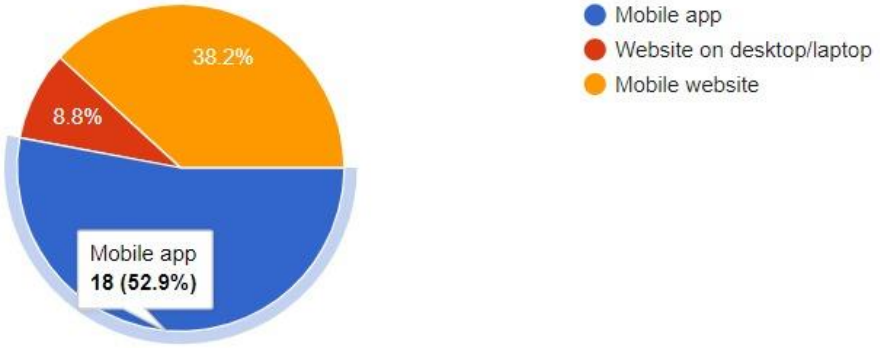
34 responses



How do you typically access online bus booking platforms?

Copy

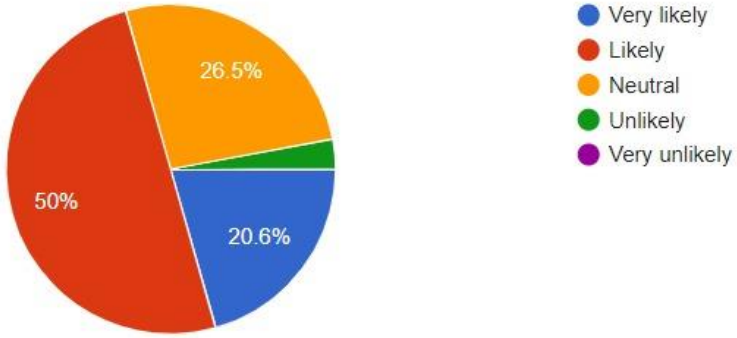
34 responses



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 personlize 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

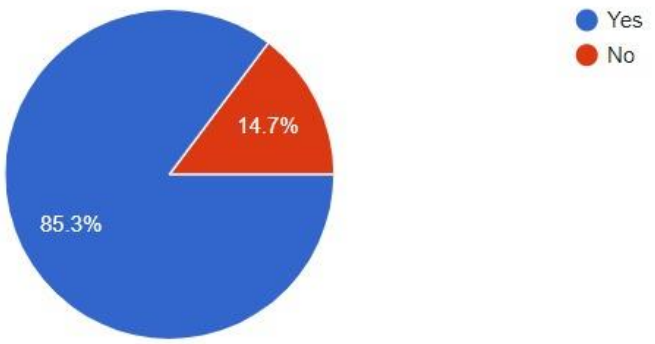
Great

Nice app

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

Copy

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

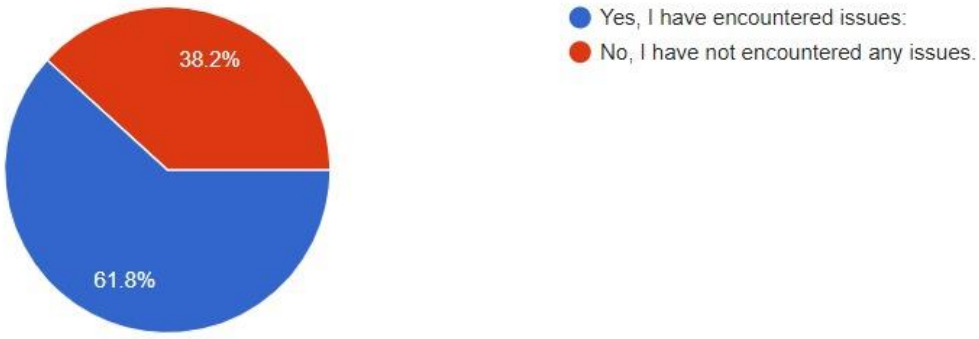
Bus roots and numbers

User friendly features

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

Copy

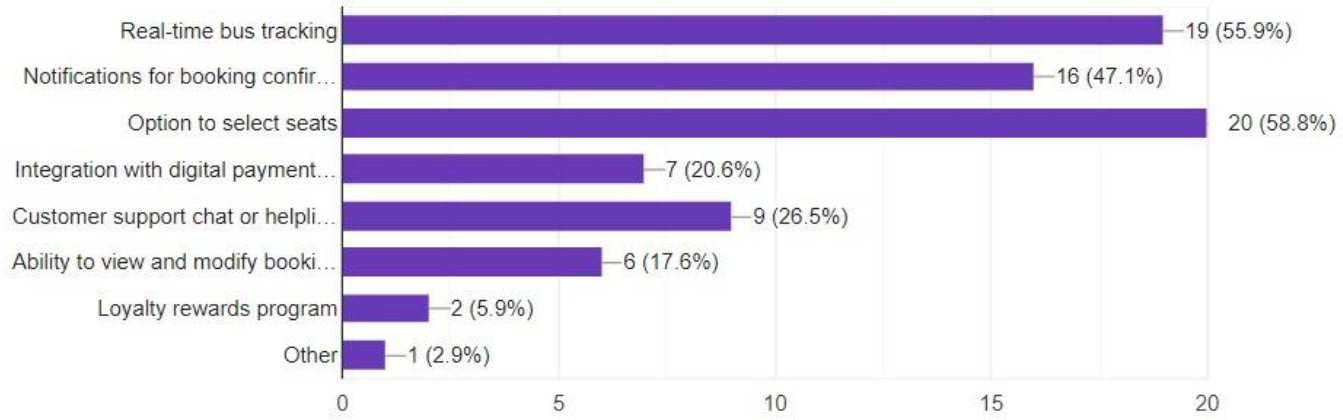
34 responses



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

Copy

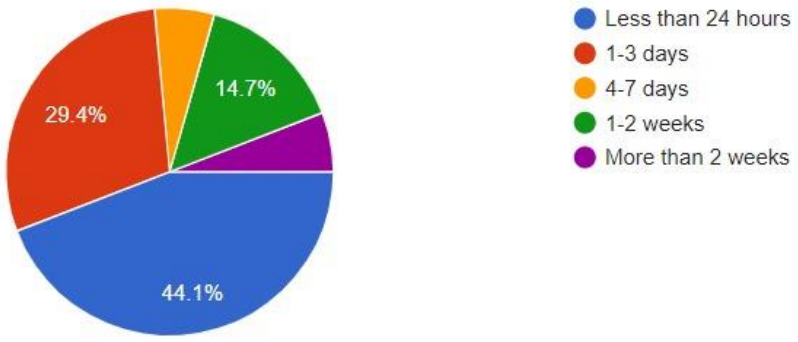
34 responses



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:


V.Lokunarangoda | Super Luxury | NC-7754
Ref : 0012742910000003 | 22-08-19 | 07:31
Route : EX1 Makumbura-Galle
මාකුඹුර - ගාල්ල
Makumbura - Galle
மாகும்புரா - கால்ல
Distance : 0.0 KM
Full : 1 * 1030.00 = 1030.00
TOTAL : LKR 1030.00
Card Balance : LKR 40.00
3571********3525
Thank You | 0713171491 | 1955

Conclusion

In conclusion, a major step toward modernizing Sri Lanka's bus transportation sector has been taken with the creation of the seat booking and tracking system. By utilizing cutting-edge technology, adopting a user-centric strategy, and engaging in constant feedback-driven iteration, we have effectively tackled the task of augmenting user experience and optimizing operational efficiency. Through the smartphone application, customers can easily reserve seats, plan their routes, and get real-time bus information on a dependable and easy platform. Even though the project has been rather successful in its current scope, there is still plenty of room for improvement and growth.

Through our emphasis on user input, adoption of technical improvements, and promotion of stakeholder engagement, we are well-positioned to persist in promoting good change and providing outstanding value to users within Sri Lanka's transportation sector.