TEAM FOUR GUIS
RIDE-SHARING APP
CARAOKE APP

PREPARED FOR

ICTE3002 - Human Computer Interface
School of Computing Sciences,
Curtin University

PREPARED BY

Sanugi Perera - 20542524
Sahas Gunasekara - 20462075
Pramoda Gunarathne - 20531218
Kasundi Bandaranayake - 20583387

GROUP NUMBER - SLIIT_12
TUTE DAY & TIME - TUESDAY AT 10:30AM

Table of Contents

Executive Summary 7

1 Introduction 7

2 Background 7

2.1 Project Description 8

2.1.1 User-centric Approach 9

2.1.2 Design purpose 10

2.1.3 Overview 11

3 Team 12

3.1 Team Members 12

4 Software Engineering Lifecycle and Tools 12

4.1 Agile Process 14

5 Design Thinking 18

5.1 Design Thinking Process 18

5.2 User-Centred Design 21

5.2.1 User Research 22

5.3 User Interviews, Surveys, Questionnaires, and Observations 24

5.4 Data Analysis 25

5.5 User Feedback and Iterations 31

5.6 Personas 33

5.6.1 Jane Doe 33

5.6.2 Kusal Perera 34

5.6.3 Daya Fonseka 34

5.6.4 Raymond D'Andre 35

5.6.5 Lucien Asher 35

5.7 User Journeys, User Flows, Empathy Maps 36

5.7.1 User Journeys 36
5.7.2 User Flows 38
5.7.3 Empathy Maps 42
5.8 User Stories 44
5.9 Use Cases 46
5.10 Competitor Analysis 48
5.10.1 RideShare.lk 49
5.10.2 BTW Carpooling 50
5.10.3 Uber/ UberPooL 51
5.10.4 BlaBlaCar 52
5.11 Pain Points 53
5.12 Problem Statement 54
5.13 Ideate Solutions 64
6 Requirement Specification 65
6.1 Functional Requirements 66
6.1.1 User Requirements 66
6.1.2 System Requirements 67
6.2 Non-Functional Requirements 69
6.3 Hierarchical Task Analysis 72
7 UI /UX Goals 76
7.1 Usability Goals 76
7.2 User Experience Goals 78
8 UI/UX Design Principles 81
8.1 Design Principles 81
8.2 UI/UX Design Principles and Visual Design Principles 82
8.2.1 Hierarchy and Layout 82

8.2.2 Colour 84
8.2.3 Proximity, Alignment, Repetition 86
8.2.4 Typography 87
8.2.5 Imagery and copy 88
9 Usability Heuristics 89
10 Wireframing 96
11 Low-Fidelity Prototype 98
11.1 Design 1: Visibility and Affordance 98
11.2 Design 2: Feedback 100
11.3 Design 3: Mapping 101
11.4 Design 4: Constraints 102
11.5 Design 5: Consistency 103
12 Expert Review 104
12.1 Performing Expert Review 104
12.2 Revision Post Feedback 110
13 High-Fidelity Prototype 110
13.1 Design 1: Visibility 110
13.2 Design 2: Affordance 112
13.3 Design 3: Feedback 113
13.4 Design 4: Mapping 115
13.5 Design 5: Constraints 116
13.6 Design 6: Consistency 117
13.7 Design Specifications for Handoff 117
14 Project Management 118
14.1 Meetings 118
14.2 Risk Management 119

14.3 Milestones 120
14.4 Problems Encountered 122
15 Development 122
16 Conclusion 123
17 Acknowledgements 124
18 References 124
19 Glossary 126
20 Appendix 128
Appendix A: User Survey Responses 128
Appendix B: ChatGPT 140
Appendix C: Expert Review 140
Appendix D: Meeting Minutes 142
Appendix E: Record Keeping 142
Appendix F: Contribution Table 146
Appendix G: Other teamwork evidence 147
Appendix H: Figma Files 148

List of Figures

Figure 1: SDG 11 and SDG 12 8
Figure 2: Iterative Model 13
Figure 3: Waterfall Model 13
Figure 4: Product Backlog in Jiara 14
Figure 5: Planning Poker played by the team 15
Figure 6: Planning poker results for Software life cycle model 15
Figure 7: Sprint 3 for worksheet03 (Requirements) 16
Figure 9: Burn-up chart for sprint 2 17
Figure 10: Design Thinking process used 18
Figure 11: Team FourGUIs design thinking process 20
Figure 12: FourGUIs FigJam - Design Thinking 21
Figure 13: Iteration one for high fidelity 32
Figure 14: Iteration two for high fidelity 32
Figure 15: User flow of the Caraoke App 39
Figure 16: Use case diagram 47
Figure 17: SWOT structure 48
Figure 18: RideShare.lk system 49
Figure 19: BTW App 50
Figure 20: UberPool option in Uber App 51
Figure 21: BlaBlaCar App 52
Figure 23: FourGUIs FigJam - Pain points affinity mapping 54
Figure 24: Problems classified by risk assessment 64
Figure 25: Ideate solutions 65
Figure 26: Milestones achieved for Assignment 1 121

Executive Summary

In order to achieve Sustainable Development Goals (SDGs) 11 (Sustainable Cities and Communities) and 12 (Responsible Consumption and Production), a ride-sharing app can be developed, where we created a platform called Caraoke App. By encouraging shared transportation and advocating less individual car use, the app offers a solution to the issues of traffic congestion and carbon emissions. To ensure a simple and enjoyable user experience, the team finished high-fidelity prototypes that follow Don Norman's 6 UI/UX design principles and objectives. The app's UI is made to be visually appealing, with simple, recognizable icons and simple navigation. The Caraoke App will reward users who carpool with incentives like discounts on their journeys to promote responsible consumption and production. In conclusion, the ride-sharing app will offer a practical, accessible, and eco-friendly transportation choice that supports SDGs 11 and 12.

1 Introduction

Our Caraoke App aims to provide an efficient and affordable means of transportation for users, while also reducing carbon footprints and traffic congestion. By allowing users to share rides to work or other destinations, the app can help people save time and reduce air pollution. We prioritize user experience and offer various functionalities to attract more users. Our project's main goal is to provide convenient and efficient transportation to anyone who needs to hitchhike a ride and have access to a practical and reasonably priced means of transportation (Worksheet01 2023). This report gives an overview of our carpooling app, including its target audience, impact on society and the environment, features, and user experience. Our goal is to attract more users by providing a user-friendly experience and reducing traffic congestion and carbon footprints(Worksheet01 2023).

2 Background

With the rising number of vehicles on the roads, carbon emissions increase drastically every year (Worksheet01 2023). Many workers want to get to work quickly but due to traffic congestion on the road, it almost seems impossible. Hence, users require an application that helps them to commute to their destination in a time-efficient and cost-effective manner.

There are various solutions implemented in the past to achieve *an eco-friendly and cost-efficient ride-sharing system* and a few of these systems will be discussed in detail under competitor analysis. However, these applications consequently lack in addressing sustainable development goals 11 and 12 (Worksheet01 2023).

- RideShare is a desktop software that arguably affects the usage of the application and the interface has no map functionality so users cannot get efficient drivers going their way (Worksheet01 2023).
- BTW Sri Lanka is a carpooling application that has no location input through GPS, have to manually type location, and only allows scheduled trips in advance and not hitch-hiking (Worksheet01 2023).
- Uber is currently the best transportation application. This does not reduce emissions as there always will be a dedicated driver who takes riders to destinations rather than hitchhiking riders (Worksheet01 2023).
- BlaBlaCar is another popular ride-sharing platform that does not have an alternative arrangement for cancellations that could lead to a bad user experience (Worksheet01 2023).

2.1 Project Description

The Sustainable Development Goals (SDGs) 11 and 12, which are concerned with creating sustainable cities and communities and responsible consumption and production, respectively, can both be addressed by using the ride-sharing Caraoke application(Worksheet01 2023).

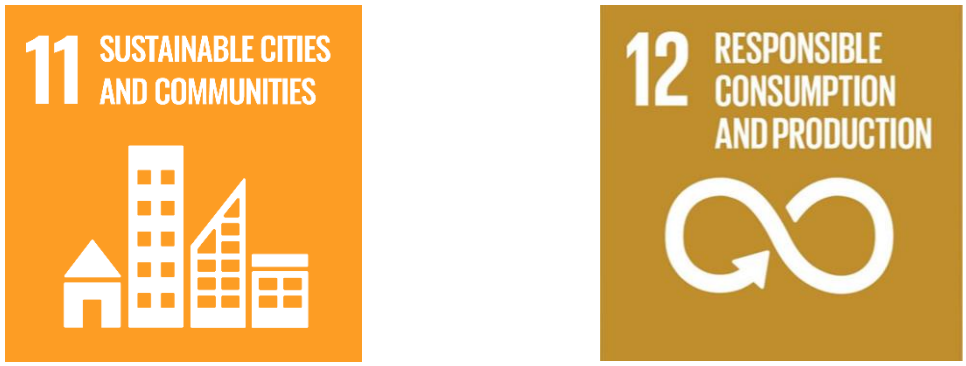


Figure 1: SDG 11 and SDG 12

The main *problem statement* is that the local people must be able to find someone to carpool with so that they can save money, and time, and reduce the impact on the environment (Behance n.d).

The Caraoke application can be used to address the sustainable goals as follows and helps to tackle this issue (Worksheet01 2023):

- Sustainable cities and communities (SDG 11): The app can assist in reducing traffic congestion, lowering carbon emissions, and reducing air pollution by lowering the number of vehicles on the road. As a result, communities and towns may become more livable and sustainable (United Nations n.d).
- Responsible consumption and production (SDG 12): The application encourages resource sharing, which can result in more sustainable use of natural resources. People can lower their carbon footprints and save money on gasoline and upkeep by sharing a car, for instance (Worksheet01 2023).

2.1.1 User-centric Approach

The user-centric prototype design is followed by the team to make the project successful as follows (Inside Design Blog 2019):

- Research to identify the target audience (our target audience is the working population of the age group of 18-60) to understand their needs and context. This stage was achieved by performing user personas, empathy maps and ascertaining their user pain points and problems. Interviews were conducted with the target audience
- Defined the user requirements and system requirements efficiently using user stories, and use case diagrams.
- Ideate – The team brainstormed on the information gathered to design the application to follow design principles and user experience goals by using user flows, and user journeys.
- In the design and prototype stage, the application assets were mentioned and low-fidelity prototypes were converted to high-fidelity prototypes.
- The test and evaluation stage was carried out to evaluate the designs against the user requirements.
- Iterations can be produced during the high-fidelity prototypes where the final design would be mentioned thoroughly in the report under the high-fidelity prototype section.

The app primarily targets office workers, especially those in middle-sized companies, who struggle during morning rush hour. It's also useful for people who want to save money and avoid

the hassle of owning a car, as the cost of rideshare services has gone up due to the economic crisis.

Users of this UI/UX system often fall into one of two categories: drivers and passengers.

- Drivers – The individuals that are willing to offer rides to people on their commute.
- Passengers – The users that want to cut down on money, carbon footprints, and save money.

- The app enables passengers to track their driver's location and history, book shared rides and join the Caraoke community to support and fight against climate change and receive exclusive promotions. Passengers can also connect with friends and family through the social integration screen to hitch a ride together (Worksheet01 2023).
- The app allows drivers to accept ride requests, set the number of passengers they can carry, communicate with passengers, and receive payment through the app. (Worksheet01 2023).

2.1.2 Design purpose

The Caraoke app aims to provide an aesthetically pleasing and minimalistic user interface while also prioritizing usability and user experience. To achieve these goals, the app addresses a variety of design considerations, including(Worksheet01 2023):

- *User-friendly interface* - The GUI is simple to use and navigate, giving users access to accurate and concise information. It also has a cohesive design language and branding, making it visually appealing. User-friendliness can result in users having a better user experience and being satisfied with the application interface regarding its smoothness. The user experience should be fluid as it leads users through the entire ride-sharing process, from requesting a ride to paying for it (Worksheet01 2023).
- *Usability interface* - The app needs to operate swiftly and dependably so that users can immediately order a ride and be picked up on time and receive notification alters. The app should give precise and consistent information about the costs, and anticipated arrival time. The app will support multiple languages so that there are no restrictions for the users.
- *Attractiveness* - Caraoke application aims to attract potential users through the smoothness and quality of the interfaces. With the application having more than 15 interfaces for each feature, the quantity will be always smooth and nicely distributed (Worksheet01 2023).

- *Efficiency* - The efficiency can be determined by how fast each task in the application is done by the user allowing users to have a smooth user experience (Worksheet01 2023).
- *Personalization* - By offering options for language settings, tailored preferences for ride requests, and remembered payment methods, the GUI should enable users to customize their ride-sharing experience (Worksheet01 2023).
- *Integration with other services* - To improve the user experience and make it easier for users to communicate and share information, the GUI should integrate with other services like social media and messaging systems which helps to connect with loved ones and co-riders faster through the app to hitchhike a ride (Worksheet01 2023).

2.1.3 Overview

The report consists of 20 main topics that illustrate the Caraoke app in every aspect possible to help in achieving the UI/UX goals. The design thinking process has a broad explanation of the principles that were used during the process and the different techniques used to manipulate the research aspect. Section 6 Requirement specification, indicates all the requirements with user stories for UI functionalities, and hierarchical task analysis was done to show the workflow of the goals. In section 8 UI/UX Design principles, share a broad idea about Don Norman's 6 UI/UX Design Principles covered by the app and the relevant visual design principles. In many places throughout the world, ride-sharing has altered how people travel by offering a more environmentally friendly and economical substitute to conventional modes of transportation. The main design purposes covered above are essential to be present in the Caraoke application. Failing to meet the criteria, could cause the application's demand to drastically plummet over time. Hence, our team has made it our utmost importance to not lose sight of our user's needs and the design purposes with which the idea was initially put forward.

3 Team

3.1 Team Members

Student	Name	Curtin ID	SLIIT ID	Roles
1	Pramoda Gunarathne	20531218	it21115820	Project Manager Document Controller
2	Harshi Kasundi Bandaranayake	20583387	it21151606	Data Analyst Psychologist
3	Sahas Gunasekara	20462075	it21100666	Usability Engineer Interaction Designer
4	Sanugi Perera	20542524	it21138836	Graphic designer Document Controller

4 Software Engineering Lifecycle and Tools

Out of all available, there were three Software Lifecycle Models we could narrow down our options to (Worksheet02 2023). These being;

1. Waterfall Model
2. Iterative Model
3. Agile Model

The Iterative Model provides a significant plethora of structural benefits such as customizability and more engagement from the client itself; this could be displayed as the following (Worksheet02 2023);

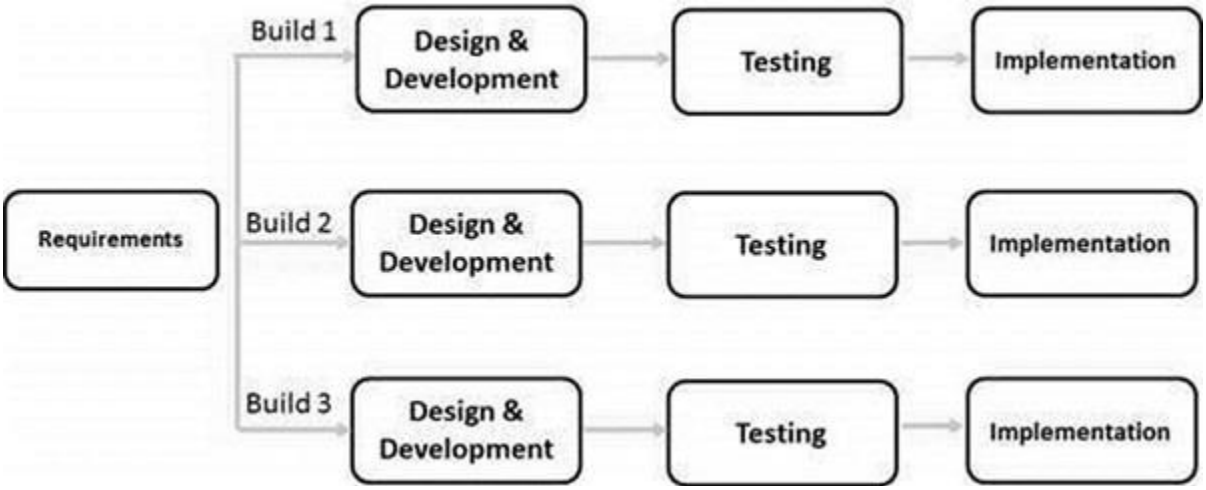


Figure 2: Iterative Model

However, the structure and the timeline we work on don't allow the need for constant development and feedback so the more obvious Software Development Life Cycle Model to choose was the Waterfall Model, which we also didn't end up choosing (Worksheet02 2023);

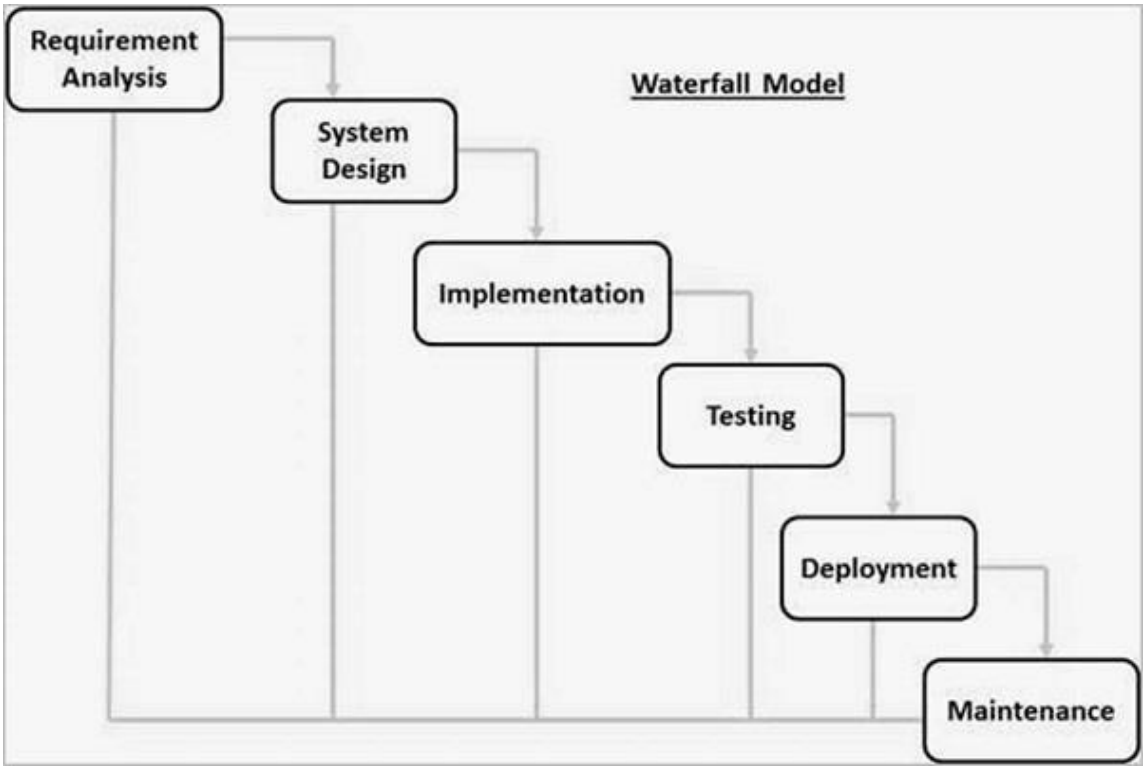


Figure 3: Waterfall Model

After consideration of both the Waterfall Methodology and Iterative Methodology, we decided to streamline the entire process using **Agile**, the implementation of Agile has been integrated into our workflow as mentioned in the following section.

4.1 Agile Process

The agile process describes a method of developing iterative software. Agile project management techniques divide work into smaller iterations or pieces without directly including long-term planning (Javapoint 2021). The project's requirements and scope are established at the start of the development process (Javapoint 2021).

Backlog

All Agile Processes, support the breaking down of tasks into smaller, more digestible tasks that allow the small tasks to be implemented quickly and to estimate the development time. The group got together and used a popular management tool known as Jira to break down our initial task (Worksheet02 2023). The tasks were broken down according to the Assignment 1 requirement to make the development process of the milestones easier as shown in the below figure.

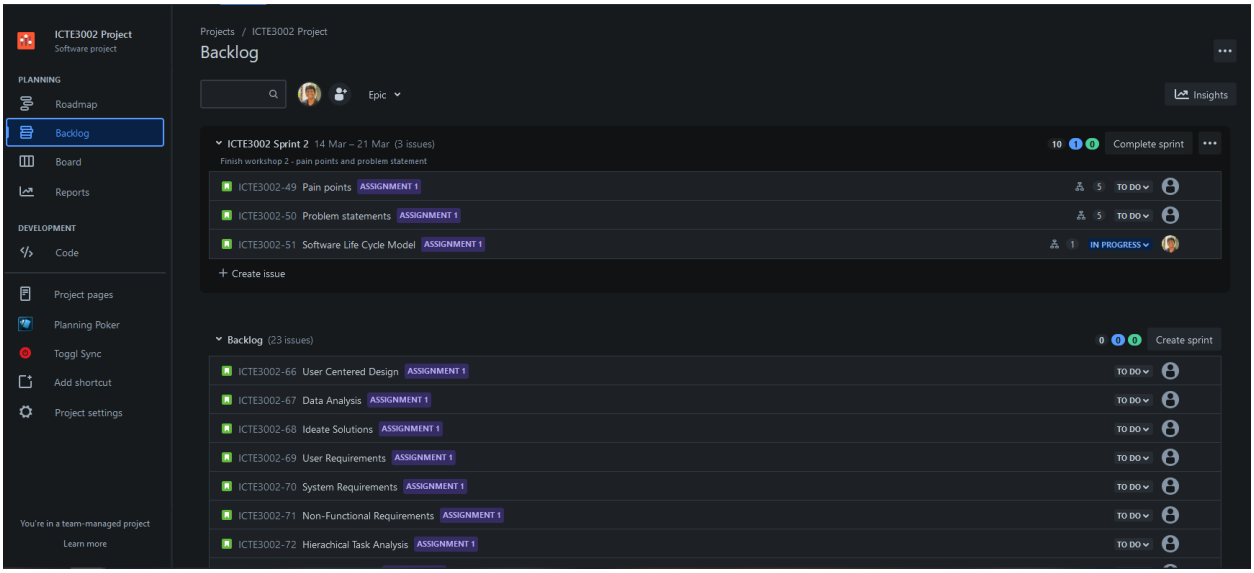


Figure 4: Product Backlog in Jiara

Planning Poker

Once the tasks were broken down into smaller projects that could be estimated more accurately than an entire system, we started assigning each estimate on a relative scale known as Story Points. This was done by playing a game known as Planning Poker (Worksheet02 2023).

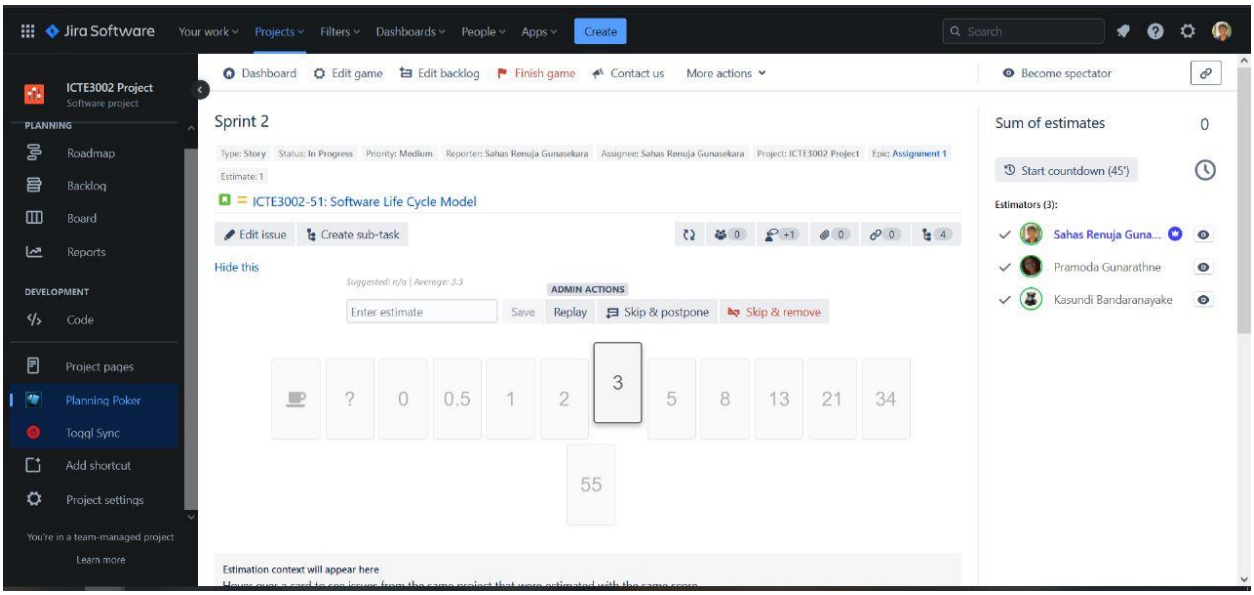


Figure 5: Planning Poker played by the team

Planning Poker allows us all to estimate how long a particular story will take to complete, this is done by not showing each other's picks until everyone has chosen so that more dominant voices won't influence the decisions of others. Once all the cards have been picked by the participants we can view them as follows (Worksheet02 2023);

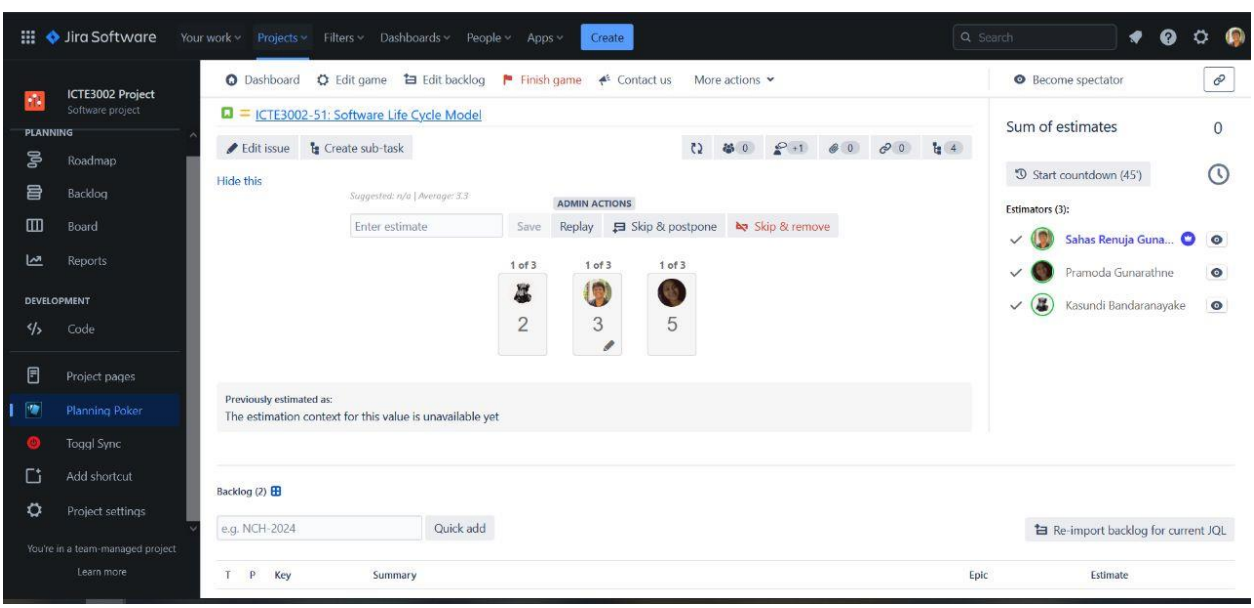


Figure 6: Planning poker results for Software life cycle model

Milestones

Each weekly submission milestone was completed by the team with the thought of using the content for assignment 1. Each sprint represents a week that was allocated for the worksheet with the ultimate goal of targeting the assignment 1 content as shown below in Figure 7. Therefore, almost all the content in each worksheet will be thoroughly used in this report.

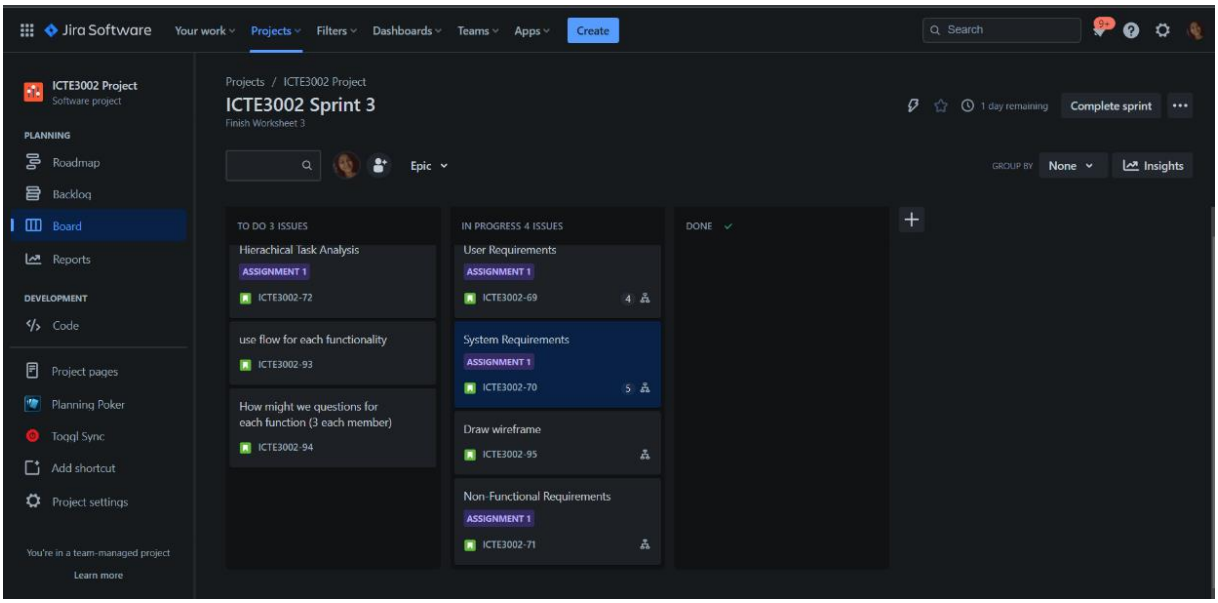
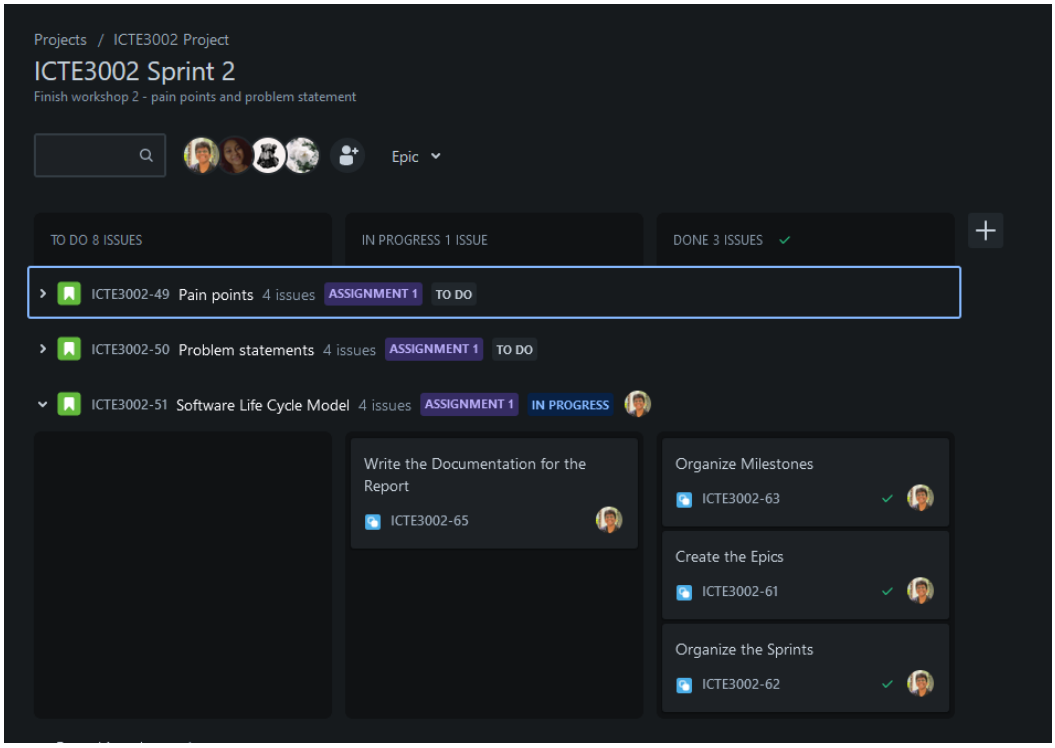


Figure 7: Sprint 3 for worksheet03 (Requirements)

Kanban Board

Once the Estimates have been given we move a doable amount of work into our Sprint to work on which can be viewed and tracked on our Kanban Board (Worksheet02 2023);



We maintain a Kanban board that enables the tracking of issues and it is transparent in showing the progress of the work that has been done. The calculation to see the work which has been done (also known as Velocity) is closely monitored as well with the aid of Burn-up charts (Worksheet02 2023).

Burn-up Charts

Burn-up Charts allow us to monitor the pace at which our tasks are being completed and whether extra time or attention is required depending on our estimated line (Worksheet02 2023). This also allows us to add an appropriate amount of tasks to prevent idleness for an individual Sprint (Worksheet02 2023).

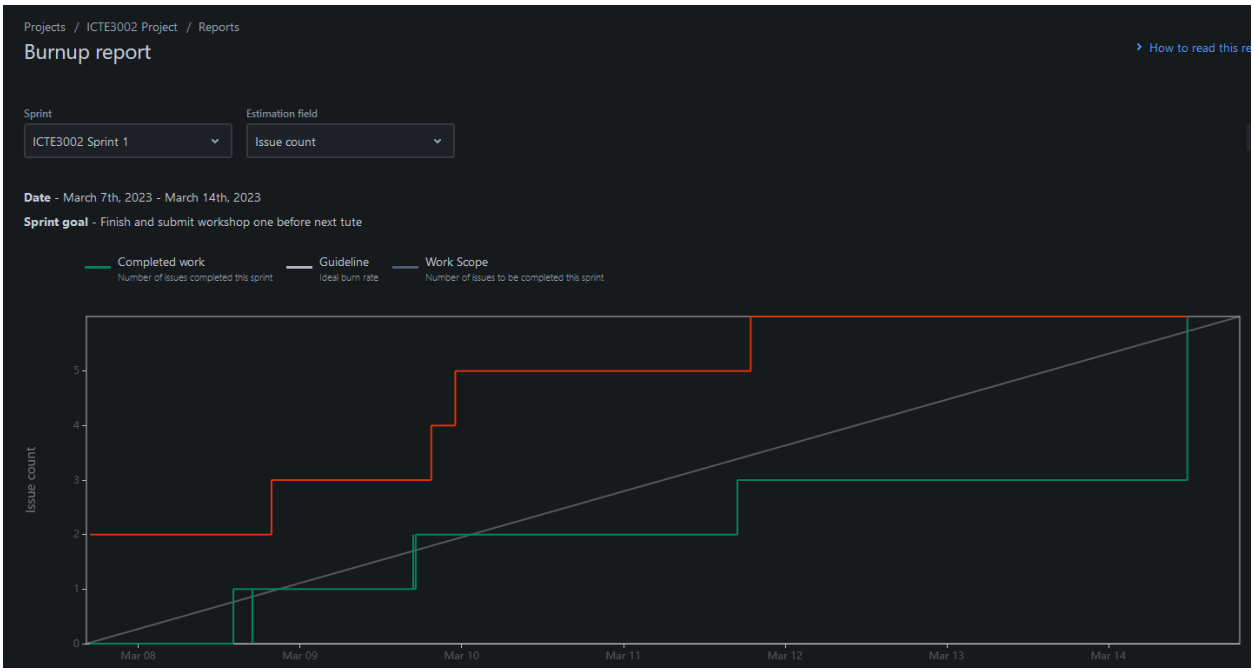


Figure 8: Burn-up chart for sprint 2

The above figure shows the second sprint's completed work (with regard to issue count) compared with the total scope that needs to be covered for that week. It shows that the sprint went smoothly and was able to complete the sprint's work on time.

5 Design Thinking

5.1 Design Thinking Process

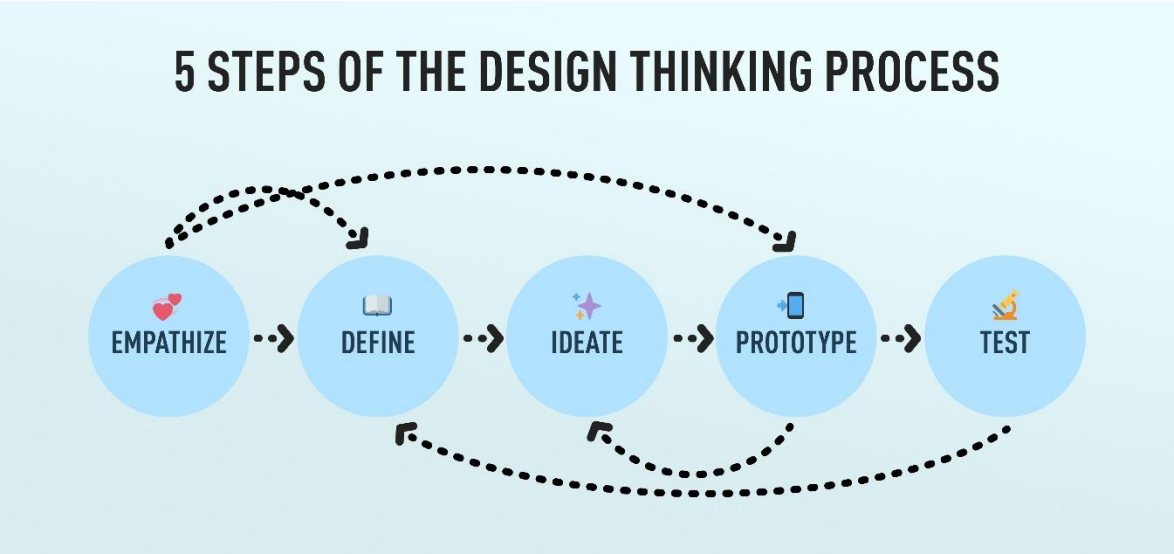


Figure 9: Design Thinking process used

As Browne (2021) states design thinking is an iterative process leading the world toward innovative solutions (Worksheet01 2023). The process involves 5 steps namely: Empathize, Define, Ideate, Prototype, and Test where each step provides the solution with space for improvement.

Regarding the Caraoke application, Team FourGUIs has made it our utmost importance to stick to the above-mentioned ideology throughout the development process as follows:

- The team first ***empathized*** with its potential users by conducting initial interviews, questionnaires, and surveys to identify the current domain, and the problem space, and identify the pain points that the Caraoke application must strive to find solutions for (Worksheet 01 2023).

  After analyzing the common trends and behavioral patterns among the identified users by performing immersion such as in-depth research from analysing the survey and interview data and reading reviews on competitor applications (Worksheet02 2023). The team came up with a considerable number of user personas, and empathy maps, enabling the team members to help understand their target demographic.

- During the ***define*** stage, the requirement specification was done by the team to state the user requirements, system requirements, non-functional requirements, and hierarchical task analysis.
- Having empathized with the user base, the FourGUIs team members brainstormed collectively to come up with problem statements and How Might We? (HMW) questions. Through affinity mapping, these questions were classified as Low, Mid, High, and Critical based on the negative impact the identified problem statement may have on the UI/UX and functionality of the application. After successfully identifying the problems the team prioritized and worked on ***ideating*** solutions to each issue identified. The solutions were then categorized through affinity mapping to ensure that the team covers important aspects of UI/UX such as design principles and best practices, performance optimization, improving convenience, increasing app visibility, customer retention, and engagement strategies.
- Wireframes for the application were sketched to bring the solutions put forth by the team during the ***Ideate*** phase into life. The wireframes were then developed into low-fidelity prototypes to identify the basic flow, Call-To-Actions (CTA), and the overall positive flow of the Caraoke application.
- Involving end users and receiving feedback every so often during the ***Prototype*** phase allowed the team to come up with several iterations of High-fidelity prototypes for the Caraoke application. The suggestions and feedback were warmly received and the team promptly took action to get the best design.
- The final prototype shared later in the document was chosen as it received mostly positive feedback from the users during the ***Test*** phase and aligned well with the team's objectives and design purpose.

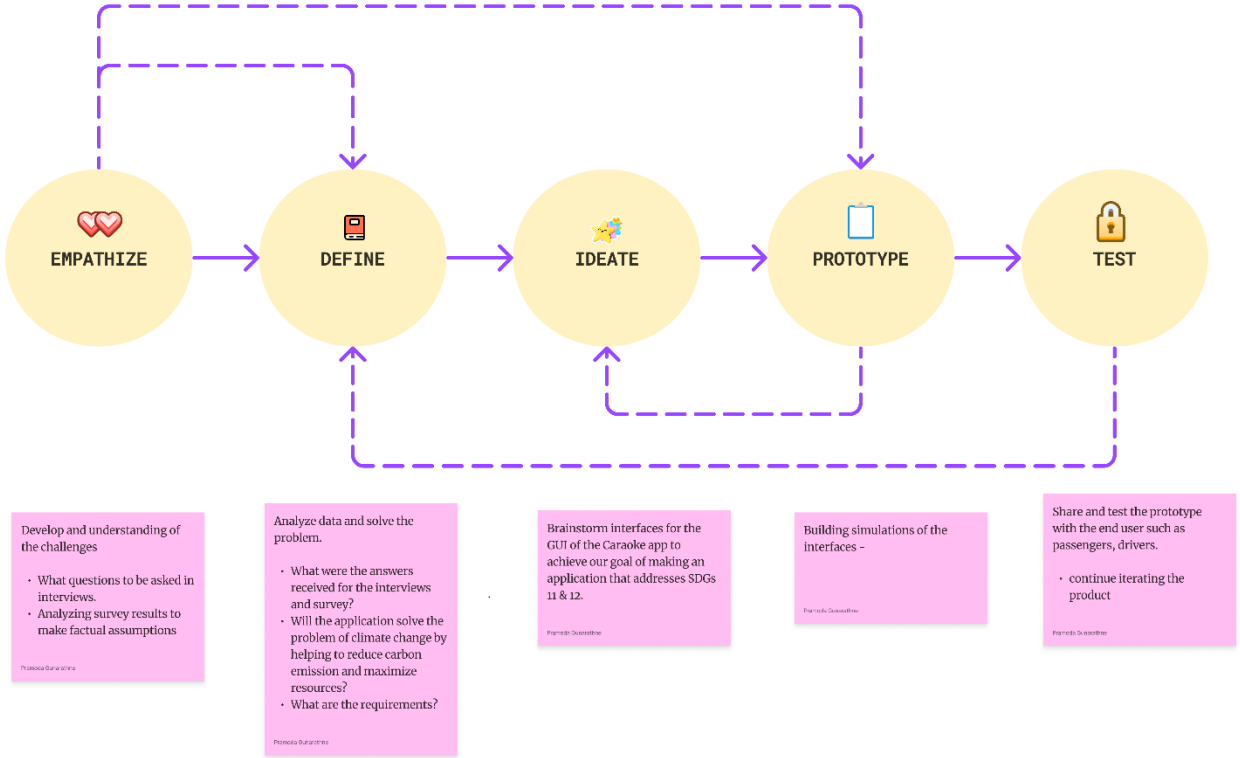


Figure 10: Team FourGUIs design thinking process

[FourGUIs FigJam - Design Thinking]()

During the Design Thinking Process,

- To stand amongst the existing competition, the Caraoke team focused on providing effective yet refreshing solutions to existing problems.
- On top of the already existing features such as ratings, and reporting/blocking, team FourGUIs put forward a fresh proposal, focused on providing a safer service to our valuable users offering/requesting carpooling through Caraoke.
- During market research, user analysis, and feedback, team FourGUIs identified that to make carpooling more appealing to its users, we had to offer a reassuring guarantee regarding their safety while using our service.

- FourGUIs understood and acknowledged that women's/children's safety is a significant concern related to ride-sharing applications. Suggested a precautionary feature that allows women and children to only match with female drivers/female passengers.

Team FourGUIs managed to create a smooth, elegant application that focuses on providing the expected functionality while enabling a positive UI/UX experience of an unprecedented level for its users.

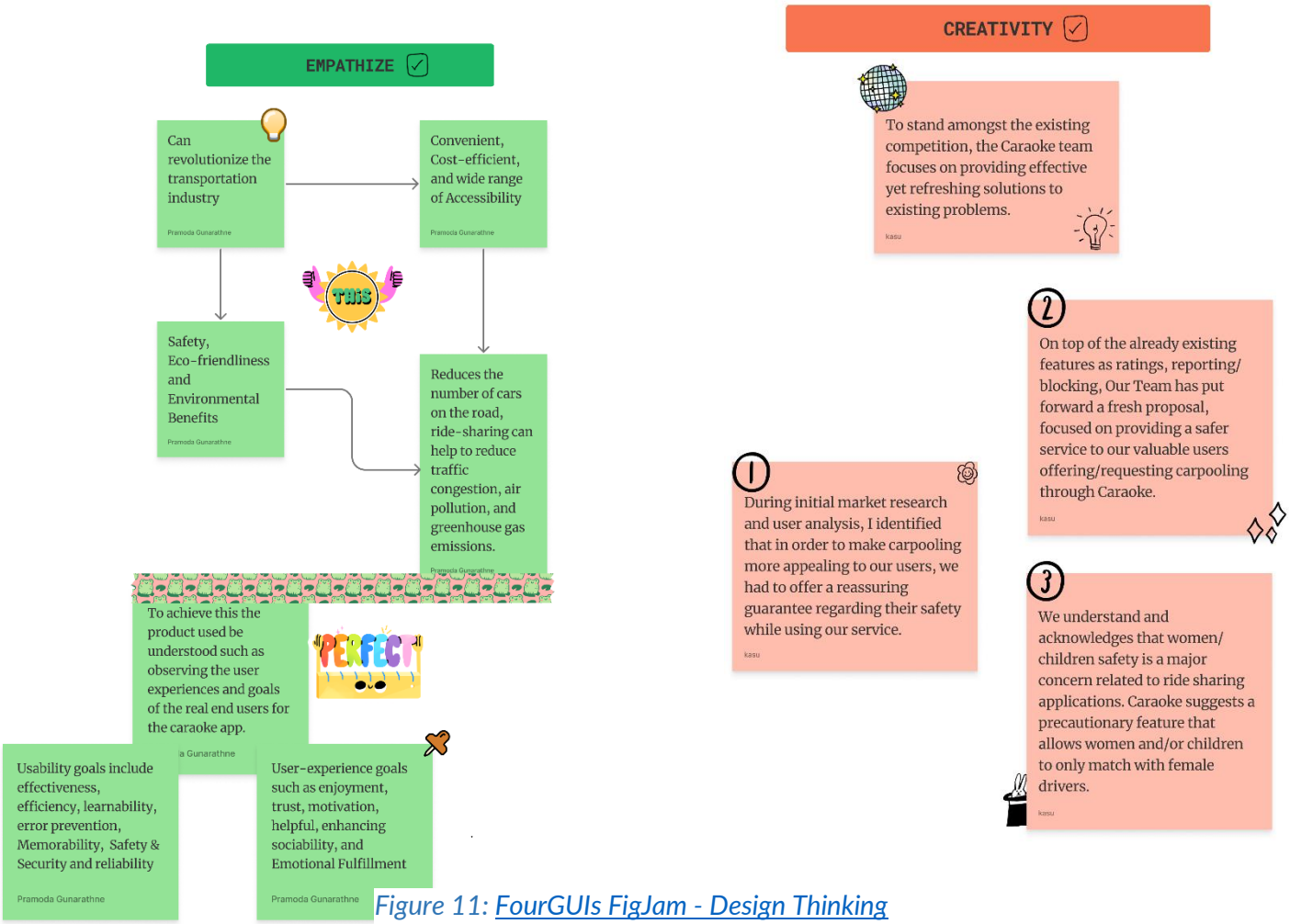


Figure 11: FourGUIs FigJam - Design Thinking

5.2 User-Centred Design

Throughout the Design Thinking Process, the FourGUIs team made it our utmost importance to involve the users to ensure the Caraoke application focuses primarily on the needs and preferences of the users.

5.2.1 User Research

It is widely known that the users of a product *know what they need* but have difficulty *clearly articulating what they require from a product* (Browne 2021). It is essential to remember that more often than not, users lack the technical knowledge to understand the intricacies of a fully-functional application and may not always understand tech-lingo (Browne 2021). Keeping this in mind, the team utilized the user research methodologies given below to help fully understand our users.

Structured interviews

Justification: During the initial domain and user observations, the team agreed to stick to structured interviews as opposed to unstructured interviews due to the following reasons,

- As these are our first interviews to be conducted, structured interviews greatly help in easing the nerves of both the interviewer and interviewee.
- Preparing a question script beforehand as a team will give opportunity for the team to discuss and clear doubts among themselves beforehand (since the team is relatively new to the problem domain).
- Avoid forgetting important questions that are vital to identifying the user, user behavior, and problem space.

Online Surveys

Justification: As opposed to holding physical surveys the FourGUIs team opted for online surveys conducted using Google Forms.

- Sharing online surveys through communication modes such as WhatsApp, Viber, and Telegram helps reach a large number of users.
- Users are more inclined to participate in online surveys through their devices as opposed to engaging in physical surveys
- Great customization options are provided in online platforms such as Google Forms.
- Google Forms allow responses to directly link to Google Sheets which greatly helped the FourGUIs team to draw meaningful conclusions through various tools such as charts and conditional formatting.

Personas

Justification: User personas provide a design team with an intricate understanding of the end users of a product, produce a reliable and realistic representation of the user base (Page 2021), and most importantly, help designers to uncover varied ways users may engage with the application and thereby determine where to direct design focus on (Page 2021), the FourGUIs team promptly researched into the problem domain, observed types of users, positive and negative experiences documented within the ride-sharing, carpooling domain and produced different user personas for the Caraoke application.

Empathy Maps

Justification: Empathy maps serve as a great, insightful tool to identify the decisions taken and how emotions play a significant impact on how the user interacts with the application (Gibbons 2018). Empathy maps are fast, and inexpensive and make way for the team to reach a common basis on how to empathize with their users better (Gibbons 2018).

Co-creation

Justification: As the application is built to provide a positive UI/UX experience to the end-user, co-creation allows ample opportunities for the team to engage the said users more directly into the creative process and gauge out what design principles/decisions will create an application that is well-received within its domain.

As opposed to other co-creation methods such as workshops and focus groups, the team decided to hold collaborative design sessions as they are less formal, and unstructured and allows a friendly conversation to flow between the user and the design team as both parties brainstorm ideas.

The FourGUIs team held one collaborative design session where a user directly joined the creative process of the high-fidelity prototype process.

Feedback and Iterations

Justification: Throughout the process of analyzing the problem space and building high-fidelity prototypes mapped to the lo-fi prototypes, the FourGUIs made sure to hold a user-feedback session to identify any preferences that the team might have possibly overlooked during the

design thinking process. During such feedback sessions, users provided much valuable feedback that was incorporated into the design in the following iterations.

5.3 User Interviews, Surveys, Questionnaires, and Observations

To help develop an application that caters to its targeted users, it is imperative that the developers fully understand their users. Interviews and questionnaires are great research tools to gain valuable insight into the user's behaviors, needs, motivations, and pain points to create an outstanding and successful product.

User Interviews

Supun Wickramasignhe (an alias for an end-user who wishes to remain anonymous), who is a sales executive tends to travel a lot during work hours, and he also wants to share the extra seating (resource) in use. In addition, he is motivated to earn extra cash by providing rides on the way to work/ after work and he especially wants to enjoy the experience of meeting new people as he is a very extroverted person. The questions and answers to this interview can be found in Appendix A.

The interview was conducted successfully and allowed the design team to discover and understand how to create an application that can be well-received and loved among its users. New pain points, user goals, and expectations were identified as most ride-sharing/carpooling applications at present heavily focus on the passenger POV and in many instances tend to overlook the UX of the driver POV.

Surveys, Questionnaires, and Observations

Transitioning from *Empathize* stage to the *Define* phase, the team agreed that involve user feedback to ensure that most needs and behavioral patterns are encapsulated in our problem statements and How Might We? Questions and to get a better understanding of what the users would most likely prefer. For the survey responses received, 5 observations were predicted in the data analysis section.

Link to the Google Form (Access is provided to view responses to the survey): Survey Link

Results of the survey (Screenshots attached): Survey Results - Google Drive

5.4 Data Analysis

User interviews

The findings of the interview were summarized and analyzed based on the following categorization and theme as shown below.

- Goals

– Understand the user groups involved in the problem domain

– Gain an overview of user pain points, motivations, needs, and behavior that must be handled by the Caraoke application.

– As this was the first interview to be held, building a connection with the end users to better communicate in upcoming user feedback sessions.

- Methodology

The interview was held in a structured manner, with a script of questions compiled by the design team prior to the interview. Conducted over Google Meets, the queries were then directed at Supun Wickramasignhe and the responses were noted down by the team members for future reference.

- Recommendations & Action items

Supun presented two conditions that he wants users to agree on first one being, that only 2 seating positions are given to passengers and the other seat is for the backpacks since he wants the riders to feel more at ease and comfortable during the ride. The other condition was that users must be hygienic as Supun likes to keep his car clean at all times. This shows that his user profile must be limited to 2 seats and note his preferences unless stated otherwise.

Supun also mentioned that he likes to drop people off during peak hours which is a great contribution to the environment as this period is when the number of vehicles on the road increases.

Supun also does not like to travel alone in the mornings meaning he can also reduce the personal carbon emissions of other people during rush hour by offering to share his ride with them on his way.

- Additional information

With the interview answers gathered, we can conclude that a lot of users like to be part of the Caraoke application as a driver, where they can earn money or make new friends whilst contributing to the climate change issues, making cities more sustainable and maximizing resource consumption of vehicles and productions.

Surveys, Questionnaires, and Observations

The findings of the survey questions were summarized and analyzed based on the following categorization and theme as shown below.

- Goals

– Identify the primary target age demographic for the Caraoke application.

– Identify if there's a potential market/enthusiasm towards a carpooling application.

– Identify preferences and strategies to incorporate into the design process in order to strengthen customer retention and interest in the Caraoke application.

- Methodology

The survey was conducted through online communication portals such as WhatsApp. A Google Form was designed for both possible passengers and drivers that could be involved with the Caraoke application.

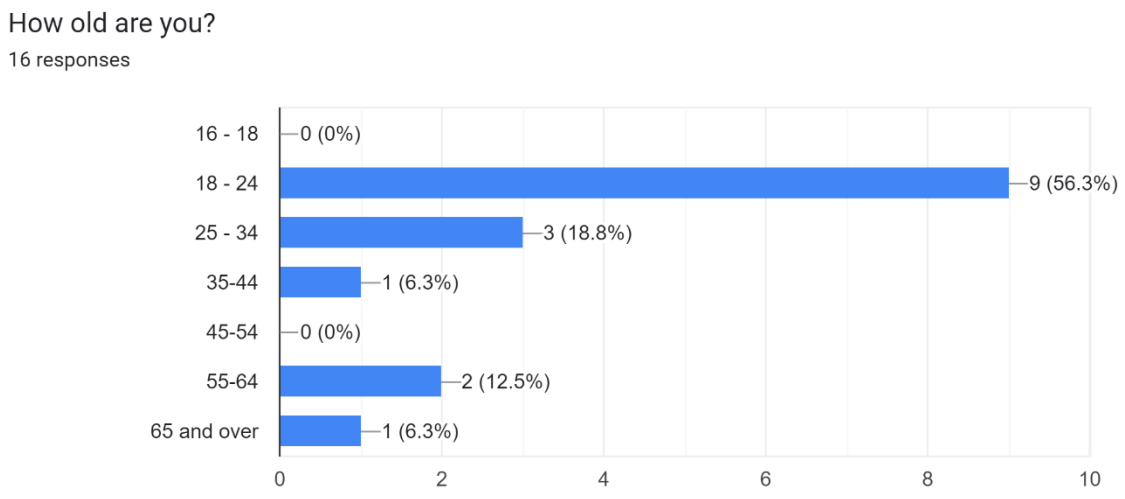
The questionnaire consisted of a mix of multiple-choice questions, linear scale questions, and a few short text-answer questions in order to avoid tiring the user and keep the questionnaire entertaining and interesting. The form accepted responses for up to 3 days and garnered a considerable amount of responses.

T/N: The form was configured so that only participants above the age of 16 could fill out the form as the age of consent for data collection in compliance with General Data Protection Regulation (GDPR) Article 8 (Intersoft Consulting 2022).

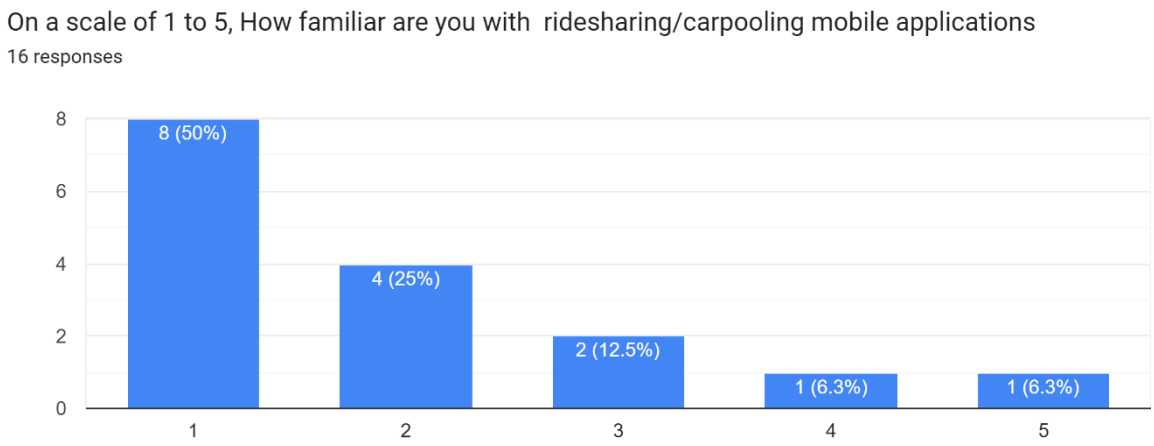
- Results

Observation #1

It was evident that most of the survey participants range from 18-64 years of age (56.3% of them are between the ages of 18 to 24 years). As such it was agreed by the FourGUIs team to focus on developing UI s that can appeal to people belonging to ages of 18 to 65 years.



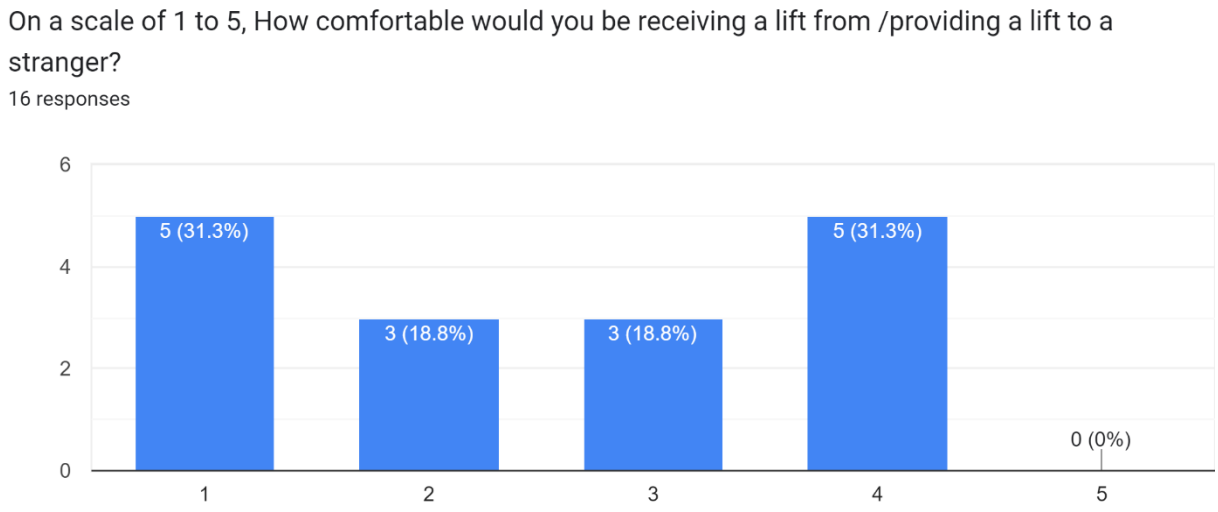
Observation #2



Given that the idea of ridesharing or carpooling is still relatively new to Sri Lanka, this was to be expected. In contrast to the easy-to-use, flexible options that the Caraoke application promises to offer its users, ride-hailing apps like Uber have a dedicated base of drivers who travel out of their way to pick up a passenger.

Observation #3

Though no participants have expressed being fully comfortable with sharing a ride with a stranger, most participants seem to not mind the idea of carpooling as it provides a solution to empty seats in their vehicle that could be used to gain an income.

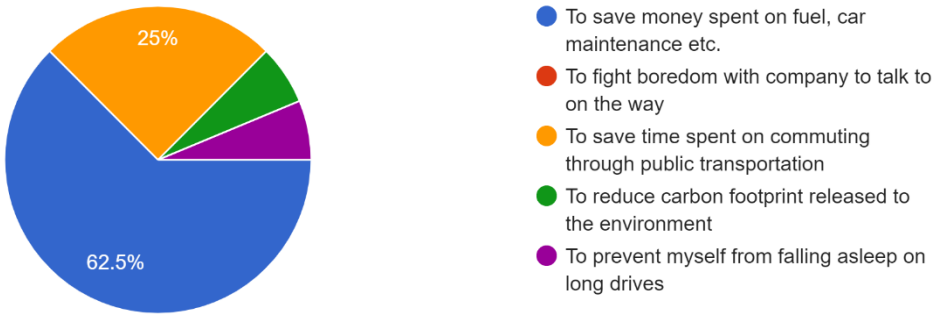


Observation #4

From the below dataset derived, it can be deduced that the users are very much motivated to try out the Caraoke application for its core functionality provided. This is an indication that the team has successfully managed to observe the problem domain to come up with an intuitive solution that is loved by the targeted user base. Based on other suggestions received, the team has also implemented functionalities such as free coupons and discounts based on a loyalty system that further consolidates our SDGs.

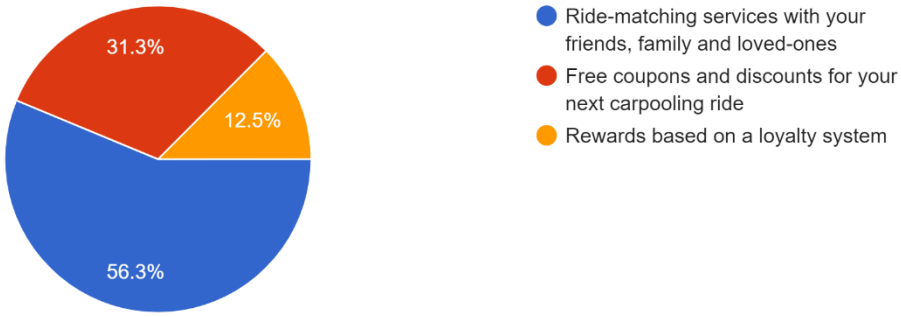
What would be your primary motivation for trying out a carpooling application?

16 responses



What could mostly influence your decision to carpool more frequently through a mobile application?

16 responses



<u>Observation #5</u>

Valuing the feedback from the participants, the team has taken measures to implement interfaces to facilitate all constructive suggestions and improvements mentioned in the survey responses into consideration while working on the project.

Taking necessary safety measures is important in a carpool to ensure a comfortable ride for everyone.

What security features are you looking for in a carpool application?

13 responses

Making sure the other passengers/driver are responsible and safe people. Perhaps consider whether they would prefer travelling with same gender. Letting them chat for a bit before choosing the people they will carpool with. Having a proper security/identity check beforehand so that people are more responsible. Maybe also check preferences such as age etc. Make sure there is a proper procedure if the ride seems dangerous.

making reviews the fellow passengers got visible to all in the ride
report and reach customer support easily

ability to share my location with loved ones

Ability to know whether passengers are safe to drive with. Knwing that you would get compensated if they damage your vehicle. Being able to talk to them prior to the carpool
Being able to maintain certain restrictions according to drivers/car owners preference (eg no eating messy food inside the car, no consuming liqour etc). Ability to know beforehand how much the petrol cost would be spilt etc.

Not too much "security", mostly the standard reviewing system so that you can see whether the rideshare you are considering has ppl who have received bad reviews

In your opinion, what improvements or changes could make carpooling more appealing and accessible for more people?

16 responses

A carpooling community around the world

Safety measures

Accessibility options for blind people within the app

If carpooling was safer (that is instead of with strangers they reccomend friends or friends of friends)

introduce a community feature to help connect with other users

safety measures that ensures secure lifts

If the drivers also get some more advantages from carpooling

A good user experience on the app: it should show where the car is at all times and give estimates on when you need to be ready by, only wait for other people for a short duration, show where everyone is being picked up and dropped off and rough estimates of time

5.5 User Feedback and Iterations

- Background Summary

Transitioning from *Ideating* the solutions to various functional requirements, non-functional requirements, and pain points, the team then moved forward with *Prototyping* the interfaces for the application. Kickstarting with hand-drawn sketches of the wireframes to the proposed solutions, low-fidelity prototypes were developed which were then improved into creating high-fidelity prototypes.

The user feedback session was conducted via Zoom where Odara Chandrasena, a potential user of the Caraoke application, was walked through the completed high-fidelity prototypes and was asked to provide a constructive review of the application developed so far.

- Goals

– Receive feedback on the UI/UX of the interfaces developed and recognize opportunities for improvement.

– Identify any possibly overlooked functionalities that may allow Caraoke application to improve further.

– Identify the preferences of the user regarding the overall feel and flow of the application.

- Methodology

The user feedback session was an unstructured, interactive period where the user was directly involved in the creation process of the Caraoke application. The user gained access to observe as the design team worked on high-fidelity prototypes in real-time and any feedback received from the user, that was agreed upon as necessary by the design team, was then added to the interfaces.

- Results

The team managed to create two unique versions of interfaces for the Caraoke application during the feedback session was extensively reviewed by the team and the user collaboratively in the same session. The pros and cons of each version as laid out and these were taken into consideration in selecting a final prototype.

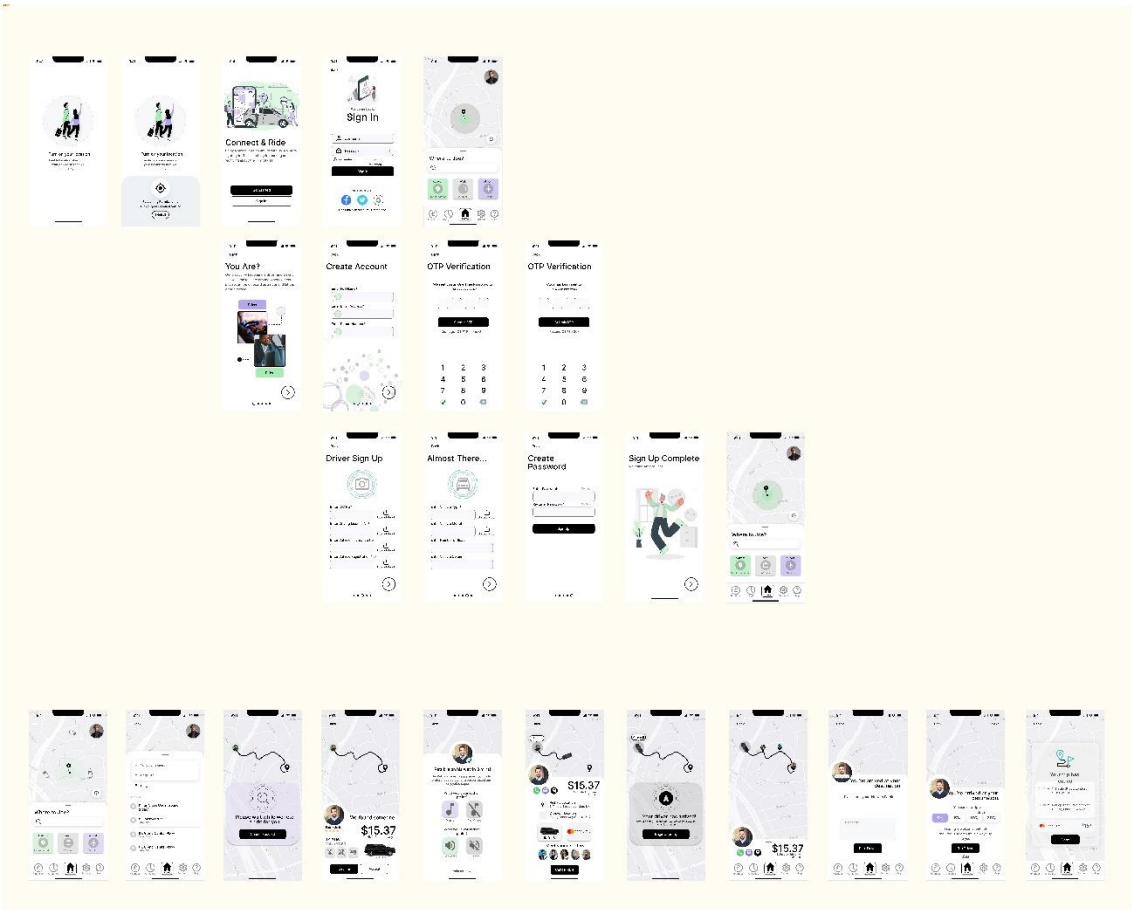


Figure 12: Iteration one for high fidelity

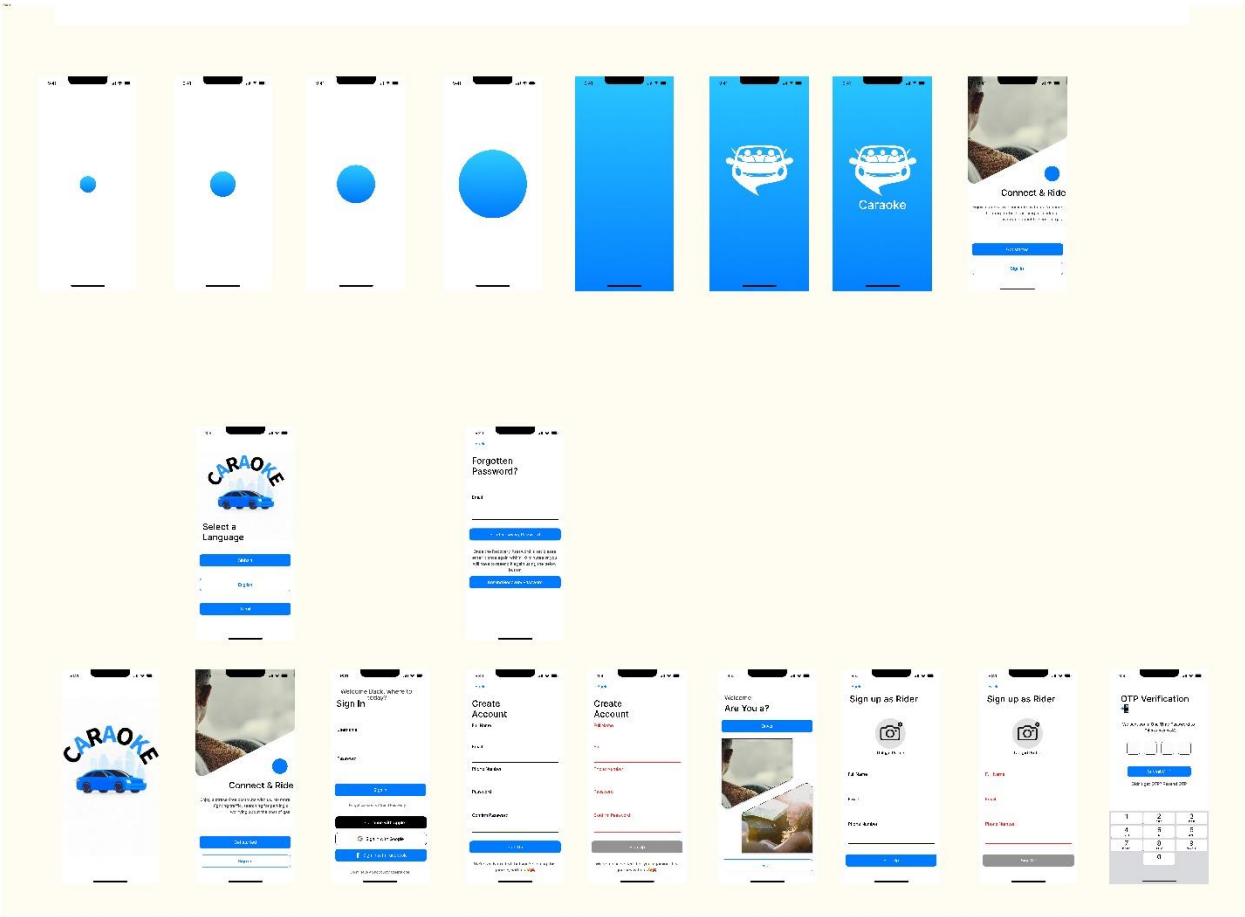


Figure 13: Iteration two for high fidelity

- Recommendations & Action items

– Through user feedback, the team made changes to the Favorite/Saved Rides page - as opposed to creating a separate UI for the user to access their favorite rides when hailing a ride, the option was then added as a quick select option to the UI where a user selects the pick-up/destination location when using the application.

– Considering feedback provided by the user during the session, the analytics page for CO2 commission was added to a pop-up that appears before a user confirms a carpooling ride.

– As per user feedback, the team decided that the final aesthetic for the rest of the application to be iteration two and followed through for the remaining UIs.

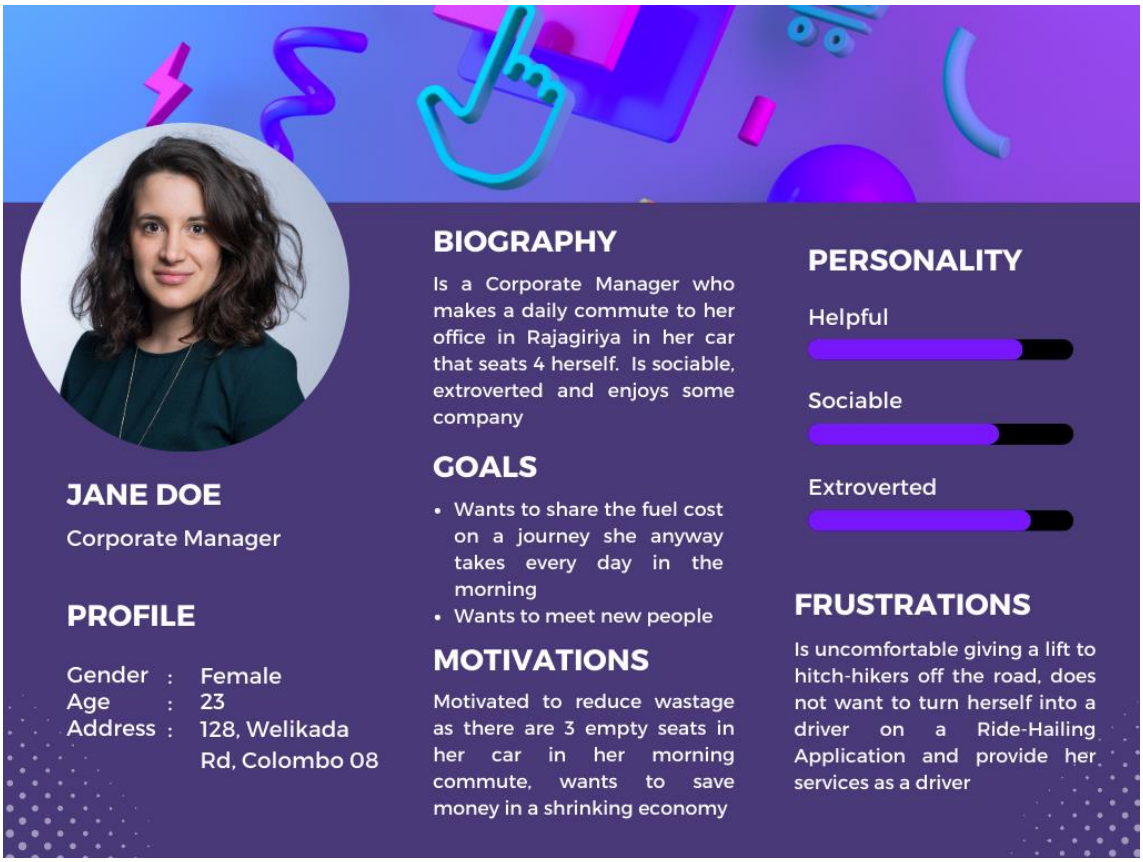
Link to the recording of the feedback session - Recordings - Google Drive

Link to the meeting minutes - Meeting Minutes - Google Drive

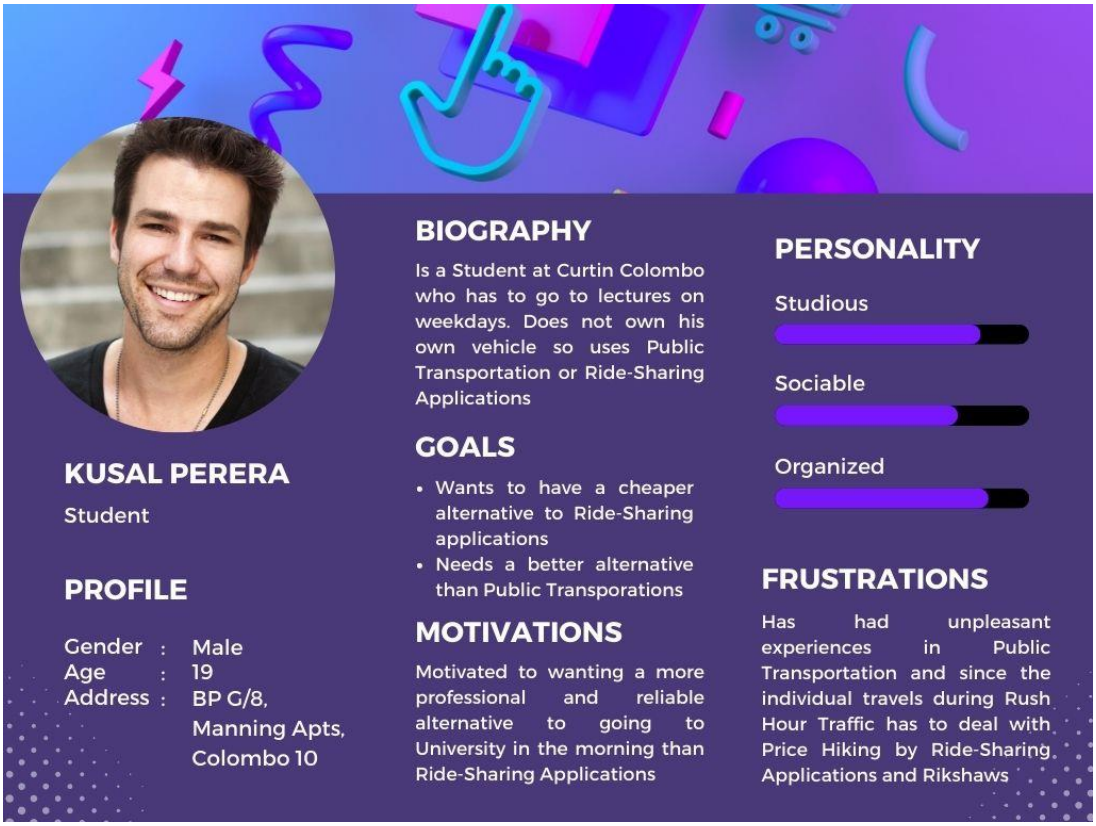
5.6 Personas

The user personas were designed after careful consideration of the target demographic of the Caraoke application as a whole so that all variations of users are taken into consideration. Different age groups, genders, economic backgrounds, and stages of life were encapsulated into the different user personas created by the FourGUIs team.

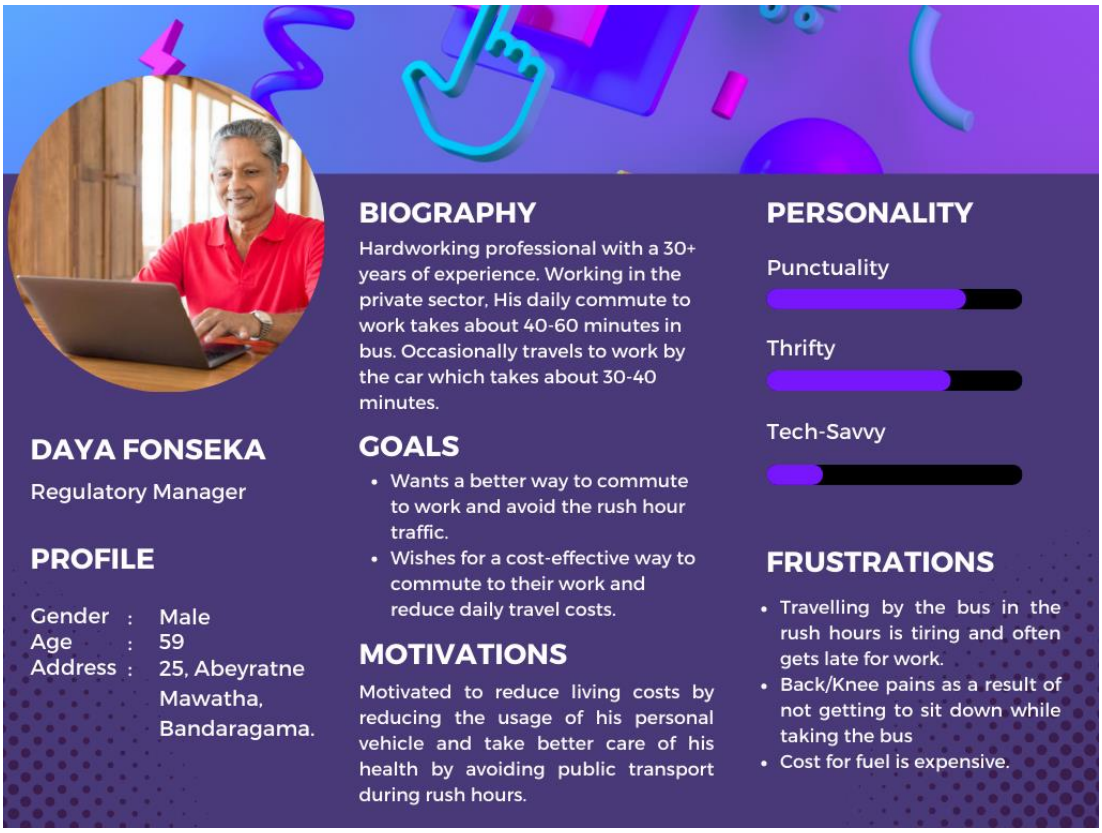
5.6.1 Jane Doe



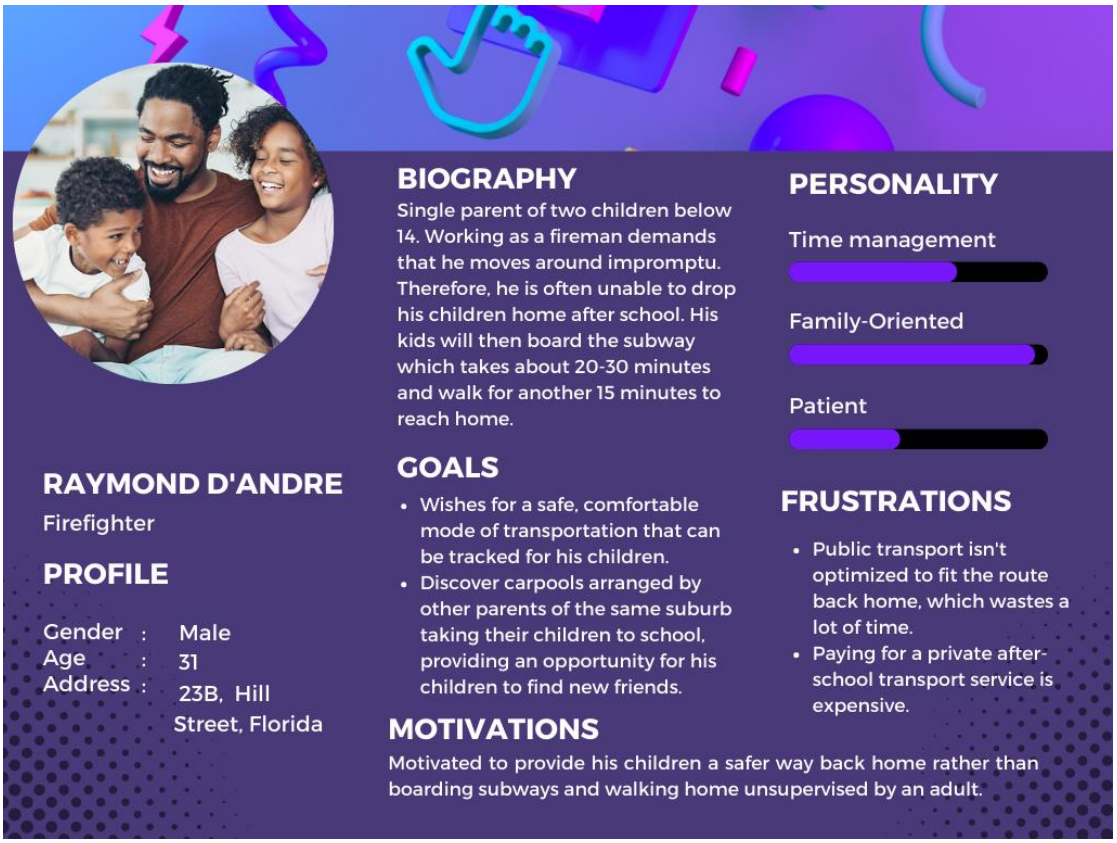
5.6.2 Kusal Perera



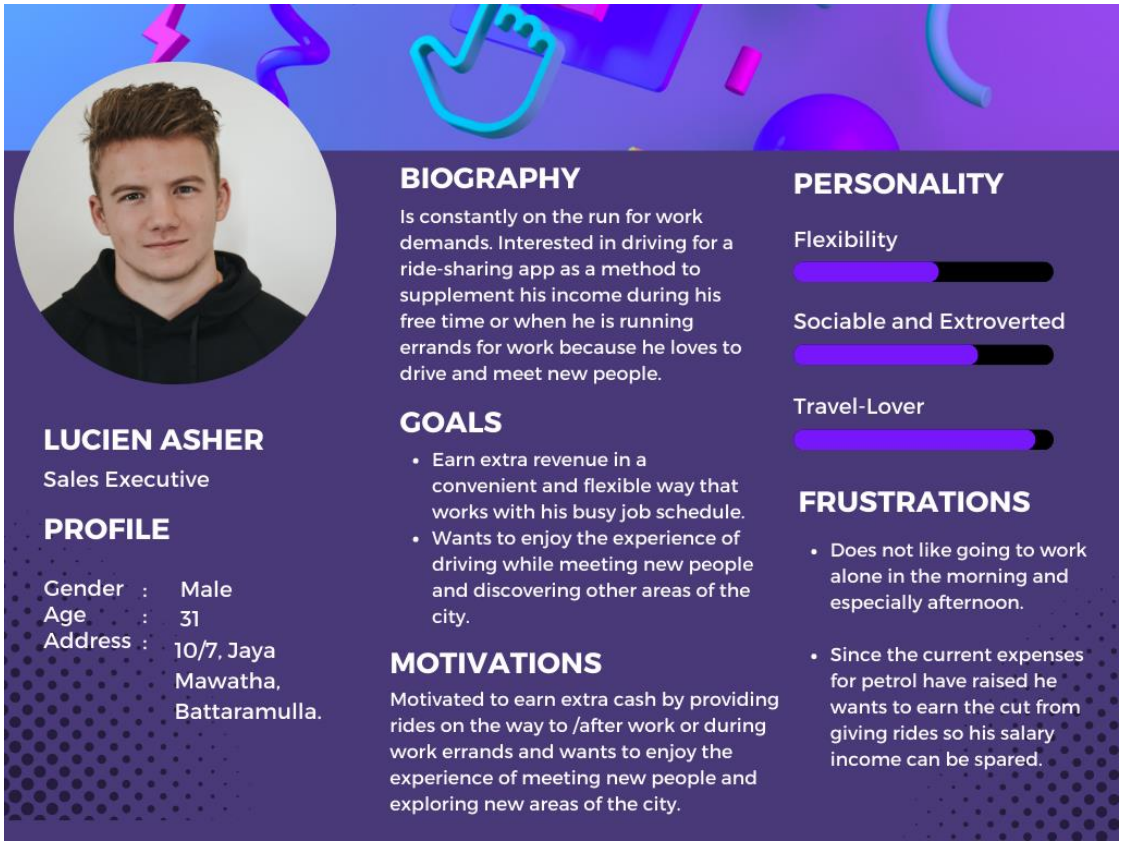
5.6.3 Daya Fonseka



5.6.4 Raymond D'Andre



5.6.5 Lucien Asher



5.7 User Journeys, User Flows, Empathy Maps

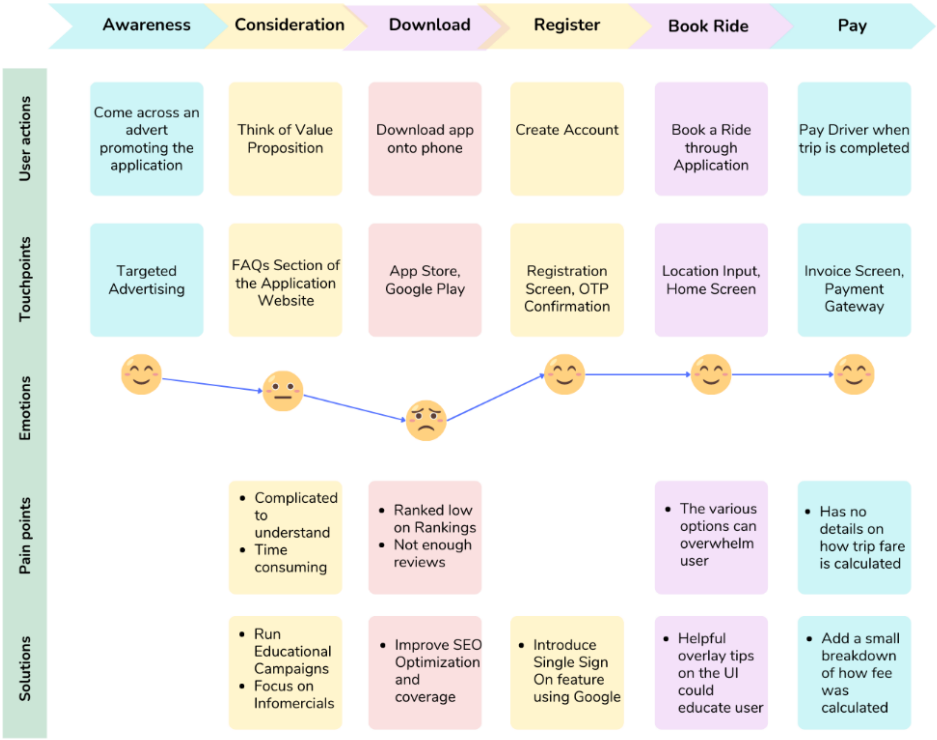
5.7.1 User Journeys

User journeys enables the developing (and other teams including the marketing team) truly understand the points at which a customer appreciates certain features, the pain points the customer can and will face, improving the overall journey of a user through your application (Worksheet 01 2023).

There are two main types of Users on our Caroake application, this being Riders and Drivers there can be two paths each accounting for a positive or a negative experience and the following has been documented accounting for all combinations (Worksheet 01).

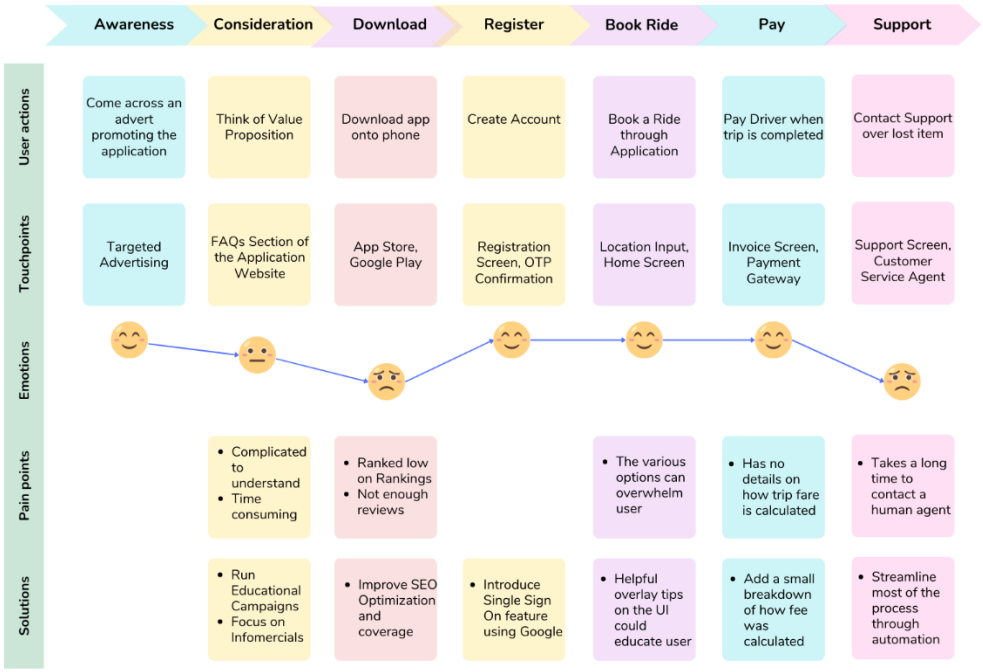
Rider Positive Flow

This is the instance where the Rider has a great experience and continues to use the application as a repeat customer (Worksheet01 2023).

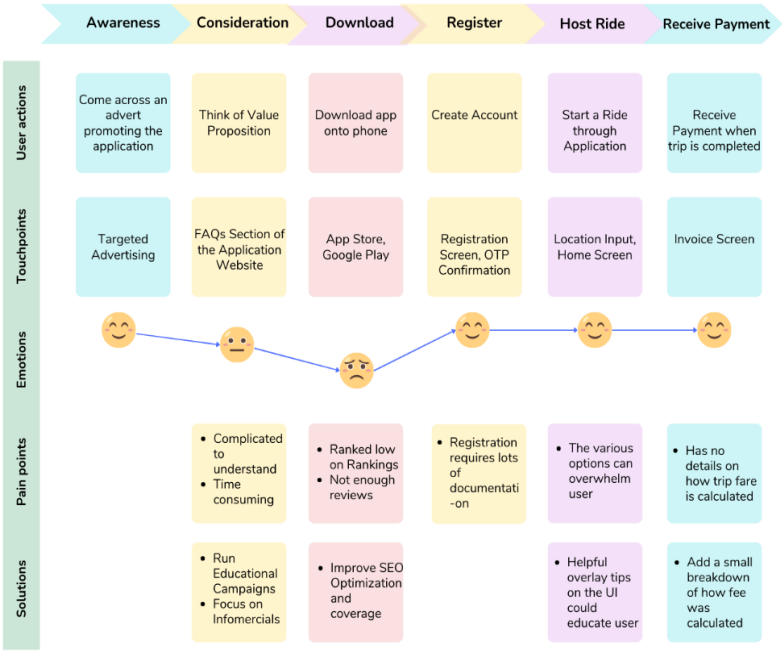


Rider Negative Flow

This is in the case where a Rider ends up with a bad experience (either disagreement or lost item) with the Driver and decides to contact Support, this would be the worst-case scenario for a Rider in our application.



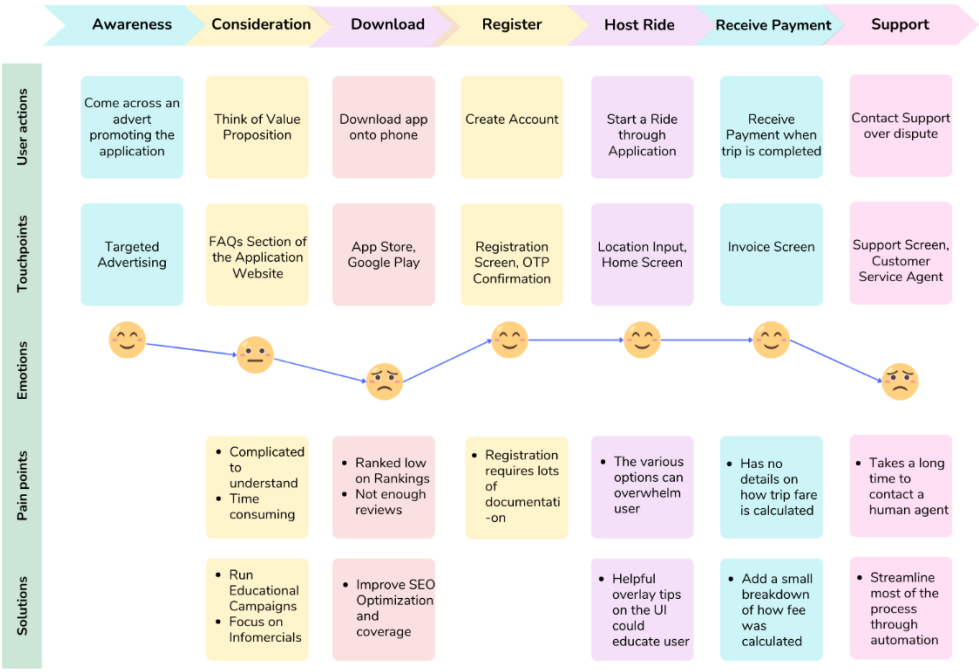
Driver Positive Flow



This is the ideal case instance for our application, the Driver ends up falling into a rhythm of allowing individuals to hitch-hike with the Driver while they go about their usual trips.

Driver Negative Flow

One of the pain points in this flow was the large number of documents required to register yourself as a Driver (License, Insurance, Registration, etc), however, there is no solution for this and this is required to protect both the application and the end users from any harm that may arise.



5.7.2 User Flows

The user flow guides mentioned below follow users through a series of processes from their entry point to a successful conclusion and end action that can be performed by the Caroke App (Worksheet01 2023). In the following section user flows are drawn for the entire app and individual processes such as adding a card payment, etc.

The overall App

The successful features and actions of the overall system are shown below in Figure 13. The actions a user can perform using the app (such as registering a driver/passenger,) will depend on the different aspects as mentioned in the below diagram.

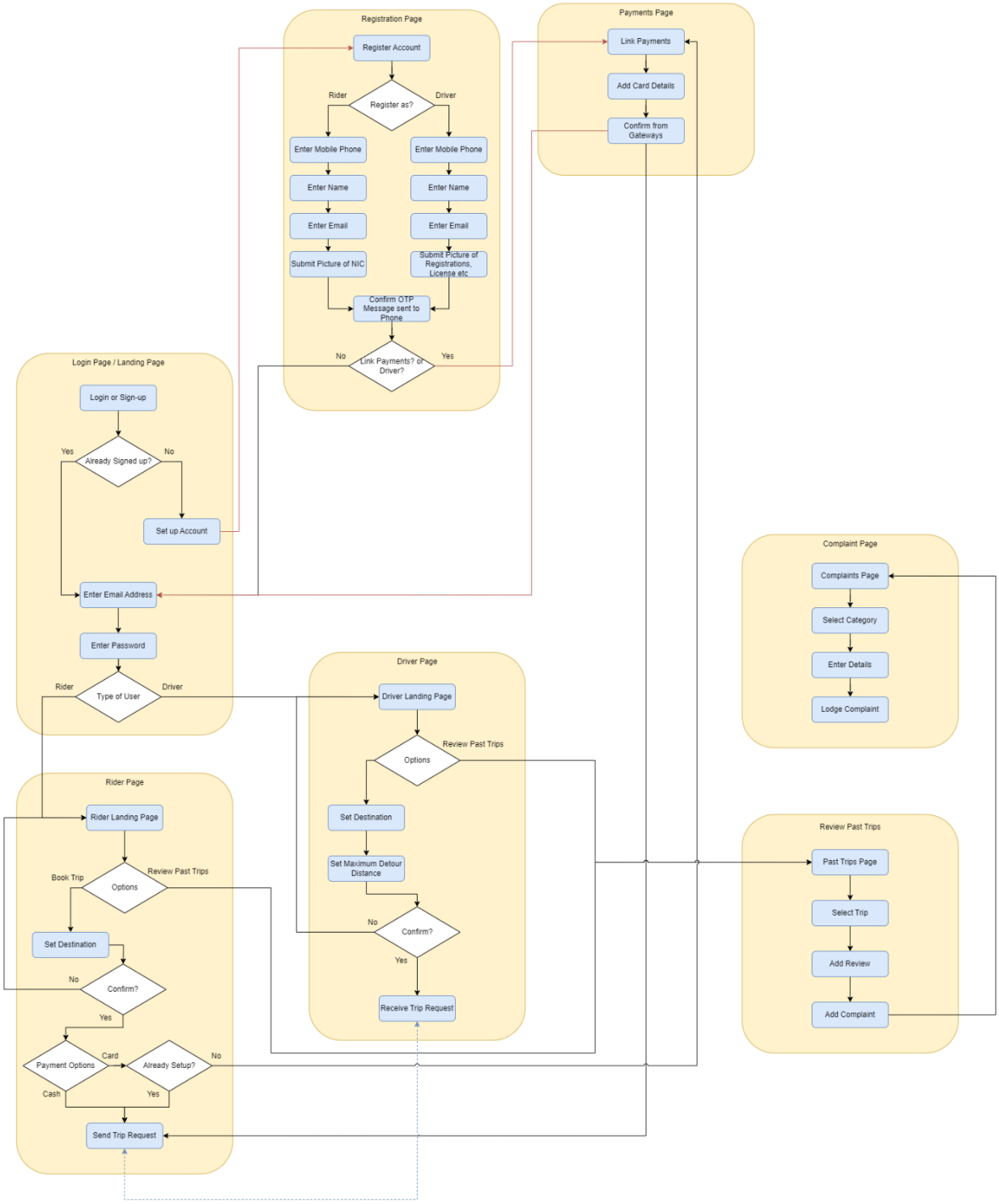
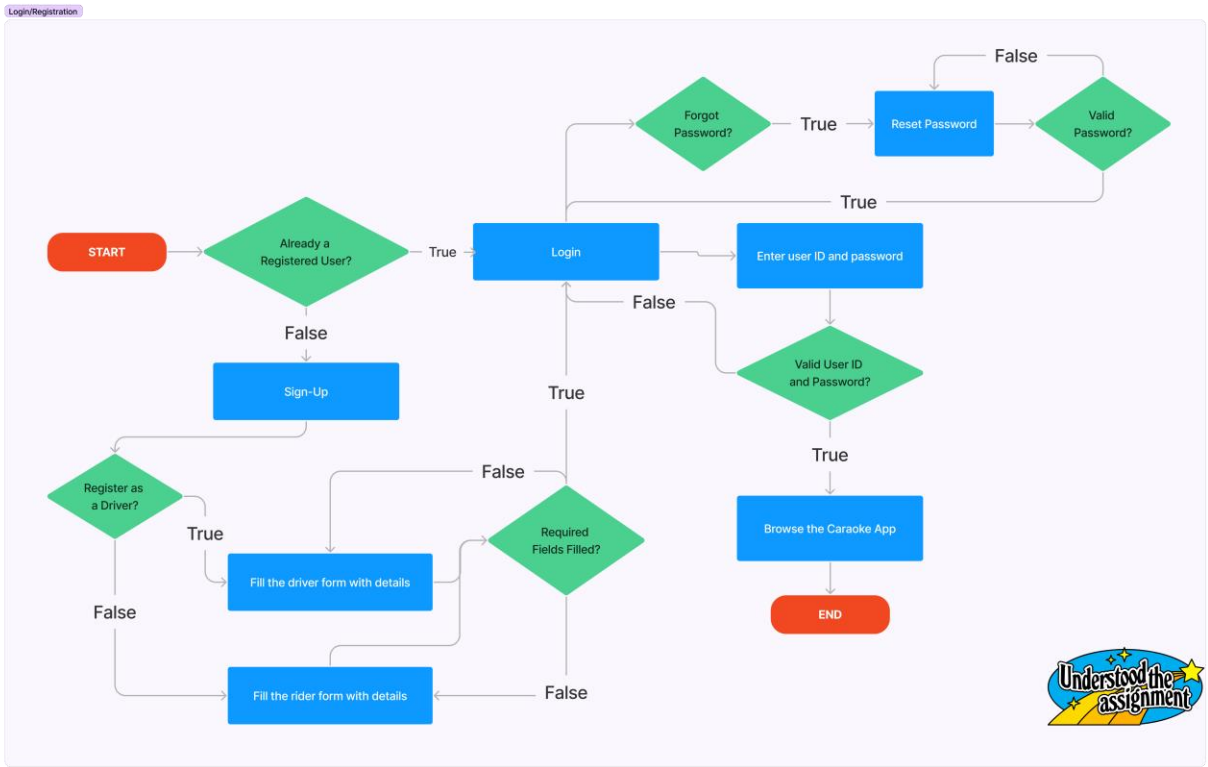
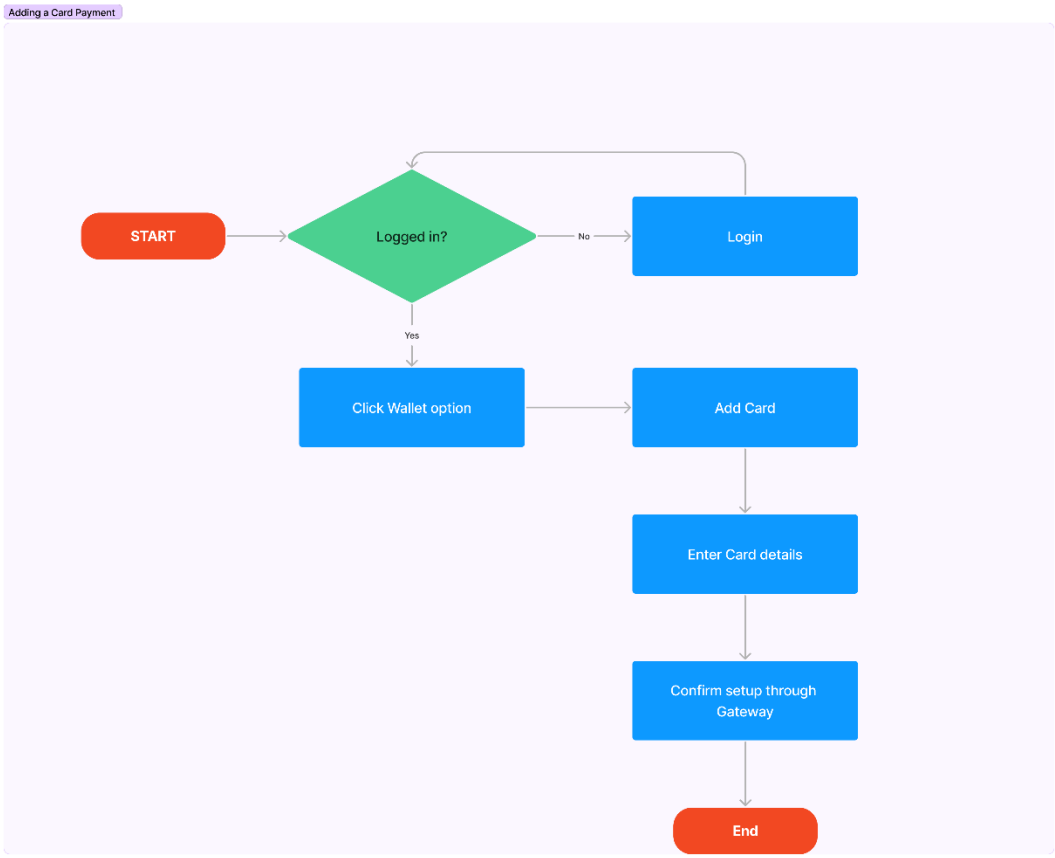


Figure 14: User flow of the Caraoke App

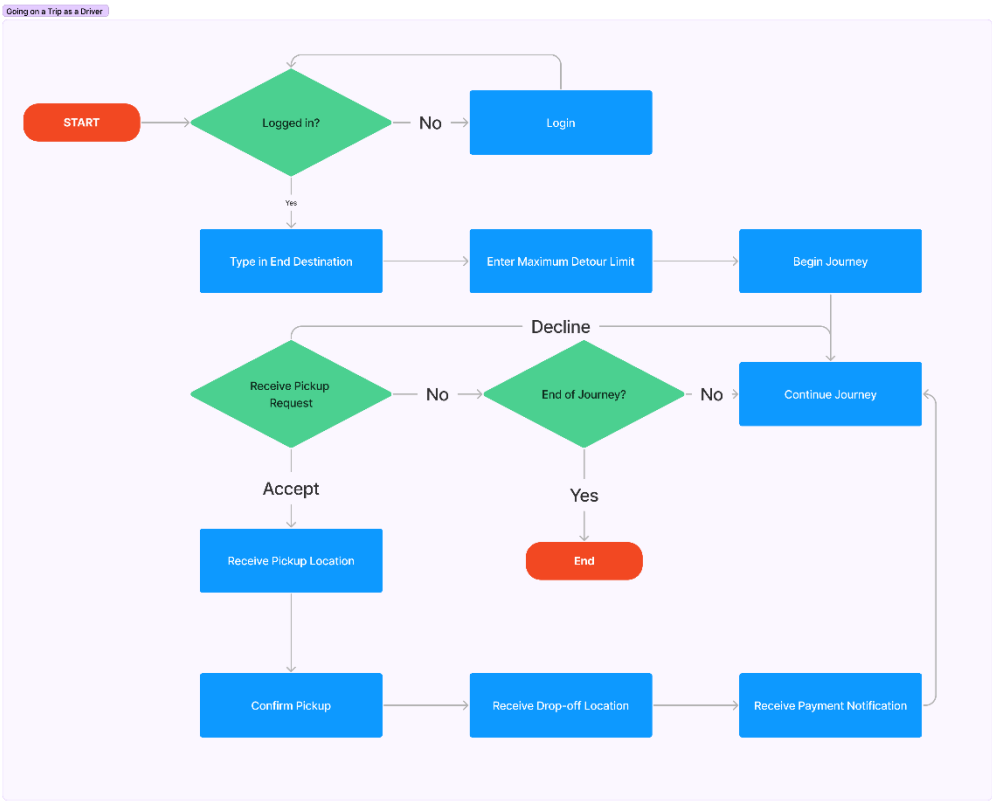
Login/registration process



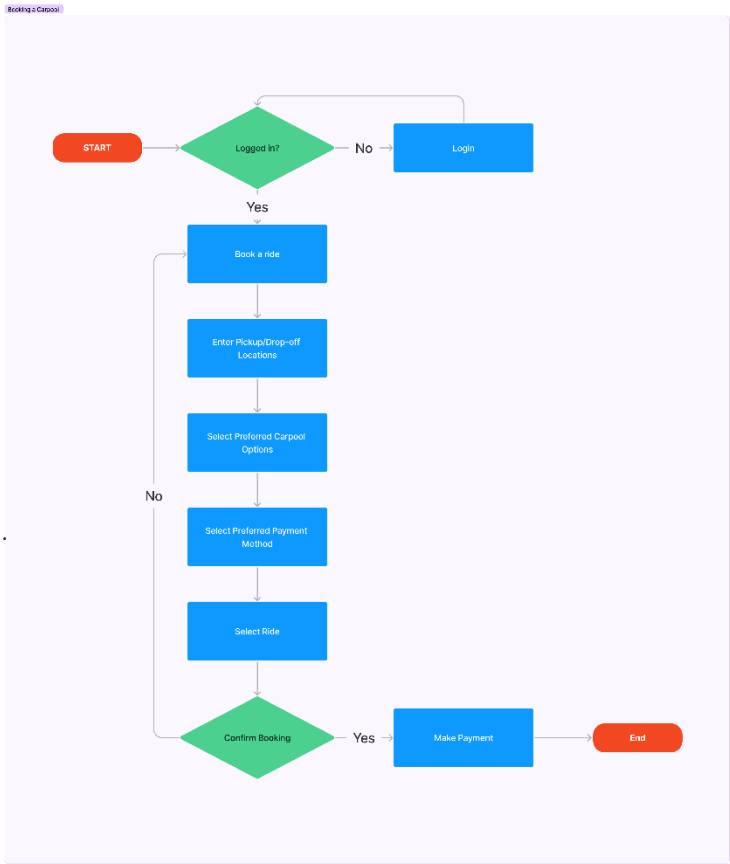
Adding a card Payment



Going on a trip as a Driver (hitchhiking passengers on the way)



Booking a carpool ride process

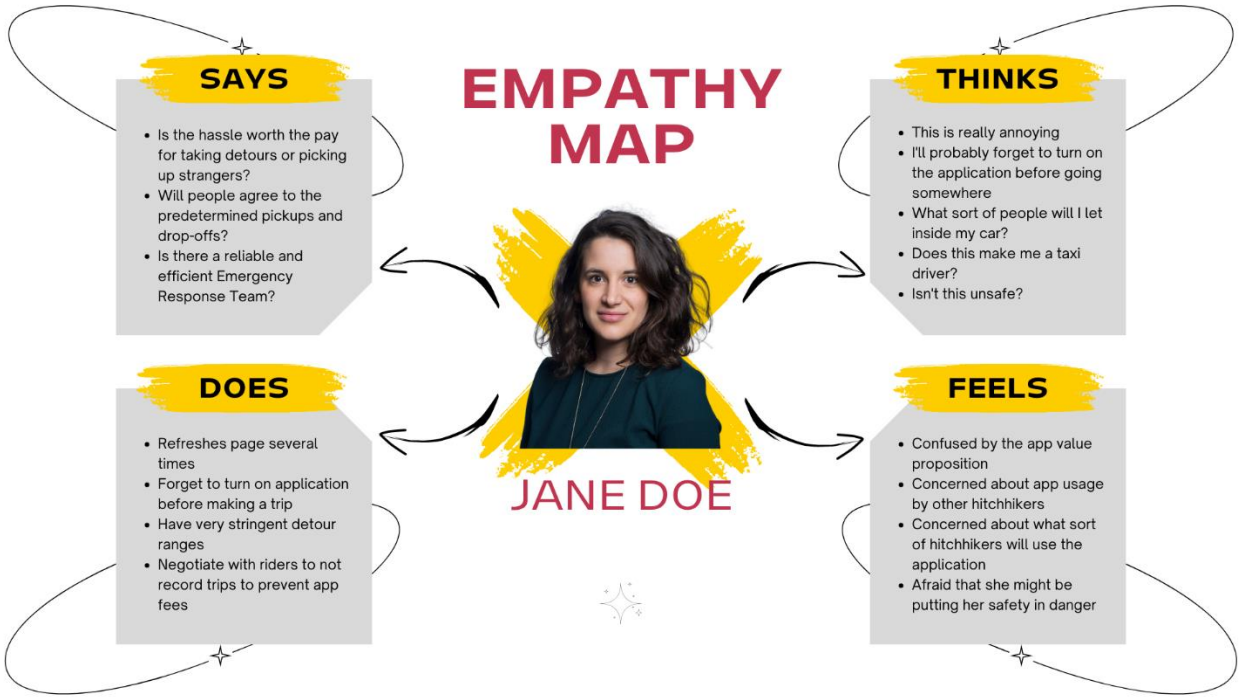


5.7.3 Empathy Maps

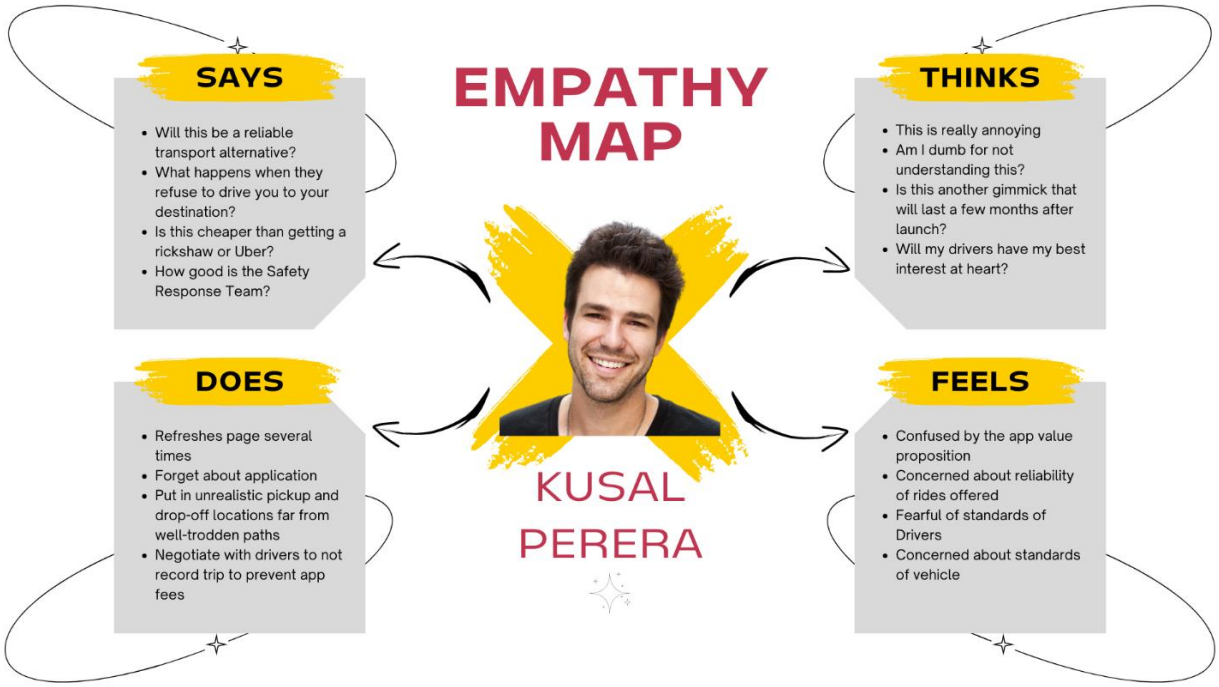
The empathy maps were designed after careful consideration of the target demographic of the Caraoke application as a whole so that all variations of users are taken into consideration. Different age groups, genders, economic backgrounds, and stages of life were encapsulated into the four empathy maps created by the FourGUIs team.

The following empathy maps shown below were obtained from Worksheet01 (2023):

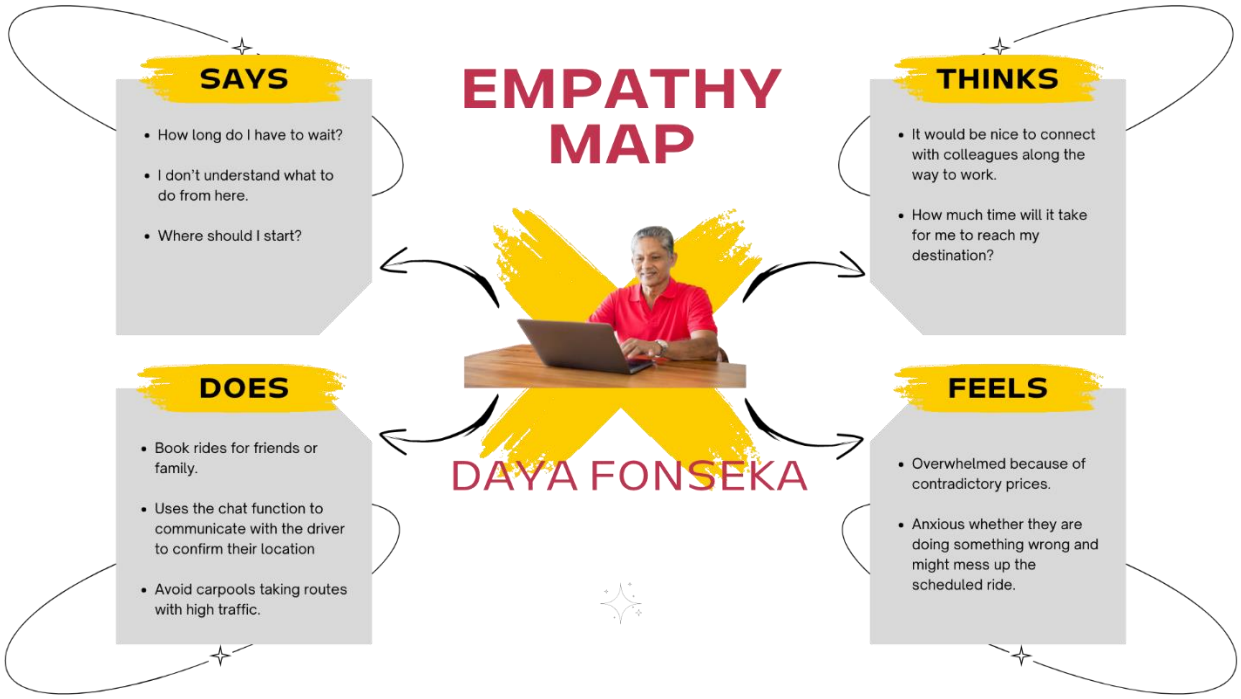
Jane Doe



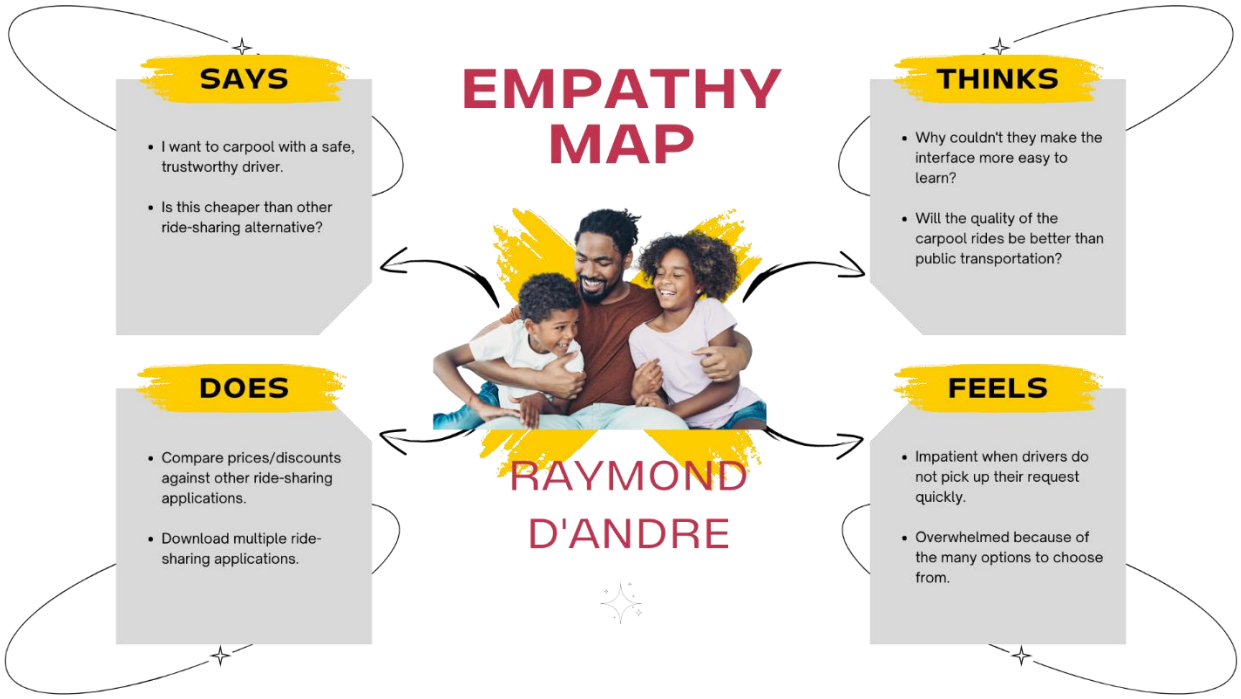
Kusal Perera



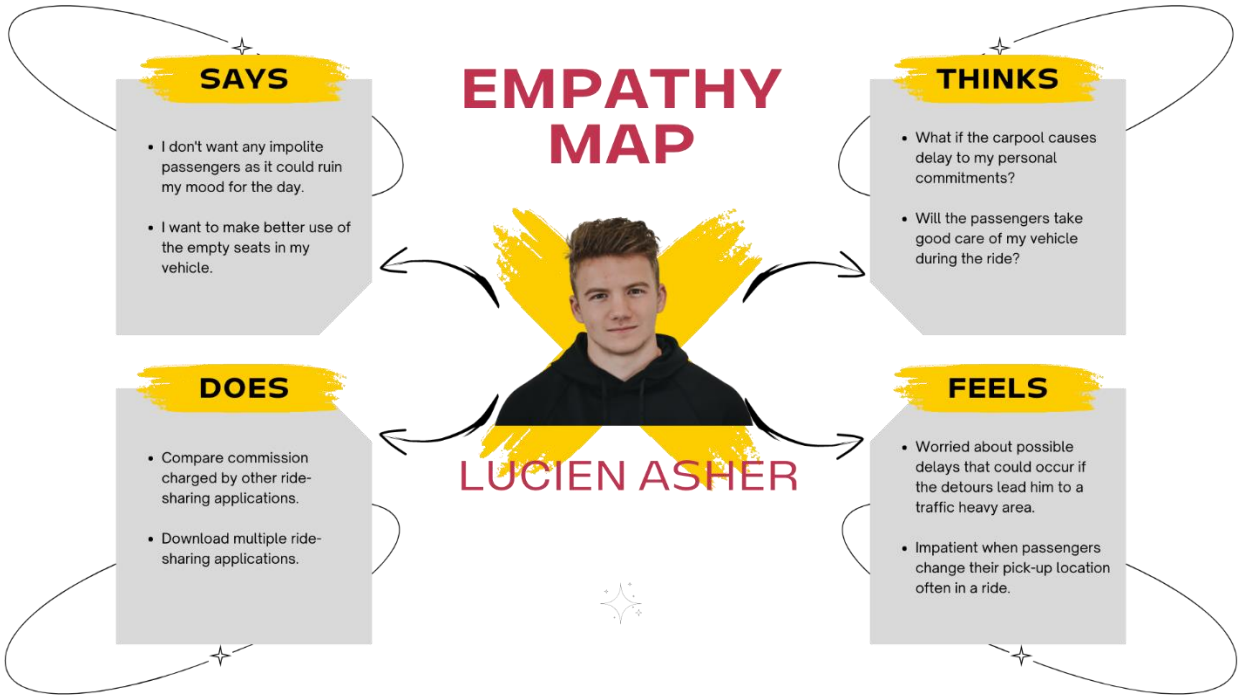
Daya Fonseka



Raymond D'Andre



Lucien Asher



5.8 User Stories

User stories for the Caraoke application include the requirements of both drivers and passengers to produce a positive experience for both participants as follows which were obtained from Worksheet01 (2023):

1. As a driver, I want to be able to offer rides to other users so that I can earn money and help reduce traffic jams.
2. As a user, I want to be able to create a profile and successfully login, so that I can search for carpooling options and be a member of the Caraoke community.
3. As a passenger, I want to be able to rate drivers, so that I can make a solid decision before confirming a carpooling ride.
4. As a driver, I want to have the ability to rate after a ride so that I can share my experience within the community.
5. As a passenger, I would like to be able to share trip details (through WhatsApp, Facebook, and Instagram) such as live location information, driver details, and vehicle details, so that I can take rides with them or for safety.

6. As a carpooling user, I want to be able to search for rides based on my current location and desired destination, so that I can find a convenient ride to share with.
7. As a driver, I want to create a ride with my starting location, destination, number of seats available, and departure time so that other users can request to share the ride with them.
8. As a user, I want to cancel my trip if I run into an emergency or if my plans change.
9. As a female passenger traveling back home from work at night, I would like to choose a ride only with female passengers and drivers, so that I feel more comfortable and safe.
10. As a driver, I want to know what the users using my ride desire to converse with during the ride such as music karaoke, small talk, or silence so that I can make the ride more comfortable for them.
11. As a driver, I want to be able to give the maximum detour so that the app can provide the users within that vicinity.
12. As a user, I want to have the ability to save my preferred rides, so that I can quickly access and book them in the future without any hassle.
13. As a user, I want to be able to make my payment from the app through an online transaction where I can choose from different payment methods such as a card or cash.
14. As a passenger, I want to tip my driver, so that I can show them my appreciation.
15. As a passenger, I want to know my estimated time of arrival before booking a carpool and during the ride, so that I can ensure I reach my destination on time.
16. As a user, I want the ability to personalize the theme of the application, so that I can opt for something more comfortable for my eyes.
17. As a user, I want like to be incentivized for being a loyal user of the application.
18. As a user, I want to be able to join the Caraoke community page, so that I can be part of the community forum.
19. As a user, I should be able to add a card to the system, so that I can pay the driver using my credit card.
20. As a user, I must be able to easily manage different card options, so that I can pay the driver with my preferred card.
21. As a user, I must be able to see the total transactions made by card and cash, so that I can have an idea of my transactions.
22. As a passenger, I want to be able to get see my past activity, so that I can check my past ride history with how much carbon emission was reduced through carpooling.

23. As a user, I want to get a walk-through of the application as a first-time user, so that I can have a smoother experience the first time.
24. As a user, I want to be able to chat with or call the driver, so I can share details of my pickup location.
25. As a user, I want to lodge a complaint in case of an unexpected inconvenience/ accident.
26. As a user, I would like to know how much I contributed to reduce the carbon footprint by using the carpooling service.

5.9 Use Cases

The below diagram is used to describe the whole application from the perspective of the driver, and passenger. And it summarizes some of the relationships between passengers and drivers within the system and it does not show the order in which steps are performed to achieve goals but rather specifies the expected behavior of the software application.

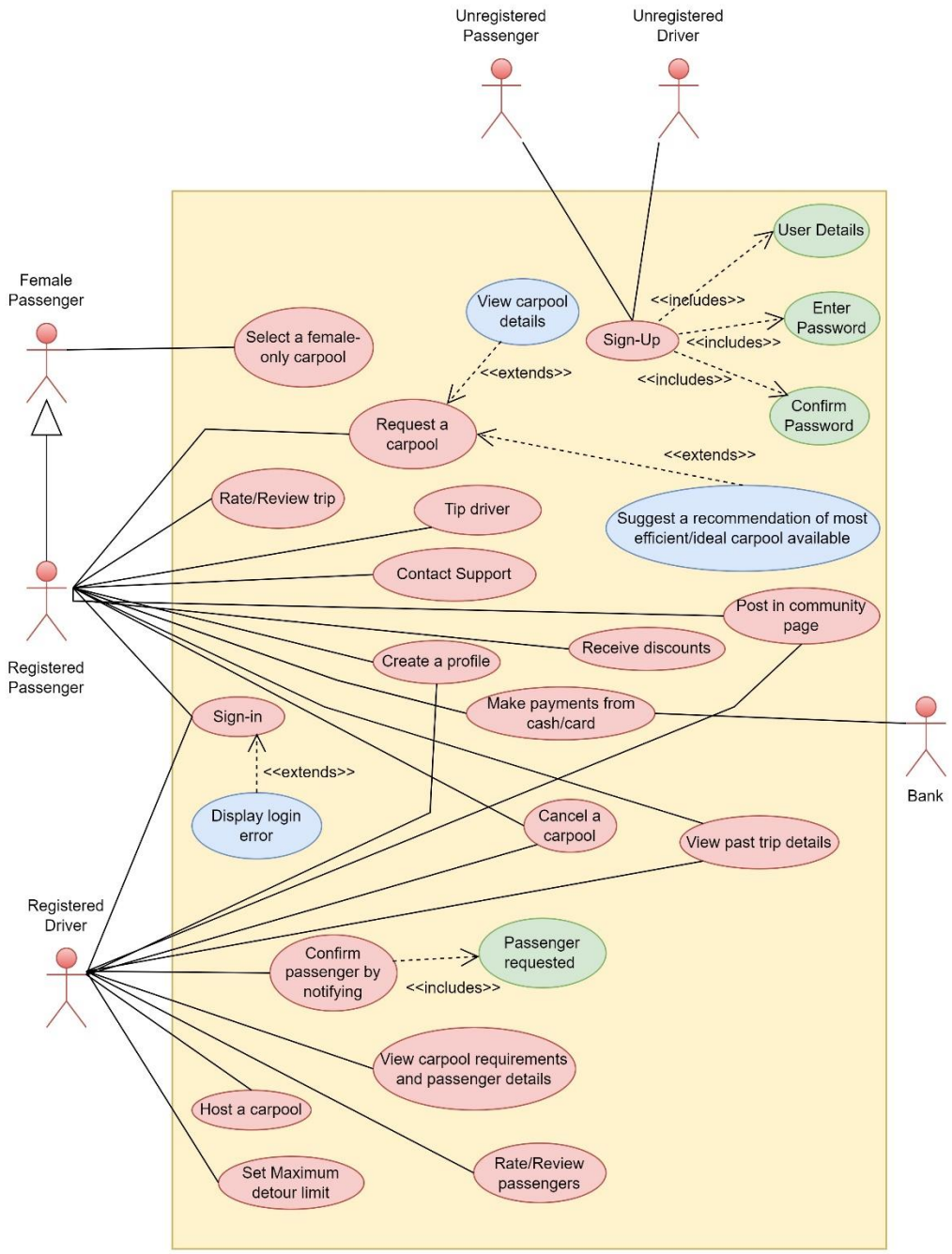


Figure 15: Use case diagram

5.10 Competitor Analysis

The core premise of this group's application is Carpooling with a focus on Hitch-hiking, or as more colloquially known in Sri Lanka; "Getting a lift to a destination", which will drastically reduce the per capita Carbon Emissions produced on daily commutes to and from destinations (Worksheet01 2023).

Upon general analysis of the applications in the current market, there seems to be a recurring theme of applications that are focused on criteria such as dropping off and picking up, and booking in advance which significantly creeps up on the core responsibilities of Ride-Hailing Applications such as Uber or PickMe (Sri Lankan Uber equivalent).

This is a stark difference to Caroake which is more impromptu, if you want to meet your friends in Colombo 08 and you're driving from the outskirts of Colombo simply enable GPS, enter your destination, and the maximum detour distance you would be comfortable taking from your original trip and continue your journey, along the way if we can match a passenger who wants to be picked up and dropped off within the boundaries set by you, we will match the parties so that they can hitch-hike and pay a sum of money to a destination you were going to go to anyway. Our core principle is to allow people to tag along in your journeys, not create another Ride-Hailing Application (Worksheet01 2023).

Figure 16: SWOT structure

There have been a few efforts (albeit with limited success) into this space, both locally and globally some of the most notable are as follows, for each of these examples we will do a SWOT Analysis Table which stands for Strengths, Weaknesses, Opportunities, and Threats in the following Structure (Worksheet01 2023):

5.10.1 RideShare.lk

RideShare.lk, formally known as Carpool.lk is a mostly abandoned web-based Ride-sharing application with no current Ride Offerings and the last Ride Request being over 2 months ago (RideShare.lk 2023) and (Worksheet01 2023).

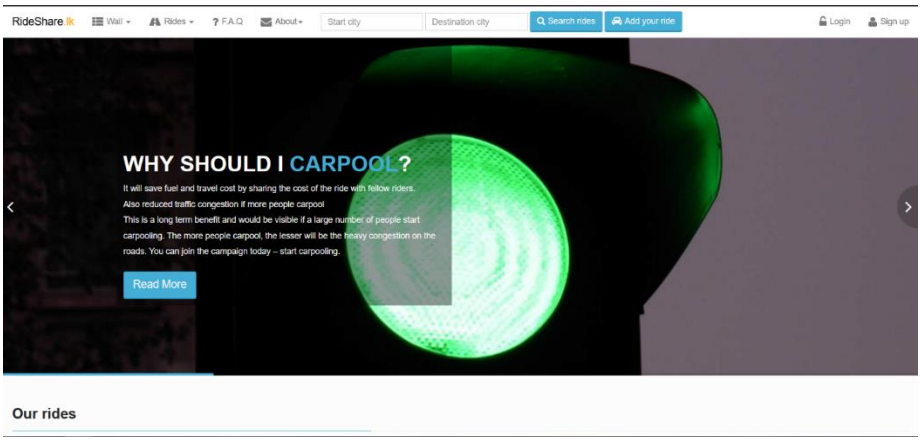


Figure 17: RideShare.lk system

Strengths	Weaknesses
• An extremely simple interface where you could type in the Start City and Destination City for both Riders and Drivers • Extensive FAQ page with questions • Community Section that allows posts and comments from the Community	• Interface has no map functionality, arguably too simple considering the lack of options • Is a Desktop Web-based application that severely affects the demographic as a driver or rider would more likely have a smartphone on themselves at all times • Location input has no nuance or GPS Support, you can input a location as Colombo 1 which spans over a few kilometers which renders the location feature useless. • Irrelevant features to the core premise of the application such as the Cost Savings Calculator.
Opportunities	**Threats**
• Many of the old conversations seem to mention whether individuals are smokers or non-smokers, this could be integrated into the ride categories as a structural binary decision.	• Any mobile-based application that could replicate this functionality • No fees are being determined by the platform which will create chaos in the negotiation stage for both riders and drivers

5.10.2 BTW Carpooling

BTW Sri Lanka is a car-pooling application that, similar to, previous competitors largely abandoned possibly due to the lack of awareness and also again because it emulates features of other large-scale Ride-sharing applications such as Uber which makes it a niche product.

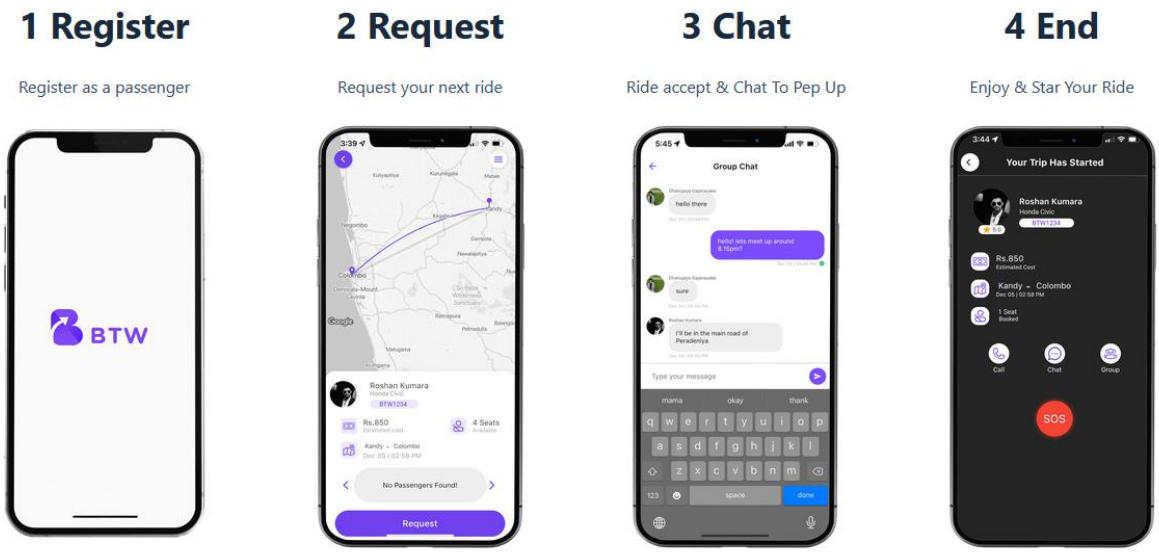


Figure 18: BTW App

Strengths	Weaknesses
• Aesthetically pleasing UI • Group Chat Feature • Integration for Groceries and Packages planned to arrive • The application is very UX friendly whilst being extremely intuitive to use.	• No location input through GPS, have to manually type location • Ability to book trips in advance converts application from Car-pooling/ Hitch-hikers category to conventional Taxi Service
Opportunities	**Threats**
• Application could integrate few feature such as route planning and detours to existing application without completely redesigning the application. • GPS Input could be overlayed with Google	• Most of the features such as booking a trip, package delivery etc are already implemented by Uber and PickMe (two largest giants in Ride-sharing space in Sri Lanka) • Has no unique features to set it apart

Maps Integration that already exists on the platform.	• Have security issues within the app.

5.10.3 Uber/ UberPooL

Uber is a Silicon Valley Ride-Sharing startup that has become the largest Ride-sharing platform in the world with a larger focus on being a convenient and cheap way to hail taxis with none of the regulations or infrastructure management (maintaining a fleet of cars) attached that often plagues older establishments such as New York Yellow Cabs or Kangaroo Cabs (Worksheet01 2023).

Your guide to driving with UberPool

With UberPool, riders heading in the same direction choose to share a ride. Uber finds the best route to pick up multiple riders along an UberPool trip. This means more time driving and less time waiting for your next trip request.

Figure 19: UberPool option in Uber App

Strengths	Weaknesses
• Aesthetically pleasing UI • Already a household name in the Ride-Sharing space with much of the market share • The application is very UX friendly whilst being extremely intuitive to use	• Does not reduce emissions as there is a dedicated driver who takes riders to destinations that the driver otherwise would not go to. This is different to Caroake which is allowing Hitch-hikers to tag-along in your journey. • Carpooling often takes riders on large detours which affects utility provided

Opportunities	Threats
• The application could integrate hitch-hiking features into the existing code-base seamlessly.	• Other Ride-Hailing Applications such as PickMe which takes a lesser percentage of fees which entices Drivers and Riders to change platforms

5.10.4 BlaBlaCar

BlaBlaCar is another popular ride-sharing platform (available both as a website and as a mobile application) that helps secure connections among drivers with empty seats and passengers that are heading in the same direction to travel together. The platform is widespread in the European continent for the most part. Standing strong against its countless unsuccessful competitors, BlaBlaCar continues to provide a satisfactory platform for passengers and drivers alike to travel conveniently and make their trips worthwhile (Worksheet01 2023).

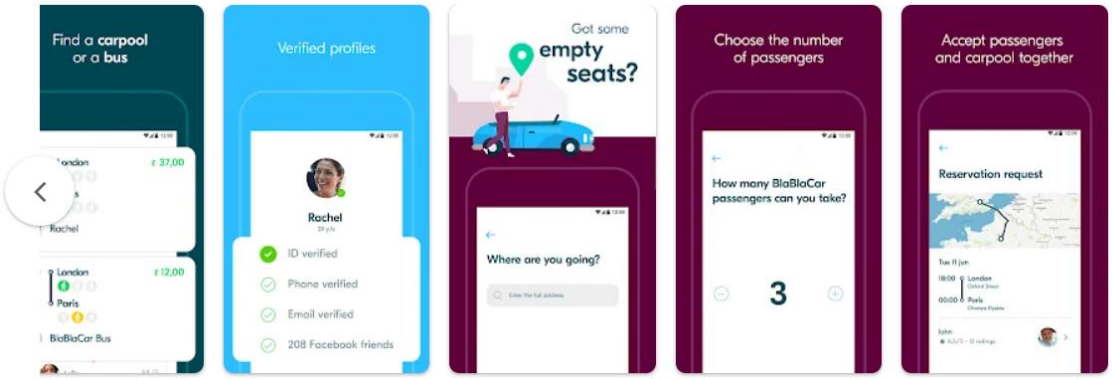


Figure 20: BlaBlaCar App

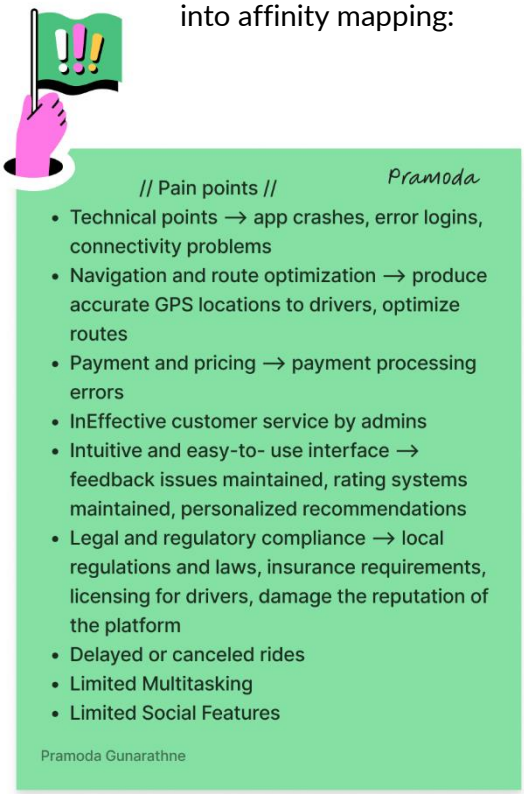
Strengths	Weaknesses
• Simple, Aesthetically pleasing UI • The application outlines the top carpool routes and bus routes corresponding to the user's location. Helps users identify the best routes to reach their destinations. • Extensive language support - Currently available in 22 languages.	• Most Ride-Hailing applications makes use of their own vehicles, while BlaBlaCar on the other hand, does not have an alternative arrangement for cancellations that could lead to bad user experience.

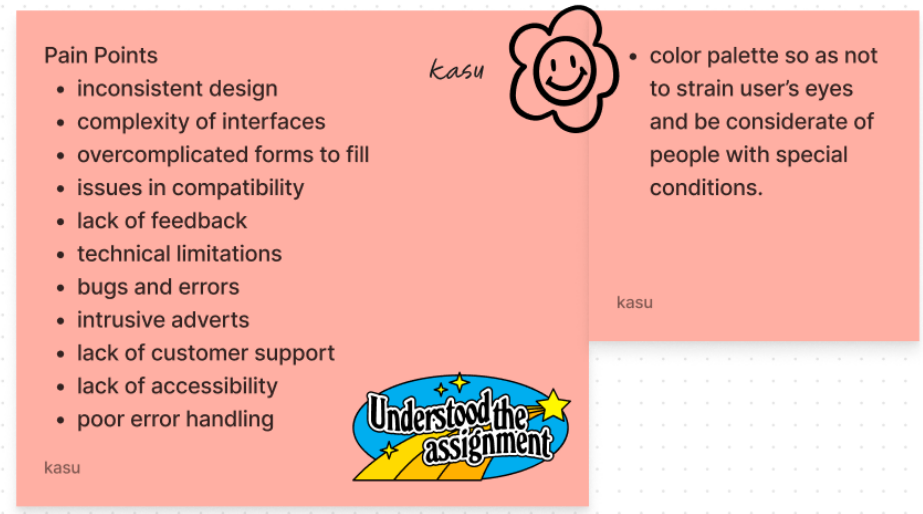
Opportunities	Threats
• BlaBlaCar has acquired a sufficient user base in Europe to confidently start integrating features that look appealing in a global context. • The application could integrate additional services such as package delivery/courier on top of the services already offered.	• Though BlaBlaCar is widely known in Europe, globally known car-pooling applications such as UberPool (Uber), and LyftShared (Lyft) are overtaking the market. • Due to the global increase in oil prices, BlaBlaCar experienced a significant plunge in the number of carpools being offered through the application.

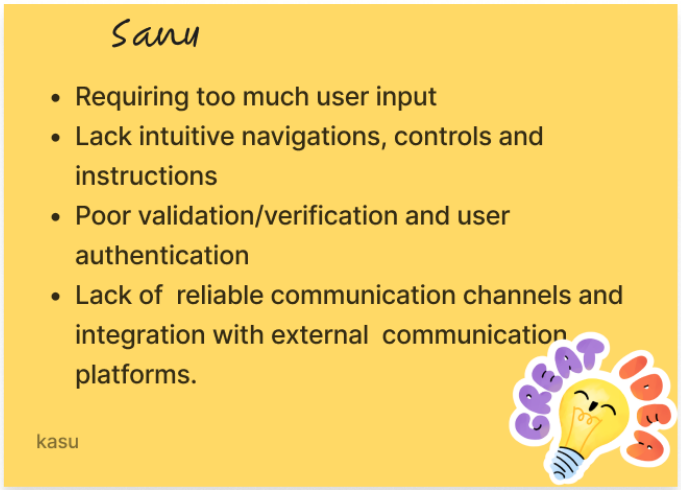
5.11 Pain Points

The term "pain points" refers to areas of the customer's experience that can be diverse, broad, specialized, clearly evident, or hidden (Gibbons 2021). Understanding pain problems is the first step towards building amazing experiences that satisfy our user's demands (Gibbons 2021) and (Worksheet02 2023).

- The initial brainstorming done by each member is shown below which was later developed into affinity mapping:







- Affinity mapping for User pain points - The grouping was done for different user experience problems that a customer of the application may face. This helps to broadly understand the issues a customer may face with the UI/UX design which will further assist the group to come up with better prototypes for the application. Hence, avoiding poor user experience and usability.

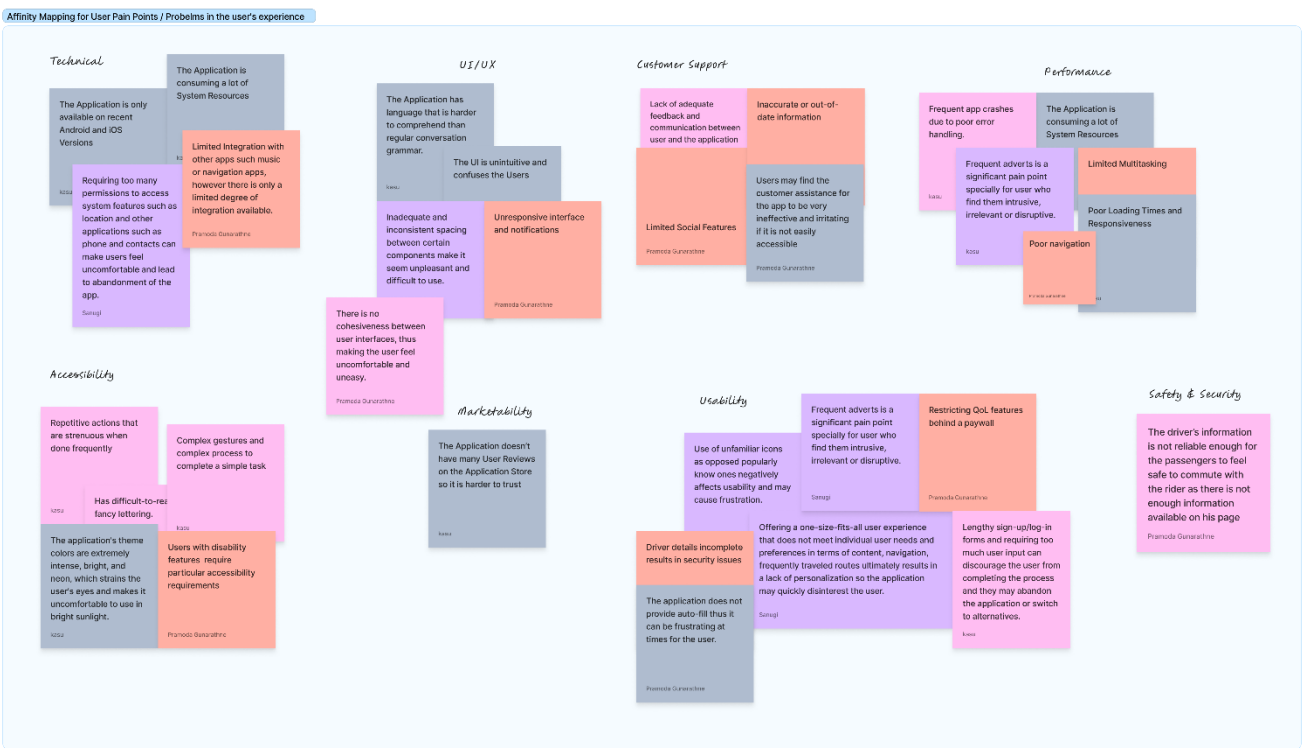


Figure 21: FourGUIs FigJam - Pain points affinity mapping

5.12 Problem Statement

The problem statement serves as a useful scoping tool, focusing the team on the issue that needs investigation and eventual resolution(Rosala 2021). What has to be done during discovery

and what is outside of scope are made clear by a problem statement (Rosala 2021). It also aids in directing the actions and choices made by the group (Worksheet01 2023).

How Might We questions

Creating How Might We questions that define the problems for ideation can deter people from offering their pet ideas, which may bear little similarity to the difficulties discovered (Worksheet01 2023).

In the below section, How Might We questions are mentioned as follows taken from Worksheet01 (2021);

- How might we make the users feel confident in booking rides and connecting with friends?
- How might we make the rider experience be enhanced when they request a ride?
- How might we make matching passengers and drivers more effective?
- How might we shorten riders' wait times when they call for a ride?
- How might we engage and keep the user mentally stimulated while waiting for the application to match them up with a rider/passenger?
- How might we encourage riders of the app to utilize the app more frequently from the driver's perspective?
- How might we raise awareness among users and encourage them to utilize the app to reduce the emission of carbon to the environment?
- How might we ensure women's safety during the Caraoke ride-sharing experience?
- How might we address issues about background checks and driver safety?
- How might we make the app's user interface and design more simple to use and intuitive?
- How might we make users feel as if carpooling by the application is far more efficient and is a better use of their time?
- How can we make the app more accessible for users and drivers with disabilities, such as those who are visually or aurally impaired?

- How might we add the rating to the driver profile pages to provide an idea about the performance and behavior of the driver?
- How might we increase the Quality of life features available to all app users, regardless of whether they have a paid subscription to the premium service?
- How might we increase user experience by allowing users to pay using multiple credit cards?
- How might we make the users ask for customer support easily when needed?
- How might we make the signup process easy for users with less number of steps?

Analysing user pain points with problem statements

The user pain points can be analyzed more efficiently to get a broad idea by determining a few problem statements and then resolving them in advance (Worksheet02 2023).

Analyzing the user pain points for each affinity category in terms of the following problem statements (Rosala 2021);

- Who is affected by the problem?
- What is the problem?
- Where does this problem occur?
- When does the problem occur?
- Why does the problem occur?
- Why is the problem important?

The below section was acquired from Worksheet02 (2023).

Performance

Pain Points	*Problem Statement*
Poor Loading Times and Responsiveness	Lesser-educated users of the application are affected by this problem which often occurs because of the use of verbose language in the application.
The Application is consuming a lot of System Resources.	All Users of the application are affected by this problem. This is because the application itself requires constant pinging to servers and GPS to

	update the locations.
Poor error handling in the application causes it to crash and shut down while being used.	Error handling that is seamless and smooth is a best practice that is expected of every product. Frequent crashes that cause the app to close down and lose the data from its most recent session will surely irritate the user. Users abandon the application and look for a replacement.
Frequent adverts is a significant pain point, especially for user who find them intrusive, irrelevant, or disruptive.	The majority of the users find the frequent appearance of advertisements on the application to be disruptive to their user experience, leading to frustration and a decreased likelihood of engagement. Additionally, ads that are irrelevant, intrusive, or low quality can create a negative perception of the application and decrease user trust and satisfaction.
The ride-sharing app may require users to multitask or use other apps.	This can affect both drivers and passengers who may need to use other apps while simultaneously using the ride-sharing app. The issue is that because the ride-sharing app might not enable multitasking, users may find it challenging to switch between apps. Those who find it difficult to multitask or switch between apps may find the app frustrating to use and look for other modes of transportation.

UI/UX

Pain Points	*Problem Statement*
The Application has language that is harder to comprehend than regular conversation grammar.	All Users of the application are affected by this problem, this problem is where the app often feels sluggish to use, the problem occurs

	primarily in areas with low connectivity and when the user's devices have a performance bottleneck.
The Application is consuming a lot of System Resources.	All Users of the application are affected by this problem. This is because the application itself requires constant pinging to servers and GPS to update the locations.
The UI is unintuitive and confuses the Users.	Mainly affected by non-Technologically adept users and older demographics, the User Interface feels as if there are too many options. This is important since we do not want to intimidate our clientele with too much information.
The UI expects numerous complex gestures to complete a task and has difficult-to-read fancy lettering that frustrates the user.	Users with limited knowledge of technology might struggle to understand what exactly needs to be done and how exactly they should go about completing a task while using our application. Our initial analysis led us to the conclusion that the majority of our user base is between the ages of 18 and 60. If the application depends too much on the user being tech-savvy, it will lose a sizable portion of its user base.
There is no cohesiveness between the user interfaces of the application, thus making the user feel uncomfortable and uneasy.	Every user is affected making the user's experience to be affected immensely. This occurs when there is a delay in switching between interfaces in the app, which can cause users to get easily frustrated.
The application's theme colors are extremely intense, bright, and neon, which strains the user's eyes.	Aesthetics play a vital role in providing a good user experience and eliciting the mood of a brand's expression. Emotions are strong and can influence how users make decisions on a psychological level. Bright, harsh colors can be

	difficult to read and may appear overly contrasting on a mobile device.
A cluttered design often results in confusing the user.	The majority of the users mainly first-time users and users who expect a streamlined carpooling service are affected by this problem. This is because a lack of adequate white spacing and cluttered components may not only seem unpleasant but might also hinder the functionality of the application.
Users may grow annoyed and lose faith in the app if the UI is slow or unresponsive.	Any user of the ride-sharing app may experience the issue of slow or unresponsive user interfaces (UIs) and poorly designed notifications. Slow or unresponsive UIs may be more noticeable when the app is experiencing high usage or when users are in areas with limited network connectivity, server overload, or inadequate app optimization. Bad user research, insufficient information offered in notifications, or a disregard for user experience design can all contribute to poorly designed notifications. Customers who experience these problems could grow dissatisfied or irritated with the app, which could damage their opinion of the app. This can drive customers to use the app less frequently or even switch to different ride-sharing apps.

Usability

Pain Points	*Problem Statement*
The application does not provide auto-fill, thus the user is required to complete a login every time they want to use the application.	Users become mentally exhausted and lose one of the pleasures of using a mobile application because of the repetitive action of frequently entering their personal log-in information. To

	create a positive, engaging user experience, auto-filling is an essential component of today's mobile applications.
The use of unfamiliar icons as opposed to popularly known ones negatively affects usability.	All the users who engage with other popular mobile applications are affected by this problem. For certain components in a mobile application, there are already pre-defined and unspoken industry-standard icons that are used to promote recognition. Use of other foreign icons to represent the same components is risky and might lead to cause frustration among users.
Requiring too many permissions to access system features such as location.	Requesting permission to access system features such as locations, and contacts, would all demand users' confirmation. However, requesting too many permissions occasionally (without keeping a track of the user's previous consents) may also make the user uncomfortable, resulting in abandonment of the.
Lengthy sign-up/log-in forms and requiring too much user input can discourage the user from completing the process and they may abandon the application or switch to alternatives.	This affects all the users particularly the ones, not in favor of long tedious tasks. Users are often required to provide a significant amount of personal information which can be time-consuming. This can lead to a high bounce rate, decreased user engagement, and ultimately, reduced conversion rates.
Offering a one-size-fits-all user experience that does not meet individual user needs and preferences in terms of content, results in a lack of personalization so the application may quickly disinterest the user.	The majority of the users have unique needs, preferences, and behaviors that are not addressed by a one-size-fits-all approach to user experience design. Users may struggle to find the information they need, navigate

	through the site or app, or complete their desired actions, leading to a negative user experience.

Accessibility

Pain Points	*Problem Statement*
The Application is only available on recent Android and iOS Versions.	Users who on average have mobile phones less than Android Jellybean or iOS 15 cannot access the app through the official application store. This is important because there is a significant user base still using these devices with firmware below this threshold.
Users who are disabled might require particular accessibility requirements.	Small font sizes, a lack of audio cues, low color contrast, and trouble using a screen reader to navigate the app are all signs that the software may not have been developed with accessibility in mind. Fixing this problem can assist ensure that people with disabilities can fully participate in society and have equal access to transportation services.

Poor Satisfaction and Support

Pain Points	*Problem Statement*
The user is left wondering if they are wasting their time because the application fails to provide adequate feedback regarding whether the ride-hailing request was successful.	Every user will be impacted. For the application to keep the user informed and interested, it must produce insightful feedback. For instance, if the application fails to notify a user who followed all necessary steps to hail a carpool that the process was successful, the user may begin to doubt their accuracy.
Restricting certain quality of life (QOL) features behind a paywall where users cannot join the	The majority of the customers will be affected by having to pay to acquire a special feature

caraoke community to earn promotional or special deals.	such as the Caraoke community feature that offers exceptional promotional deals and many more offers which can only be accessed by making a payment. This significantly damages the user experience causing customers to be affected immensely.
Customers may require assistance from customer service to resolve difficulties like misplaced merchandise, disputed fares, or other issues.	Any user of a ride-sharing app who has problems or complaints can be affected, and people with disabilities might need extra help or accommodations from customer service to use the app properly. This can lead to annoyance, and inconvenience, as a result. The problem can also occur when users feel difficulty with the app's operation or have trouble booking rides, therefore this issue can arise within the app itself or after the ride.
Users may want to combine the app with other third-party services, such as music or navigation apps.	The issue is that users of ride-sharing applications could run into barriers when attempting to connect their app to other third-party services. This may limit their capacity to personalize their experience and utilize the resources that are offered to them. Users may be less likely to use the app and may look for alternative forms of transportation if they are unable to combine it with other services.

Marketability

Pain Points	*Problem Statement*
The Application doesn’t have many User Reviews on the Application Store so it is harder to trust.	Users are unwilling to download the application since it doesn't have many reviews on the application store since it's fairly new. This is important because we need to project

	the image of trustworthiness and is often used to incentivize users to download and register.

Safety & Security

Pain Points	*Problem Statement*
The driver's information is not reliable enough for the passengers to feel safe to commute with the rider as there is not enough information available on his page (such as name, job status, the route taken to travel, and driver history)	The passengers are mostly affected. Sometimes, after new updates, the driver information can be unreliable as attributes such as phone number could be misplaced or out of date causing the passenger to have a poor user experience. Inconsistent and infrequent updates damage the application's effectiveness, causing the driver information to be misplaced hence damaging the user experience.

<u>Affinity mapping</u>

The grouping was done by dividing user pain points into low, mid, high, and critical according to how much these points might affect the functional requirements of our application later on. A risk assessment is carried out by affinity mapping as shown below regarding a few user pain points (Worksheet02 2023).

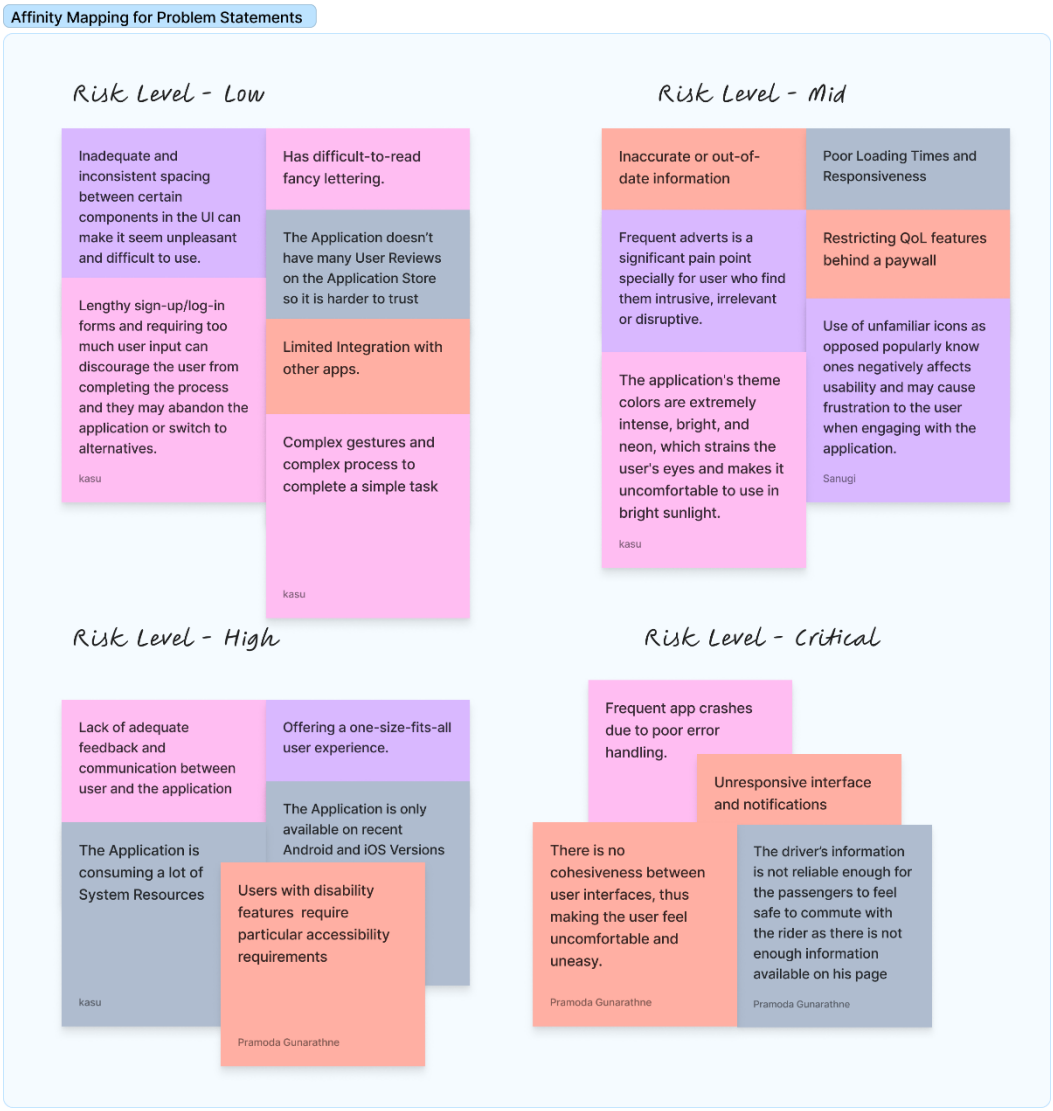


Figure 22: Problems classified by risk assessment

5.13 Ideate Solutions

As Worksheet02 (2023) states the Ideation stage of the design thinking process enables the design team to turn the information learned during Inspiration, the first step, into a physical model or prototype. The ideation stage connects the inspiration research phase, which helps us learn more about the issue at hand, and the implementation stage, which converts the prototypes into a finished product or service (Elmansy 2022).

Affinity mapping

The ideation solutions were brainstormed for user pain points as shown below, which helped the team to understand the functional and non-functional requirements of the Caraoke Application.

Figure 23: Ideate solutions

6 Requirement Specification

The functional and non-functional requirements were collected and refined by acknowledging user survey and interview responses received and by using design thinking strategies such as identifying pain points, stating the problem statements, and ideating solutions for the pain points as shown in the above section.

6.1 Functional Requirements

The high-quality functional requirements that are used to define the core fundamental interfaces of the Caraoke App are mentioned below, acquired from Worksheet03 (2023). The functional requirements will be divided into two parts to cover every aspect of the application before developing the UI/UX interfaces.

6.1.1 User Requirements

User requirements outline what the user expects from the system, as suggested in Worksheet03 (2023). User requirements for the Caraoke App are mentioned below (Worksheet03 2023):

- Users can only log in to the application using their registered email and password.
- Users can signup as either rider or driver where the two interfaces will be different from each other.
- The user as a driver registration must be able to provide the vehicle details and the number of seats available.
- The user must be able to submit ratings and view ratings for drivers.
- Before the ride, users must be able to communicate with drivers in real time through text or calls.
- The users must be able to provide the number of seats available as a driver.
- Users must be able to quickly access and view their past rides including payment with the carbon emission reduction amount in each trip.
- The users must be able to view how much carbon emission was saved by using the Caraoke application in a visual representation.
- The user should be able to view the details of each ride, including the drop-off location, estimated time of arrival, and the cost.
- The users must be able to be a part of the Caraoke community and answer in forums.
- Users must be able to get promotional deals accordingly when the carbon emission reaches a certain milestone.
- The driver should be able to specify the maximum detour limit after entering the destination address.
- The driver must be able to view how much time will add up to the ride after accepting a passenger's request.

- The users must be given the option of what they would like to do during their ride whether they prefer silence, music or to have a conversation.
- The users must be given the option to cancel the ride before pick-up due to unavoidable circumstances and they must be given the SOS option when using the app.
- The user should be able to pay for the carpool conveniently through the app with any preferred card.
- The users must be able to add different payment cards and alter changes to these cards such as being able to remove the card and make it the default card.
- The user should be able to securely save their payment information within the app and they should be able to access all past transactions made.
- Users should have a fairly easy method to connect with family and friends such as by sharing ride details with them through social media.
- Users should be able to switch between the day and night mode that best meets their preferences.
- The users must be able to access help from customer support.
- The users must be able to check the frequently asked questions easily for commonly raised questions and issues.

6.1.2 System Requirements

System requirements focus on the technical requirements and limitations the system must adhere to satisfy the above-mentioned user requirements (Worksheet03 2023). The system requirements for the Caraoke App are mentioned as follows:

- The system must redirect a first time user to either the rider signup page or the driver signup page.
- The system must ask the rider to enter the email address, full name, NIC, and password when creating an account.
- During the creation of an account, the system must ask the driver to enter the email address, full name, and password where furthermore the system will ask the driver to upload photos of the NIC number, driving license, car registration, and vehicle insurance, and enter the vehicle type, vehicle model and the number of seats available.
- The system should have a user interface that presents the driver profile including ratings, and vehicle details in an approachable way for users to view after a ride is booked.

- The system must provide an emotion-based rating method so passengers can rate, and review the drivers.
- The system must have a messaging capability within the app so users can send real-time messages.
- The system must allow the users to see their past rides with the total carbon emissions available under each ride's details.
- The system must provide an interface to get the monthly, yearly, and weekly analytics of the carbon emissions reduced by using the app.
- The application should have a map feature that allows users to check pickup and drop-off locations and estimate the distance and duration of the ride.
- The system must match the user's requests for ambiance (music, silence, or chat) in addition to the time of pick-up.
- The system must have a cancellation option available and an SOS option in case an emergency occurs.
- The payment feature should be integrated with a reliable payment gateway that ensures secure and encrypted transactions.
- The system offers its riders promotions based on reaching certain carbon emission reduction milestones.
- The payment feature allows users to save and check their total transactions performed securely within the app.
- The system allows using of voice-to-text speech when typing the address on the map or when messaging with the drivers to help disabled users.
- The system must have the option to share rides with family and friends easily through Whatsapp.
- The application's color scheme or theme should be editable by users through a configuration option on the user settings which provides an option to choose from light or dark themes.
- The system must support multiple languages initially where first time users can select the language they want.
- The system must provide the help page option readily available by placing this page in the navigation bar.

6.2 Non-Functional Requirements

The following non-functional requirements explain what the system should be (Worksheet03 2023). The non-functional requirements are categorized into different sections as shown below:

Usability

As aspiring UI/UX designers, improving usability to provide a smooth and seamless user experience is at the top of our bucket list for the Caraoke application.

- The first-time user guide for the application must be clear and concise. The introduction to the app should be 2~3 sentences.
- Font color must have high contrast against the background at each user interface to ensure all text is easy to scan and read.
- Use of known-by-all, conventional symbols to depict certain options such as magnifying glass for the Search option, user photo for the Setting page, etc. so that first-time users find it easy and engaging to navigate.
- The application must allow users to customize their preferences on the settings page such as which theme and language are preferred.
- The application should have a well-documented FAQ and a Help Section for people to be able to help themselves.

Performance

For a flawless user experience, UI/UX performance in a ride-sharing program must be maintained.

- Image and media optimization is necessary since large files can make the program take longer to load. Make sure that all images and media are optimized to be compressed and loaded rapidly.
- Prioritize mobile performance - As the Caraoke app is used on iOS and Android, make sure the app is mobile-optimized. Make the app responsive to various screen sizes.
- The application must have a fast loading time of more than 0.3 seconds to provide users with a more advanced and user-friendly experience.
- Ride-matching features must be optimized to generate quick results and should not take more than 60 seconds to find a driver/ passenger from the list of available carpool rides.

- The application must provide a response time of fewer than 24 hours for all user support inquiries.
- The system must have a 30-second response time sending alerts to the respective customers once a ride is booked or when a driver accepts the passenger, updates on the application, and any other notifications.

Reliability

To guarantee that customers have a great experience and continue to use the app, reliability must be maintained.

- Exact ETA (Estimated Time of Arrival) predictions - The ability to provide precise arrival time predictions is one of the most crucial features of the Caraoke app. To produce the most precise ETA estimate, make sure the app considers elements like traffic, road conditions, and the driver's present location.
- User feedback - The app's dependability can be maintained by routinely requesting user feedback and utilizing it to develop improvements. When customer feedback is taken into account, we can adjust the app to fix any problems and enhance the user experience.
- The system must have an MTBF (Mean Time Between Failures) of at least 1000 hours to ensure reliable operation and reduce maintenance activity frequency.
- The application must be able to handle a large number of users simultaneously.
- Contact information for the Help Center must be included at the bottom of at least 90% of the user interfaces to ensure users can access these services quickly.
- The carpooling application should use efficient algorithms and data structures to minimize the processing time required for calculating the shortest distance between passengers and carpools/passengers and destinations/riders and destinations.
- The system must produce error warning rates of less than 0.2 seconds.

Availability

- The carpooling application should be available 24/7 without any significant downtime, except during scheduled maintenance windows.

Safety & Security

Apart from providing a smooth, seamless user experience, it is also the top priority of the Caraoke application to safeguard its users.

- Authentication and Authorization - To guarantee that only users who are permitted can access the application, by using a reliable authentication and authorization system. This entails adopting multi-factor authentication, which entails using a password that follows the rules and having an OTP verification sent to the mobile phone number.
- Driver/Passenger/ Administrator Verification - Verifying the identities of administrators, drivers, and passengers involves running background checks, checking their driver's licenses and vehicle registration documents, and using other identity verification techniques.
- Encryption of data - Protect sensitive data, such as user profiles, payment information, and location data, by using encryption.
- Use third-party payment gateways that adhere to industry security requirements and implement safe payment processing procedures within the app.
- Frequent software updates - To keep an application safe from new vulnerabilities and threats, update it frequently with the latest security fixes and features.
- Secure passwords - The user (including administrator user) password must be highly confidential and protected as it could use to wrongful usage of the application thereby leading to serious implications.
- When an incorrect email or password is given during the login process, the system won't let the user log in to the app and the text box will become red. ca
- SOS Button - There should be a clearly visible button on the application which contacts Emergency Services to be visible for both the driver and the rider.

Platform and Software

Refers to the ability of software to be easily transferred or adapted to different platforms or environments.

- The carpooling application should be compatible with different operating systems (iOS, and Android), and device models (such as smartphone and tablet variations/brands/models).
- The carpooling application should support different data formats and protocols to enable seamless data exchange with external communication platforms and applications (such as WhatsApp /Contacts).
- The carpooling application should maintain consistent performance across different platforms and environments, with minimal variation in response times or functionality.

Scalability

- The carpooling application should use network bandwidth efficiently, with minimal data transfer rates that could slow down the application or consume excessive data usage on the user's device.
- The carpooling application should use memory efficiently, with minimal memory leaks or excessive memory consumption that could slow down system performance or cause crashes.
- The carpooling application should allocate system resources efficiently, based on user demand and priority, to minimize resource wastage or inefficiencies.

Efficiency

- The system must allow the user to reach the payment screen in 1 click.
- The carpooling application should be able to handle a high volume of requests and users without experiencing performance degradation, while still maintaining a high level of responsiveness.
- The user's past rides must be saved and accessible easily.
- API accessibility - The app should include APIs that other programs can use to connect to it and exchange data and information with it.

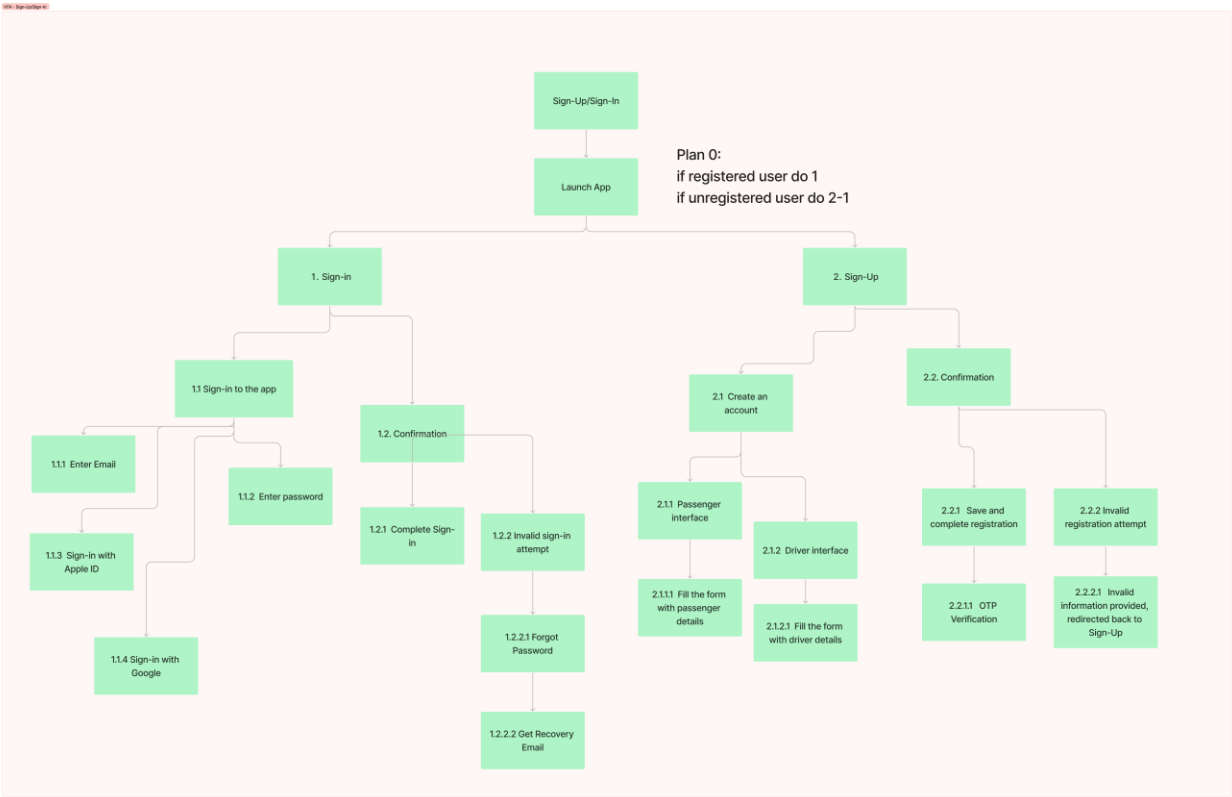
6.3 Hierarchical Task Analysis

Hierarchical task analysis diagrams are used to identify key activities that the users of the Caraoke application will perform where there are subtasks for each of the tasks in the top layer.

Three main goals are drawn below that show the subgoals that need to be achieved in order to ultimately achieve the main goal.

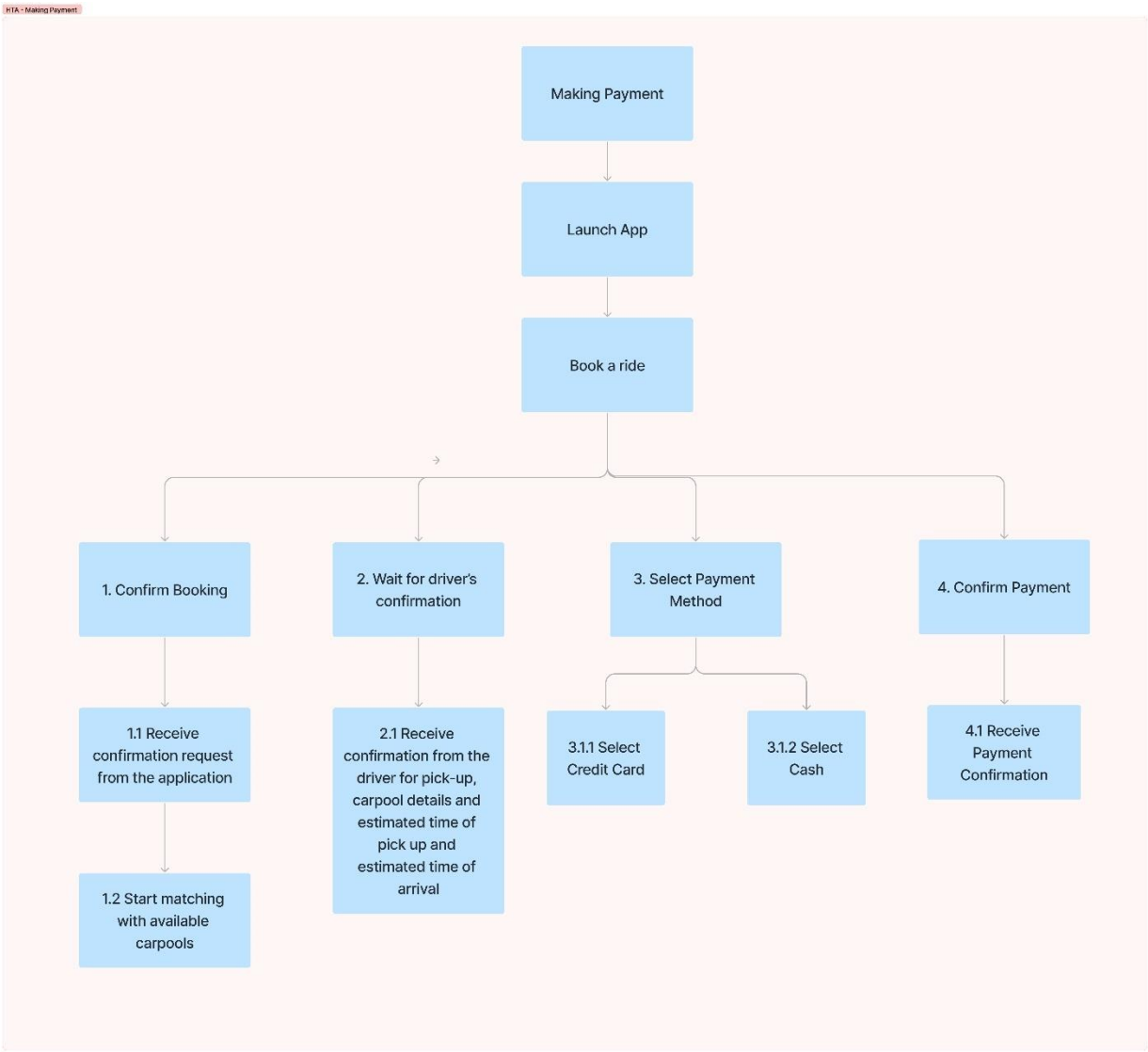
Task 01 – Login/ Registration

The user will first have to sign up as either rider or driver if they already do not have an account and fill out the form accurately by providing the necessary information to complete the process. Finally, the users can log in to the system by using their email and password.



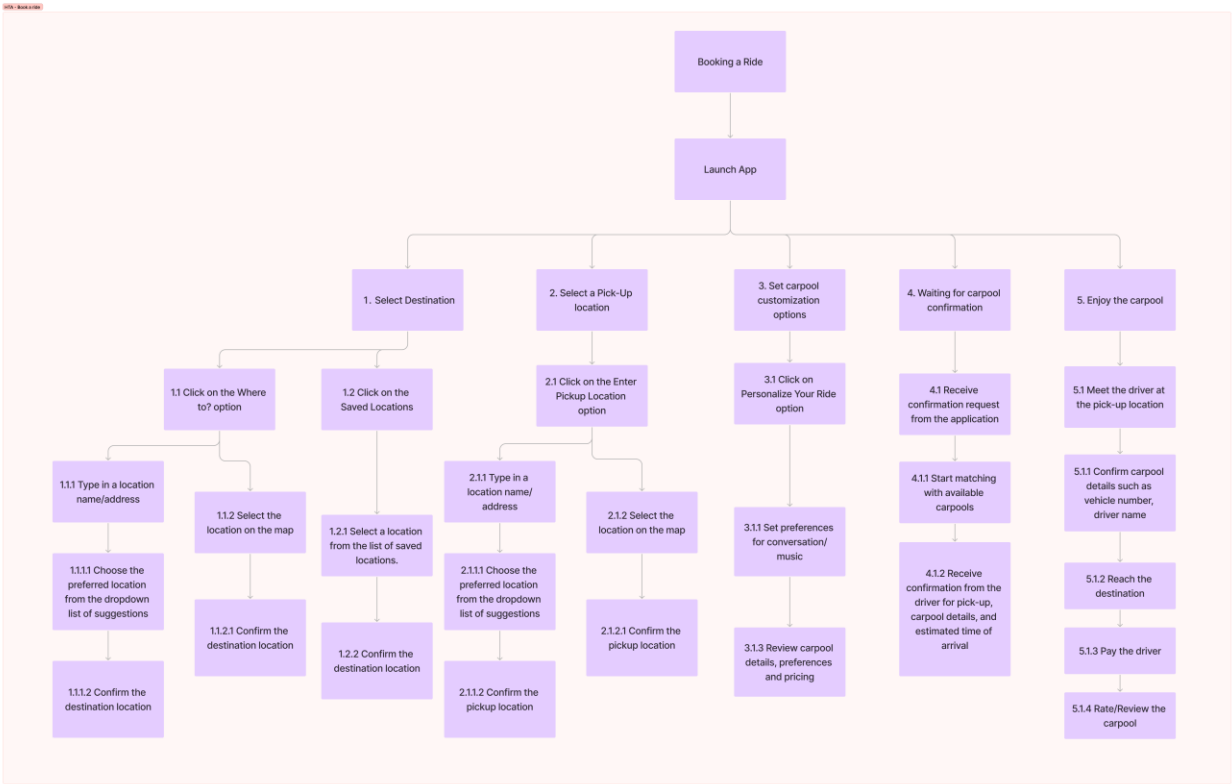
Task 02 – Making the payment

After booking a ride, the driver details will be first displayed to the passenger and will ask drivers to select a payment method they want to use either cash or card and after the payment is received by the driver at the end of the ride, they receive payment confirmation.



Task 03 – Book a ride as a passenger

To book a ride the passenger select a destination by either typing a new location or past saved locations. The passenger can set customization options after booking the ride, where the drivers ask whether passengers prefer silence, music or chat along the way. The driver details will be displayed to show that booking was success by including estimated time of arrival, cost and vehicle details. After confirmation the user can pay the driver and rate/review the rider.



7 UI /UX Goals

The project scope comprises designing a user interface (UI) and user interaction (UX) for a Carpooling application using user-centric design principles. Setting up relevant usability and user experience goals and building the application around them ensures that the application caters to performing the end users' tasks - effectively, quickly, and efficiently (Worksheet01 2023).

7.1 Usability Goals

Usability is the ability of a product for a user to successfully utilize it to achieve a particular goal (Fitzgerald 2020). The following usability goals for the carpooling application are defined to ensure that those measures are met and served:

Effectiveness

The carpooling application should be designed to be successful in producing the desired or intended result. This includes setting up goals to ensure that the promised functionality is offered simply and conveniently. An example of this would be:

- Designing a minimalistic and user-friendly interface to allow users to search/join/schedule/host carpools, communicate with carpoolers, smoothly and transparently calculate and process ride fares.

Efficiency

The carpooling application should be designed to allow users to complete their carpooling tasks quickly and with little to no effort. The application design should eliminate the - "Need To Think" aspect from the features and functionality it offers. This can be achieved by:

- Reducing the number of steps required to sign up/login to the application, search/join/host carpools, make the payment, and communicate with carpoolers.
- Minimizing the need for user input when requesting feedback on the ride, registering/login into the application, entering destination details, and when scheduling and requesting carpools.
- Automating repetitive tasks such as payment confirmations, entering current locations, and administrative tasks.

- Integrating assistive technologies such as voice-to-text as support for differently abled users, ensuring compatibility with different devices/models/operating systems, and support integration with other applications such as contacts, voice recorder, phone, etc.

Learnability

The carpooling application should be easy for users to get familiar with and should not require training or manuals even for first-time users. This includes:

- Providing clear and concise instructions.
- Offering the option for first-time users to take a tour of the application after registering.
- Using well-known and familiar icons and symbols.
- Providing intuitive navigations and controls that users are familiar with.
- Support multiple languages to allow users to choose their language of choice.

Error Prevention

The carpooling application should minimize room for errors and also protect users from making mistakes and errors. And in situations where errors do occur, the application must gracefully handle them and provide the users the flexibility to recuperate. A few examples of this would be:

- Notifying and alerting the users when errors do occur.
- Providing redo/undo/try again/refresh/confirmation dialogs functionality to prevent errors from occurring.

Memorability

The carpooling application should make users want to return and keep using it. So the application should allow users to pick up from where they left off and also keep track of their preferences for when they return to the application. This can be achieved by:

- Allowing users to personalize and customize. The interface could offer the option of choosing a theme depending on the time of day such as using dark mode. The application should allow the drivers to personalize their preferred departure and arrival times, preferred routes, and preferred carpool partners.

Safety & Security

The carpooling application should guarantee users' safety while carpooling, data security as well as privacy. All of these components play a critical role when it comes to usability and is also key requirements that the application must deliver in terms of Safety and Security. This can be achieved by:

- Establishing profile verification & validation system to authenticate users.
- Employing data encryption to protect sensitive data.
- Implementing a robust security system to prevent unauthorized access.
- Allowing users to rate and review drivers/co-riders can result in a safe and reliable experience for everyone.
- Allowing users to report and block other users.
- Allow users to get support regarding any issues from a Help page.

Reliability

The carpooling application should be performing consistently well providing maximum usage to users. Users rely on carpool applications to find rides and connect with other passengers and drivers; as such, they demand a smooth, error-free operation from the app. This can be supported by:

- Implementing a dependable communication mechanism that allows users to communicate with one other before, during, and after the carpooling process.
- Ensuring rapid and reliable data transfer between users to enable users to quickly discover and connect.
- Allow users to easily add a credit card to do online payments through the application.

7.2 User Experience Goals

The term "user experience" refers to the entirety of a customer's interaction with a product, including not just how well it performed but also how the customer anticipated it to perform, how they feel about using it, and how they feel about the business as a whole (Fitzgerald 2020).

Therefore, the following user experience goals are constructed to create a positive user experience when using the carpooling application by considering factors such as aesthetics, accessibility, and user engagement (Worksheet01 2023).

Enjoyment

The users must enjoy using the carpooling application which triggers emotional attachment and result in loyalty and favoritism among other competitor applications in the market. This can be achieved by:

- Allowing users to set preferences, customize the application outlook, and also to personalize certain aspects of the application such as their profiles, and apply themes to their liking.

Trust

The carpooling application design must guarantee that its services are credible and that it prioritizes user safety. This involves:

- Ensuring that emergency support SOS is readily available.
- Implementing a robust security system that runs background checks on user profiles, and authenticates and validates users to ensure legitimacy before they sign into the platform.
- Ensure that driver details are accurate after each new update of the application therefore the driver details have to be entered again if they are incorrect.

Motivation

The carpooling application design should motivate users to keep engaging with the service. Its design should not be monotonous, and continuous updates and changes should be made to the application without hindering the usability and familiarity aspect of the service. A few examples of this would be:

- Employing features such as how much carbon emissions were reduced from each ride to remind users to carpool instead of driving alone/carpool to reduce carbon footprint and contribute to sustainability, can improve engagement, and awareness and encourage users to use the application more often such as Provide analytics in the form of graphical visualization.
- Introducing discounts, promotional deals, and other incentives and rewards to motivate users to use the application.

- Suggesting routes, ride matches, driver criteria, and other personalized recommendations.
- Suggest routes to drivers when there is dense traffic so they can avoid these routes.
- Providing a community page so loyal customers can get promotional deals and offers on their next ride and enjoy community membership.

Helpful

The carpooling application must be designed to be easy to use and helpful for the user. This can be achieved by:

- A help section so users can ask for support regarding the application or raise other issues to the administrators.
- Designing a user-friendly and simple interface that allows the user to easily complete and navigate through their carpooling tasks.
- Providing clear and concise information about rider/co-rider details, vehicle details, destinations arrival time estimates, pick-up times, and shortest routes.
- Adding a card option gives users the freedom to use different cards during payment.
- Proper cancellation options for users so they can cancel rides when needed.

Enhancing Sociability

The carpooling application design should suggest users to ride with friendly, agreeable companions/co-riders and help promote social connections. This creates a friendly and warm ride-sharing atmosphere which contributes to a positive user experience.

- Implementing integration of social media platforms to the application so that rides suggestions can be made to users depending on their social circle.
- Allowing users to communicate with drivers and provide feedback and ratings for drivers to promote a sense of community, recognition, and acknowledgment.
- Allow users to invite friends to use the application by sharing the link easily through WhatsApp, Facebook, or Instagram options available.

Emotional Fulfillment

The carpooling application design should promote a sense of belonging and provide memorable carpooling experiences which in turn contribute to a positive user experience. This may involve:

- Providing emotional support to users in case of unexpected changes in the ride, unforeseen circumstances, or ride cancellations by asking how they felt using emotions.
- Get feedback from users regarding the overall experience of the app by using emotions for easiness.
- Establishing a carpooling community by allowing users to connect easily on the application's communication platform by being able to chat with their past co-passengers or drivers.

8 UI/UX Design Principles

8.1 Design Principles

Throughout the creation of high-fidelity prototypes for the Caraoke application, team FourGUIs decided to stick to Don Norman's 6 UI/UX design principles as it is highly acclaimed and well-known within the UI/UX development community (Enginess 2014). Don Norman's UI/UX design principles greatly assisted in ensuring consistency throughout the Caraoke application. Additionally, as the design principles are well tested and proven over time, adhering to such greatly helped in conserving time that would be otherwise spent debating and discussing minute design details.

Don Norman's 6 UI/UX Design Principles consist of (Enginess 2014);

1. Visibility - The user interfaces must be clear, concise, and intuitive. A user interface must provide the user with a clear understanding of its purpose at first glance. If a user looks at an interface of your application and inquires about the exact functionality of the UI, it maybe an indication that the designed interfaces might be violating the above design principle (Enginess 2014).

2. Feedback - Every action must be met with feedback from the system, as the user must stay informed throughout every interaction with an application. Lack of such feedback will result in the user experiencing negative emotions such as anxiety, stress, nervousness, and frustration.

3. Affordance - The UI must be easy to understand and navigate through. Within the Caraoke application, we have made use of this design principle by disabling the *Sign-in* button when the user inputs insufficient or invalid information.

4. Mapping - Every call-to-action, symbol, and color schema must map to action with good logical reasoning (Enginess 2014).
5. Constraints - This design principle focuses on limiting the range of interactions in an interface to avoid overwhelming its users.
6. Consistency - Lack of consistency is easily one of the things that are noticeable to the user. Sticking to a specific color schema, font style, spacing, alignment, and symbols create a visually pleasing effect. In a more functionality-focused POV, buttons on different UIs with a similar symbol perform one action in one interface and perform a different action in another interface (Enginess 2014).

8.2 UI/UX Design Principles and Visual Design Principles

8.2.1 Hierarchy and Layout

This section will discuss the importance of design to have a pre-conceived way in which users of the application process and follow the flow of information on the application, This section will be modeled and be inspired by Moreno, "Fundamentals of Color in User Interface Design (UI)."

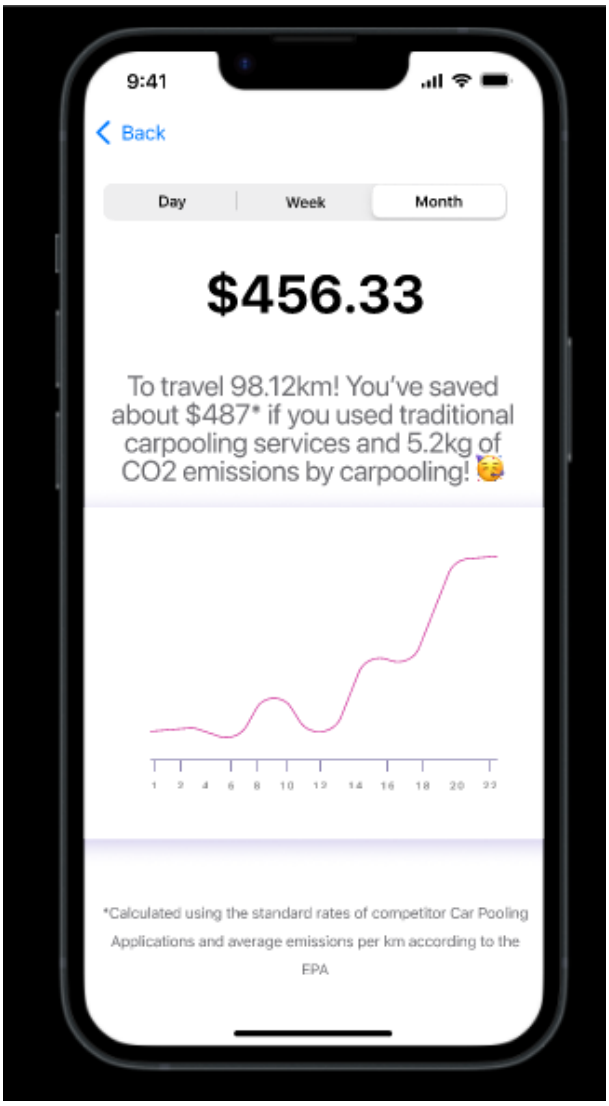
Sizes are effectively used in various positions to juxtapose and subdue elements in the application. In the selection of sizes in both texts, images, and placements, two considerations are taken into account. These two are;

1. Importance of Information Displayed → Effective Juxtaposing
2. Page layout and effective use of white space

Let's break down these three concepts further;

1. Effective Juxtaposing

Effective juxtaposing is used to prioritize the information being displayed to the user, let us look at an example in our application;



This example shows the analytics of the past trips taken within a month by a User. Breaking this window into multiple components displays some critical information;

1. The amount of money spent is the most important item you search for on a page meant to display analytics. On average we make the most important text at least 25-35% larger than all other texts to draw attention to it. The range is there since all pages aren't built in equal parameters.

2. We add the breakdown of the highlight in a smaller text underneath for a User who would want to view extra information about the amount of money spent. This as mentioned earlier is 25-35% smaller in comparison to the highlight feature of the page.

3. X-Axis on the page is in a smaller text since it's only supposed to give an overall idea of the timeline.

4. The footnote text is about 50% smaller than the breakdown text solely since

    a. What metric is used to calculate the values is not extremely important to the User daily.

    b. When claiming a User has saved a particular amount of money or saved a certain number in Carbon Emissions it is important to add it mostly as a legal requirement or else it would be problematic to make unfounded claims and might dissuade existing and future customers.

2. **Page Layout and effective use of white space**

Text sizing is used significantly for effective page layout and use of white space. This will be discussed further in the Alignment Section;

The sizing of the text depends on the individual UI and what section constitutes what importance. This means we use the font size 46 for information that is often centered and the focal point of the page such as the heading in the above UI. Font sizing always goes from ascending order of importance to being center or left justified depending on the layout of the individual page to maximize symmetry or whitespace.

For more font-related information please refer to the Typography Section.

8.2.2 Colour

When choosing the colour for the applications there were a few considerations we agreed to be at the forefront of our design language.

1. Colours should be used sparingly to elicit responses.
2. Colours should be of sufficiently high contrast to be accessible to the most common colour blindness.

Let us delve into both these requirements at length;

1. **Response-invoking Colors**

We use colours sparingly throughout our application for a few reasons.

- We want this application to champion the iOS Platform which according to Apple Inc., “Color - Foundations - Human Interface Guidelines - Design - Apple Developer.” is to use colours sparingly and have the same responses. For example, a negative response to whether to decline a trip, take a trip in silence, or remove your card from your account is #F92525 which

is Red. Chat is blue (#007AFF) whether it is to chat internally on the application or have a chat with your driver.

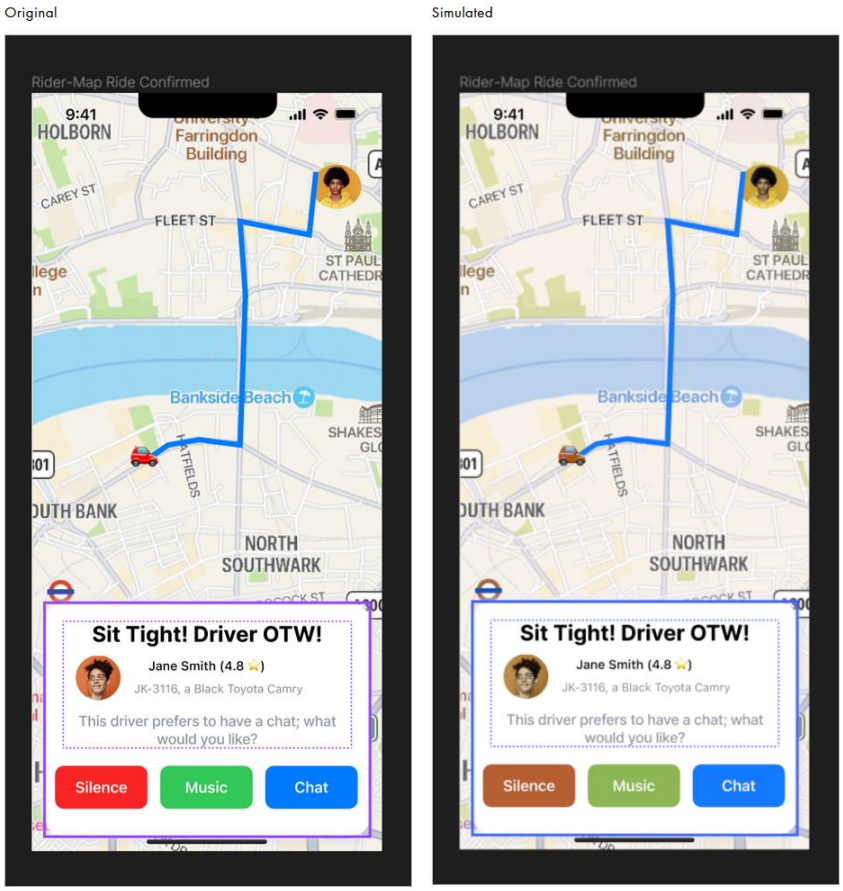
- These colours should be blended with your standard iOS Application, we want the application to feel like part of the ecosystem you're always used to so it doesn't feel like a detour from your regular usage of your phone. The colour codes used in our application are the same as what is part of Apple's SwiftUI Package.

This allows the User to understand that when there is colour in the application it means there is a task that is currently occurring (ride ongoing) or that a response from the User is required for the application to carry out a task.

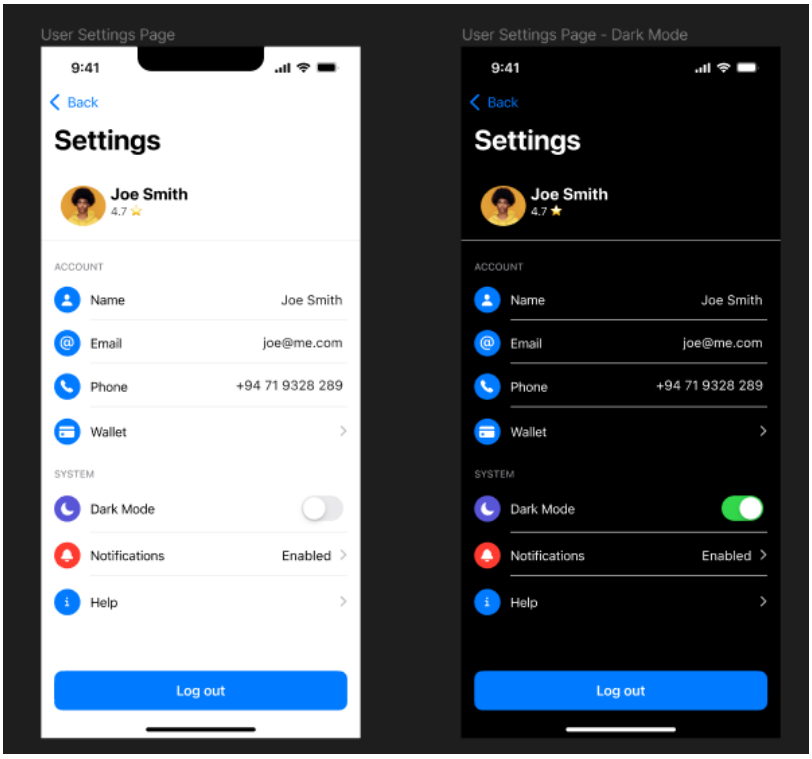
2. Accessible High Contrast Colors

One major goal of accessibility in our application was to use colours sparingly but also to use high-contrast basic colours according to The Interaction Design Foundation, "What Is Color Theory?". This is why the only times colour is used in our application it is red, green, or blue highly contrasted against each other without any hues. This is mostly to prevent individuals with the most common colour blindness in the world according to "Types of Color Blindness | National Eye Institute," June 26, 2019, was Red-Green Colour Blindness.

Below diagram is our application simulated with the most common kind of Red-Green colour blindness which is Protanomaly. Our use of high-contrast colours helps in this situation as they allow a distinction to be still maintained to a large extent within the application.

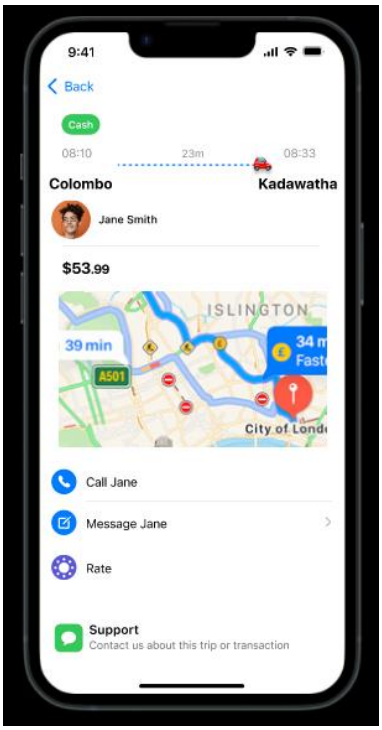


8.2.3 Proximity, Alignment, Repetition



All elements having any layout in the application are laid out in such a way that it is easy for users with both one-handed or both-handed use. Items are ordered in such a way that a User would expect related items to be in the same location such as the above example depicting where the Name, Email, and Phone are located.

Another example is our Trip Ride Reviewer;



All the options regarding the past trip including a Support Button are located on the same page so the User understands the context which is what fuelled the context-driven design when choosing the elements. Call, Message, and Rate our driver are together since they are forms of interaction with the driver whereas we separated Support since it might or might not be directly related to the driver.

8.2.4 Typography

For our entire application, we use the Apple San Francisco Pro family of text. We use system-specified widths and spacing (0%) as defined by the Apple Documentation on using fonts in “Typography - Foundations - Human Interface Guidelines - Design - Apple Developer”. We use SF Pro Display to Display Texts and SF Pro Text in the Messaging Application which is standard Apple Practice.

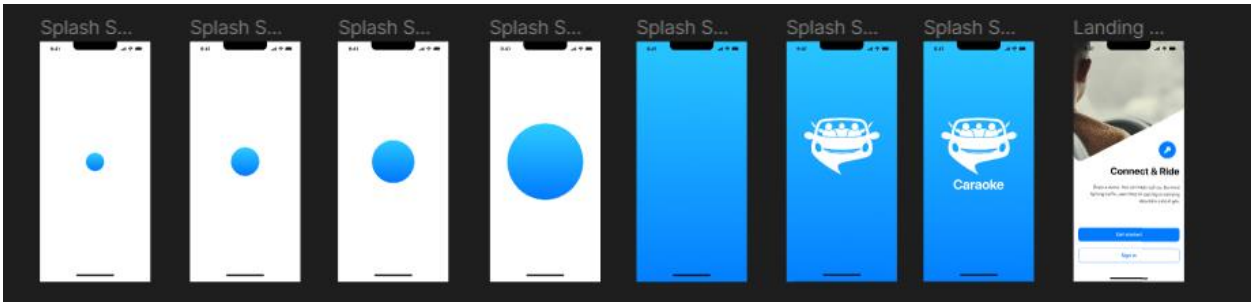
All colour codes have been extracted from Sample Apple Design thinking and any important information to be

juxtaposed will be #000000 or #FFFFFF depending on the invention of colours.

Style	Front	Size	Reasoning
Heading 1	SF Pro Display - Bold	34	These are the “topics of each page” one word or phrase that explains the purpose of the page you’re currently on.
Heading 2	SF Pro Display - Bold	24	These are the important details that need to be displayed in the page.
Information	SF Pro - Bold / Light	16-20	Depends on text juxtaposition and the laying out of the application. Hints have color code #9098A3 and text should have #000000.

8.2.5 Imagery and copy

There is no imagery used extensively within the application other than the splash screen which was aligned with the core colours of the application as described above in the Colours section.



The Map Screen is the standard Apple Maps application screen and the icons/emojis used in the application are part of the SF Display font family.

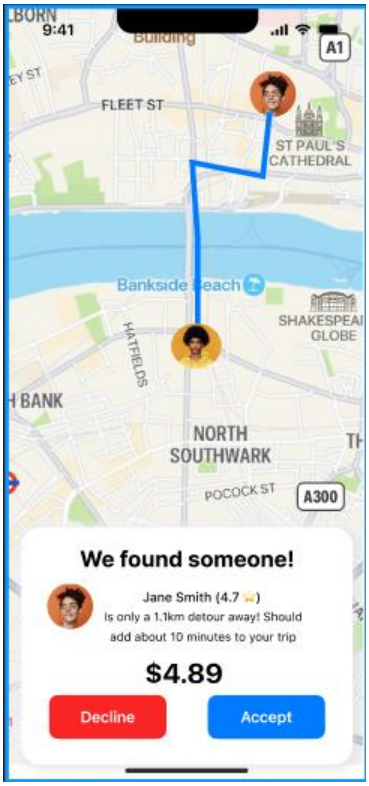
9 Usability Heuristics

The link to figjam brainstorming Uability Heuristics session - [Design Thinking FigJam]

#1: Visibility of system status

User location: The application indicates the driver's location and rider's location. This functionality was prioritized as it is a crucial aspect of the visibility of the system status heuristic. The app provides a real-time map display of the exact location of the driver and rider, along with updates on any changes in pickup or drop-off locations or times. This helps users make informed decisions and ensures they arrive at their destination safely and on time. This ultimately improves the user experience and increases the overall effectiveness of the carpooling service.

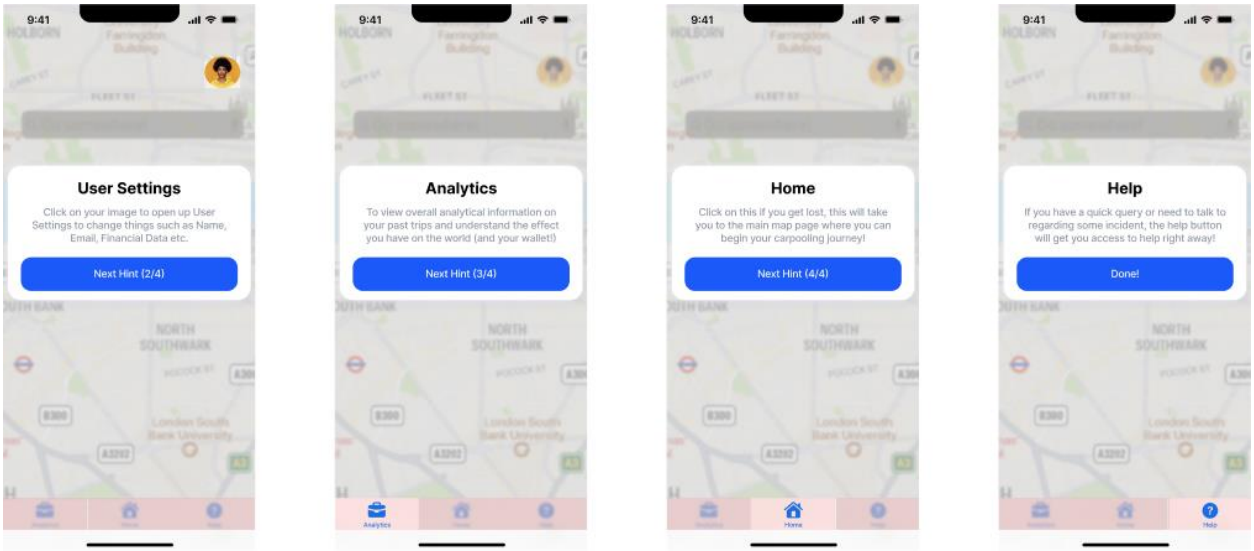
RIDER POV: The application let the rider know that the driver is x minutes away and the rider can also see which route the driver is coming from as shown in the above snapshot which depicts the red car moving toward the location pinned by the rider's avatar. Avatar and the car vector were used to improve visual representation and make it simpler and easier for the rider to keep track of the status of the ride with familiar icons.



DRIVER POV : As shown in the right, the application clearly let the driver know that the rider is x km away including the detour distance and the amount of time it adds to the driver's trip in x minutes. And the driver can also see carpool requests on the map reflected by the requesting rider's avatar which also gives a more visual representation of the distance to make an informed decision.

#2: Match between system and the real world

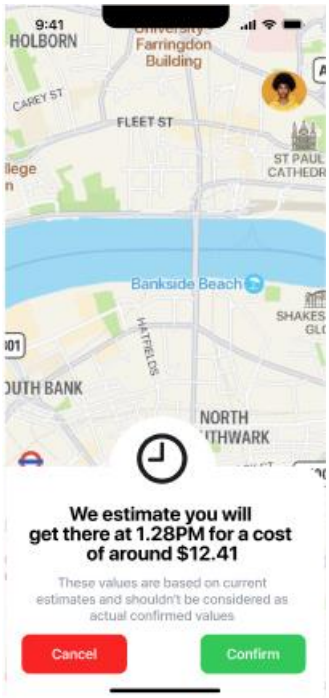
First-time tricks and tips: The effectiveness of a system in matching the real world can be assessed by its ability to provide first-time tricks and tips functionality, which enhances the intuitiveness of the user interface. This, in turn, enables users to perform tasks that are aligned with their mental models and expectations with ease and efficiency (Nielsen 1994).



The figure presented above illustrates the initial guidance provided to new users for navigating the application. The step-by-step tutorial guides the user through the application's navigation bar, which allows access to the main components of the system. Each icon on the navigation bar is accompanied by a concise definition and a hint, which helps users unfamiliar with the application to quickly grasp its functionality. This approach familiarizes users with the interface, enabling them to navigate the application with ease and complete their tasks efficiently.

#3: User control and freedom

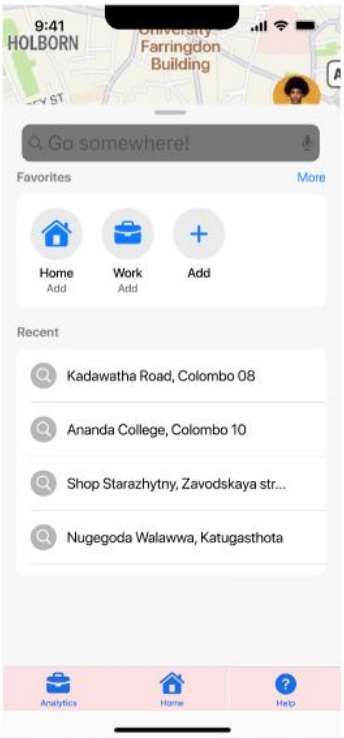
Easily visible exit/cancel options: The application provides prominent and easily accessible exit or cancels options so that users can quickly and conveniently exit or terminate an ongoing task, which reduces frustration and improves user satisfaction.

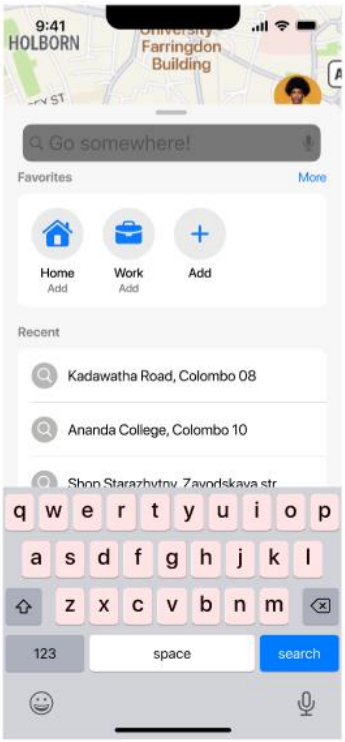


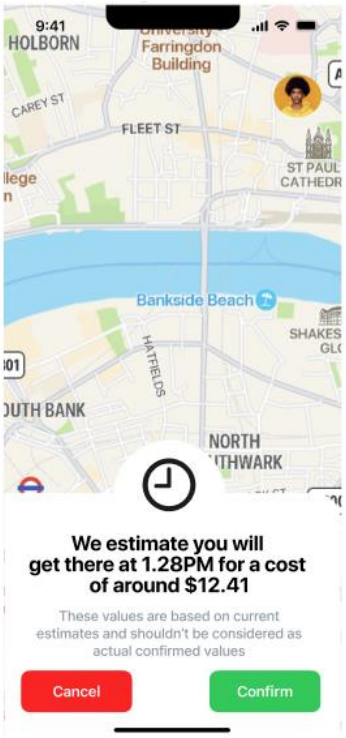
The figure represents the interface used to 'Provide Ride Time Estimate to Rider'. The interface provides essential information such as the estimated time and cost of the ride, enabling the rider to make an informed decision about confirming or canceling the trip. To facilitate the cancellation process, a 'Cancel Trip' button is prominently displayed in a red, rounded button, making it easily identifiable and accessible for the user to terminate the booking process if desired.

#4: Consistency and standards

Making use of iOS standard color palettes and UI kits: iOS is a widely used mobile operating system, and it has established a set of design guidelines that define the visual language and interaction patterns used in iOS apps. The guidelines include standard color palettes, typography, and UI kits, among other things.



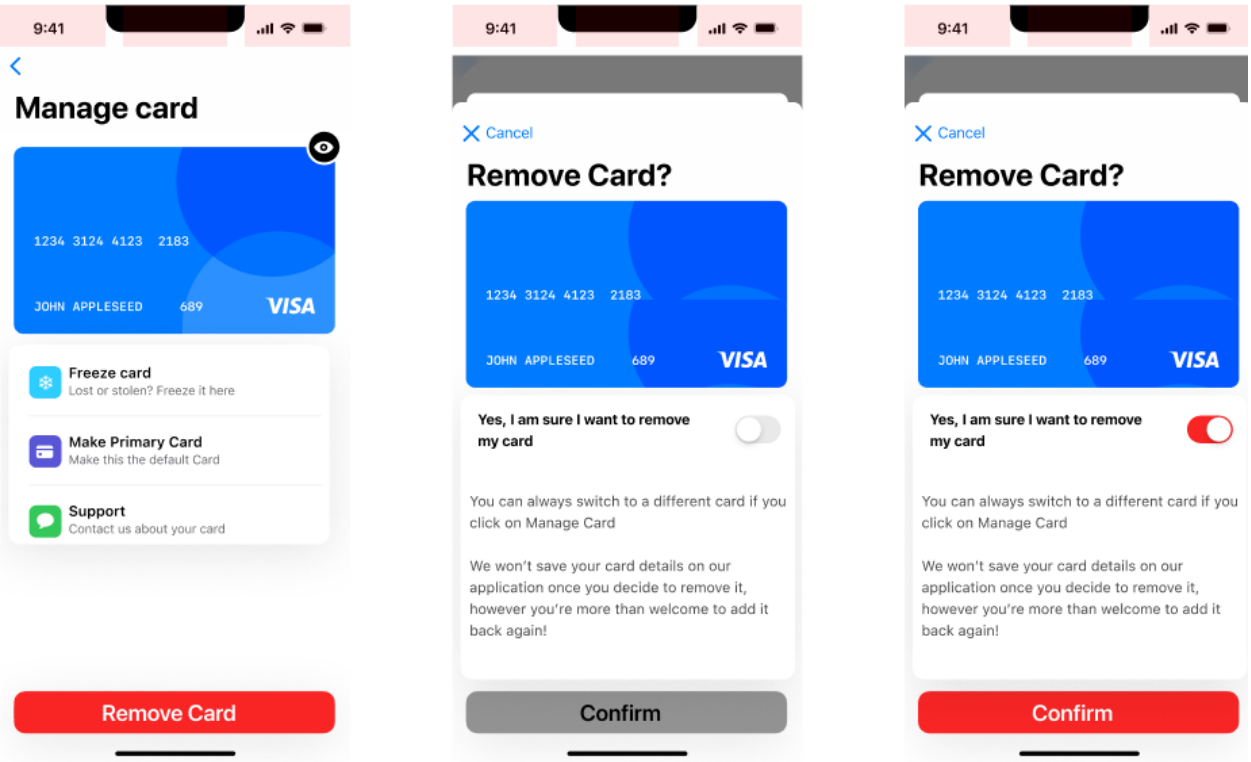




The interfaces in the figure showcase the initial steps of booking a ride through the application, highlighting its functionalities. To ensure a cohesive and recognizable user experience, the interface design follows the iOS UI kit guidelines. The font style, color, and size, as well as the icons, map, navigation bars, and controls, remain consistent throughout. This consistency fosters familiarity and helps create a strong brand image, while also promoting a seamless and intuitive user experience.

#5: Error prevention

Confirmation Messages and Clear Labelling: The application makes use of strategies such as input validation, confirmation messages, and clear labeling, on its interfaces so that it is easy to use and minimizes the chances of user errors. This creates a more positive and efficient experience for carpool application users and helps them achieve their transportation goals with minimal hassle or confusion.

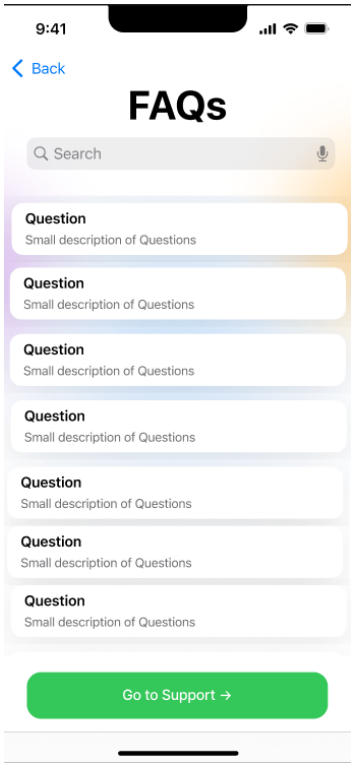


When a user clicks on the 'remove card' button at the bottom of the interface, which is clearly labeled and has red rounded corners to promote recognition and convey a sense of warning, the application doesn't immediately remove the card. Since card details are sensitive information and users may click on this button by mistake, a confirmation UI appears in the middle to prevent

accidental deletion and loss of data This implementation of the 'Error Prevention' heuristic helps to prevent users from making inadvertent mistakes and ensures that sensitive information is not lost.

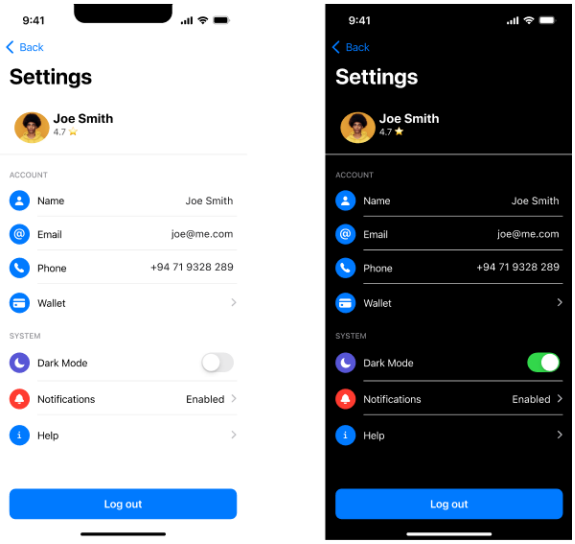
#6: Recognition rather than recall

Use of familiar and well-known Icons: The application follows the design principles and guidelines of the iOS UI kit and therefore makes use of icons that are offered in the kit which are familiar among the platform users and commonly used by other applications in the market as well. Therefore, this enables users to easily recognize certain actions and perform them without having to recall the action from memory.

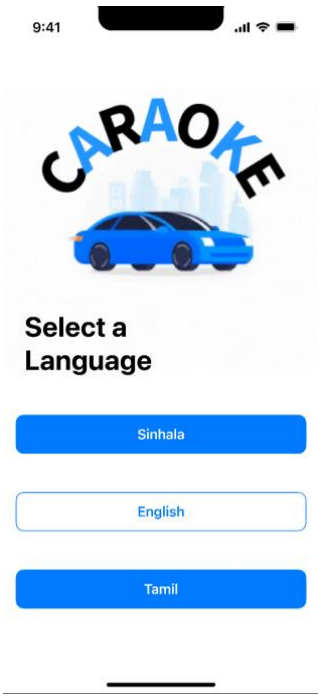


The interface represents the FAQs main page. The "magnifying glass" icon and the “voice-to-text” icon used in the search bar of the application are well-known, thus users easily recognize their functionality.

#7: Flexibility and efficiency of use



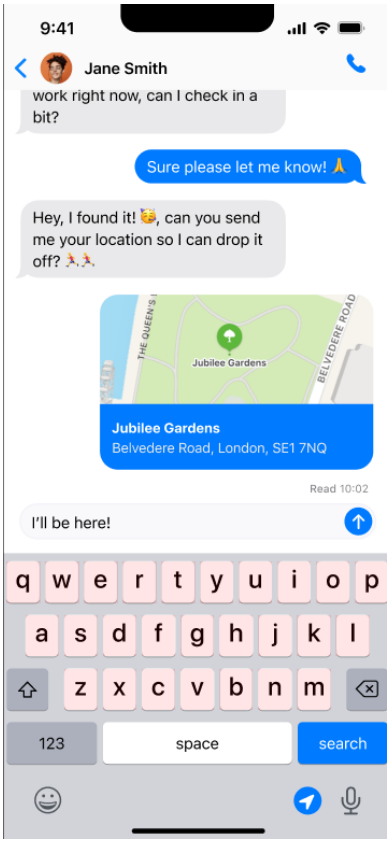
Offering night mode option allows users to customize the interface to their preferences, improving their overall experience. Further, night mode also helps to reduce eye strain.



By allowing users to choose their preferred language, the interface becomes more accessible and easier to use, improving efficiency in completing tasks. Users do not have to struggle with a language they are not comfortable with, reducing the potential for errors or confusion.

#8: Aesthetic and minimalist design

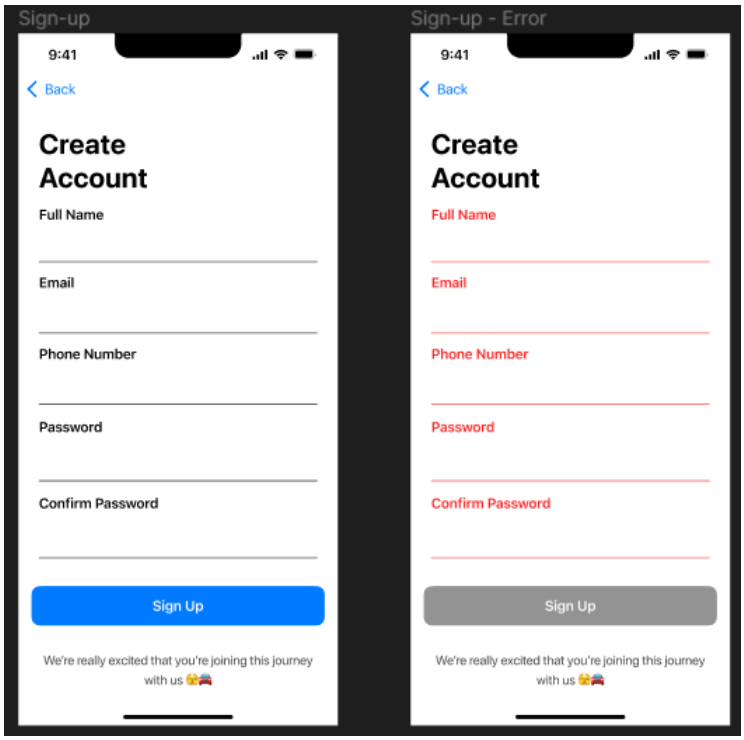
Effective Use Of White Space and Component Spacing: The application makes use of effective component spacing which helps create a clear and organized design, leading to a more efficient and easy-to-use interface.



The user interface is the applications chat user interface between the rider and the driver. The chat interface features plenty of white space and clear component spacing, making it easy to read and respond to messages.

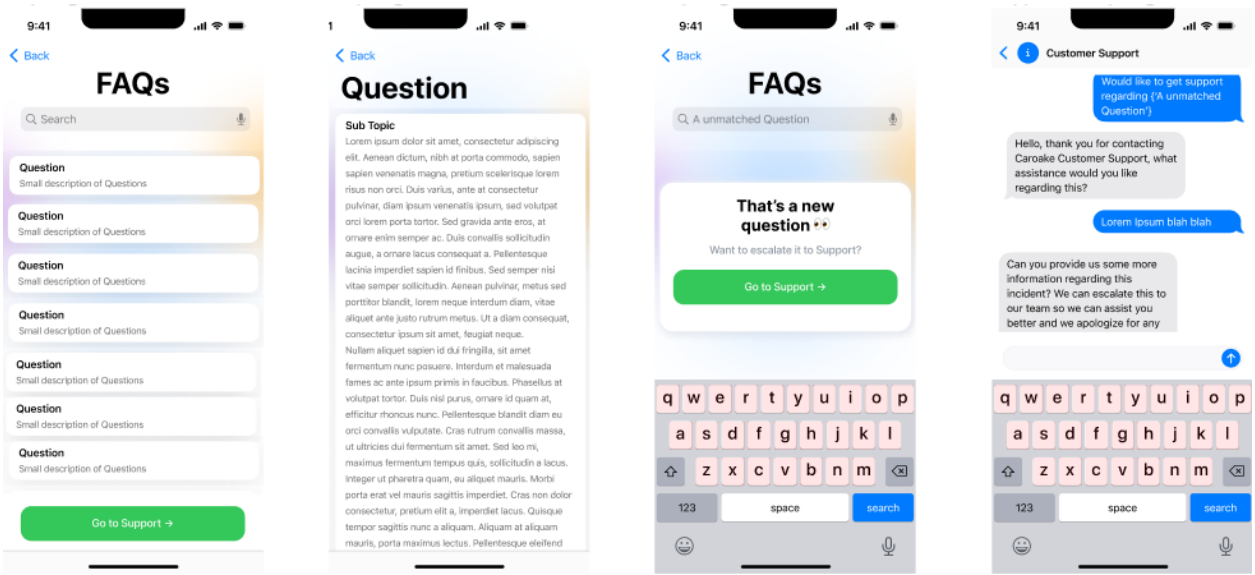
#9: Help users recognize, diagnose, and recover from errors

Providing Error Messages & Validation Feedback: The application offers feedback in case errors or unexpected user behavior is detected. The below snapshots present a sample scenario of where user input is required. For instance, when creating an account, the user must input information that is prone to human error. To prevent invalid or incorrect input, the application provides feedback as needed, ensuring that the user is aware of any mistakes. The app accomplishes this by using various feedback mechanisms that can help guide users to input the correct information.



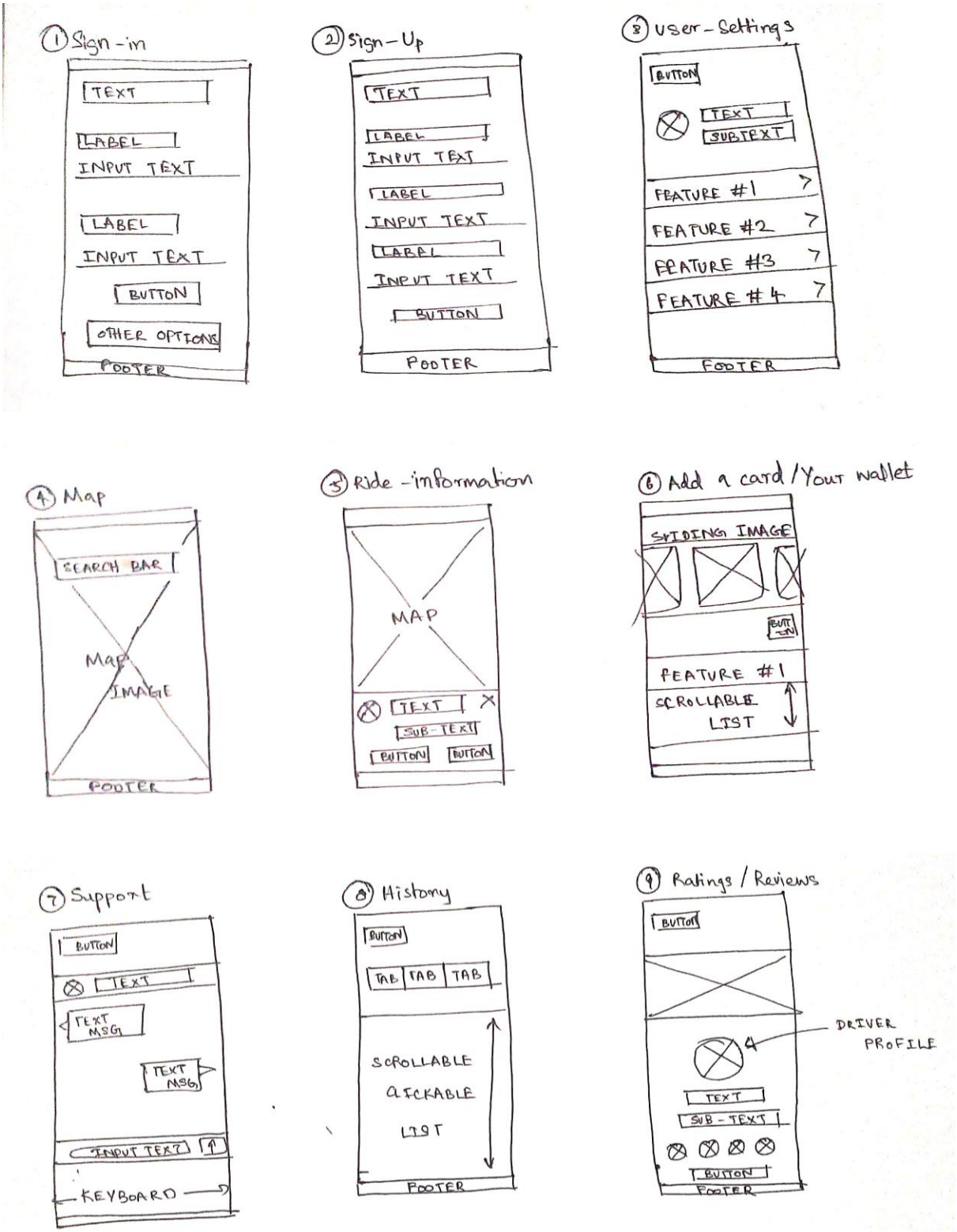
#10: Help and documentation

FAQs and Support: Users can easily access help and support within the application by using the navigation bar's link to the Help page. The Help page provides FAQs and 24/7 support functionality, ensuring that users can get assistance whenever they need it. This easy access to help and support pages enhances the user experience by providing users with additional guidance and assistance, helping them understand how to use the application effectively

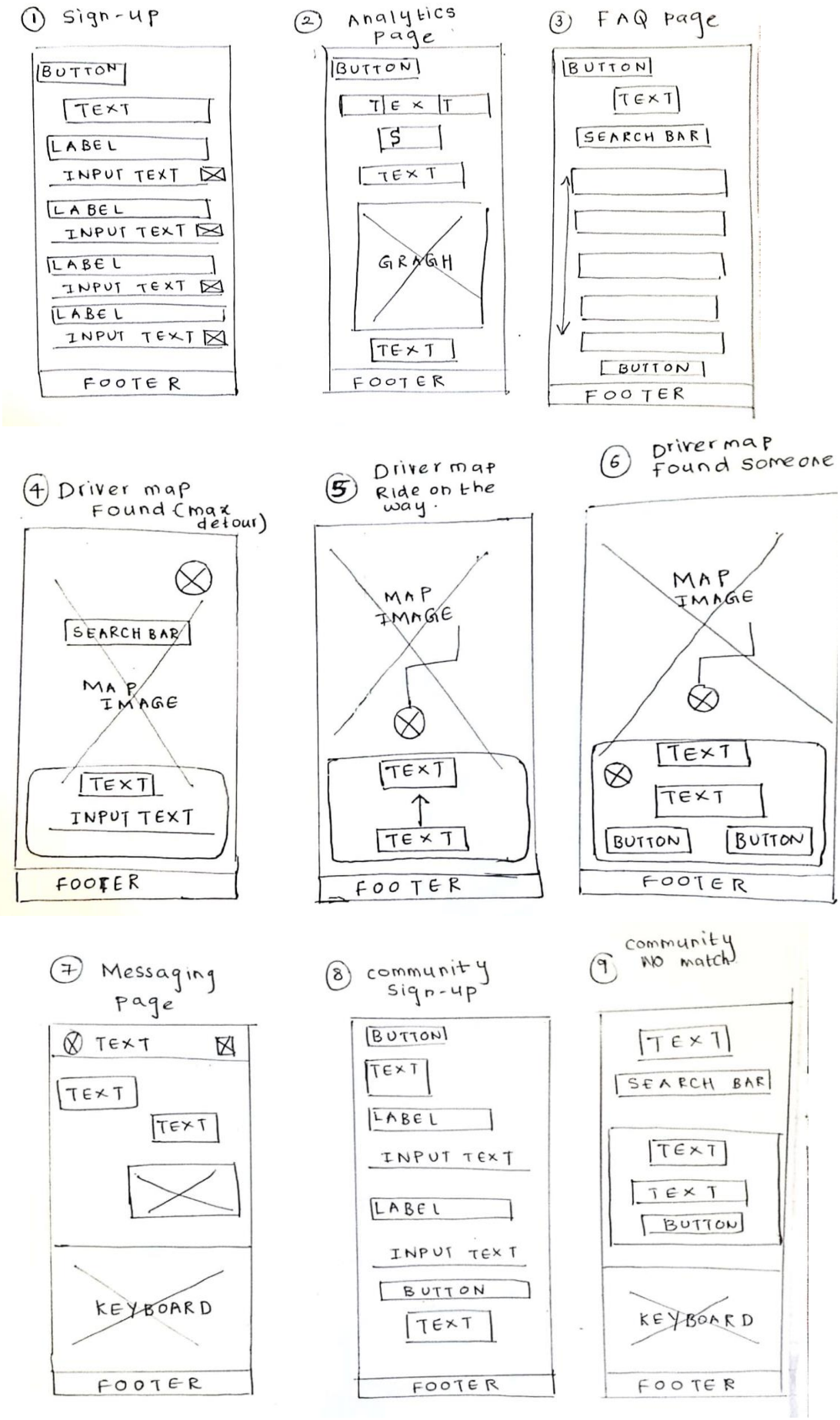


10 Wireframing

Some of the wireframes for Rider's POV are shown below:



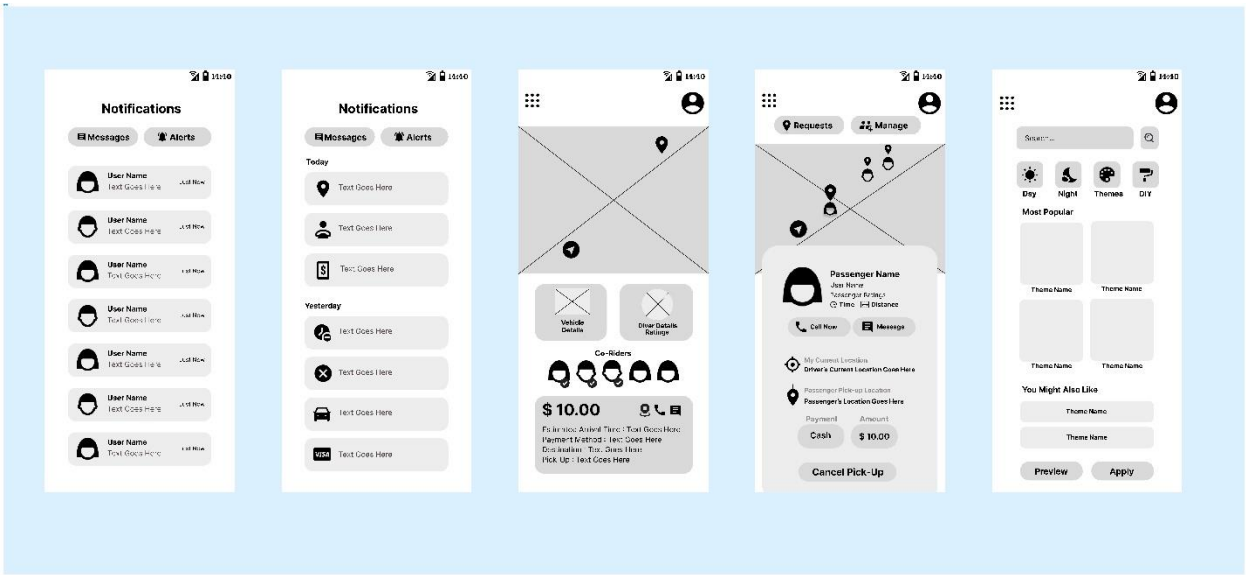
Some of the wireframes for the driver's POV are shown below:



11 Low-Fidelity Prototype

There were two iterations done for low-fidelity prototypes. The second iteration was more related to the design principles stated above, hence this was our final choice.

The first iteration is as follows where another team group reviewed and gave valid feedback (feedback is available in Appendix C):



The link to the rest of the low-fidelity prototypes drawn by each member is available: [Low-fidelity prototypes]

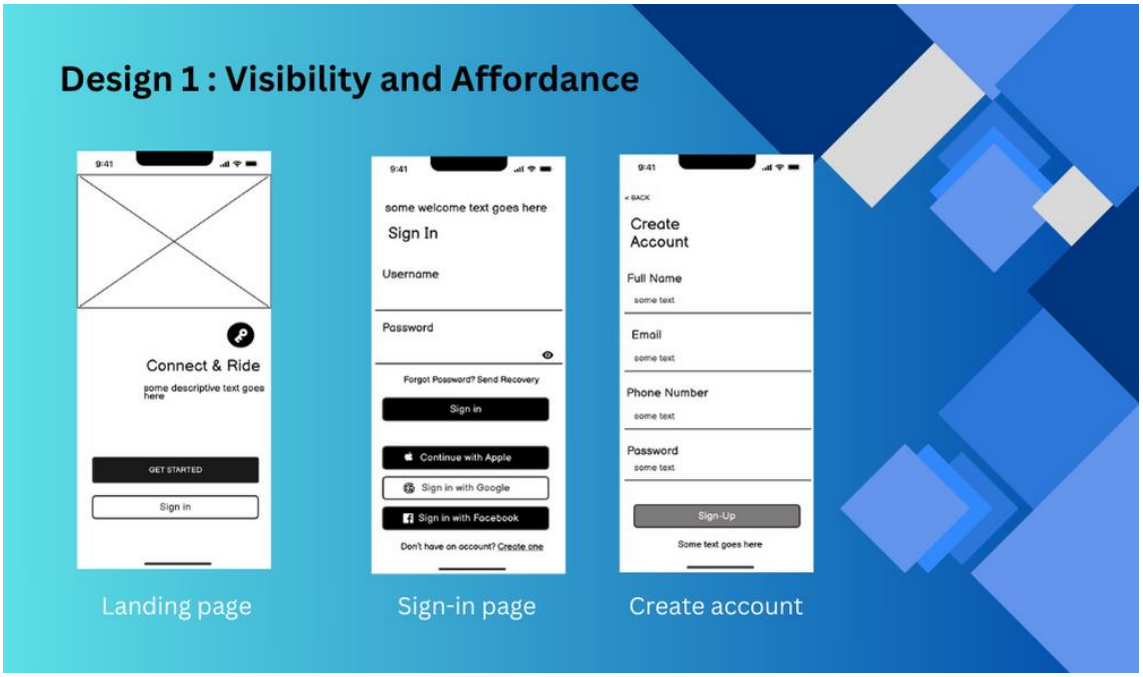
However, after refining these initial low-fidelity prototypes, the second iteration was selected and completed which follows our design principles as stated above in section 8.

11.1 Design 1: Visibility and Affordance

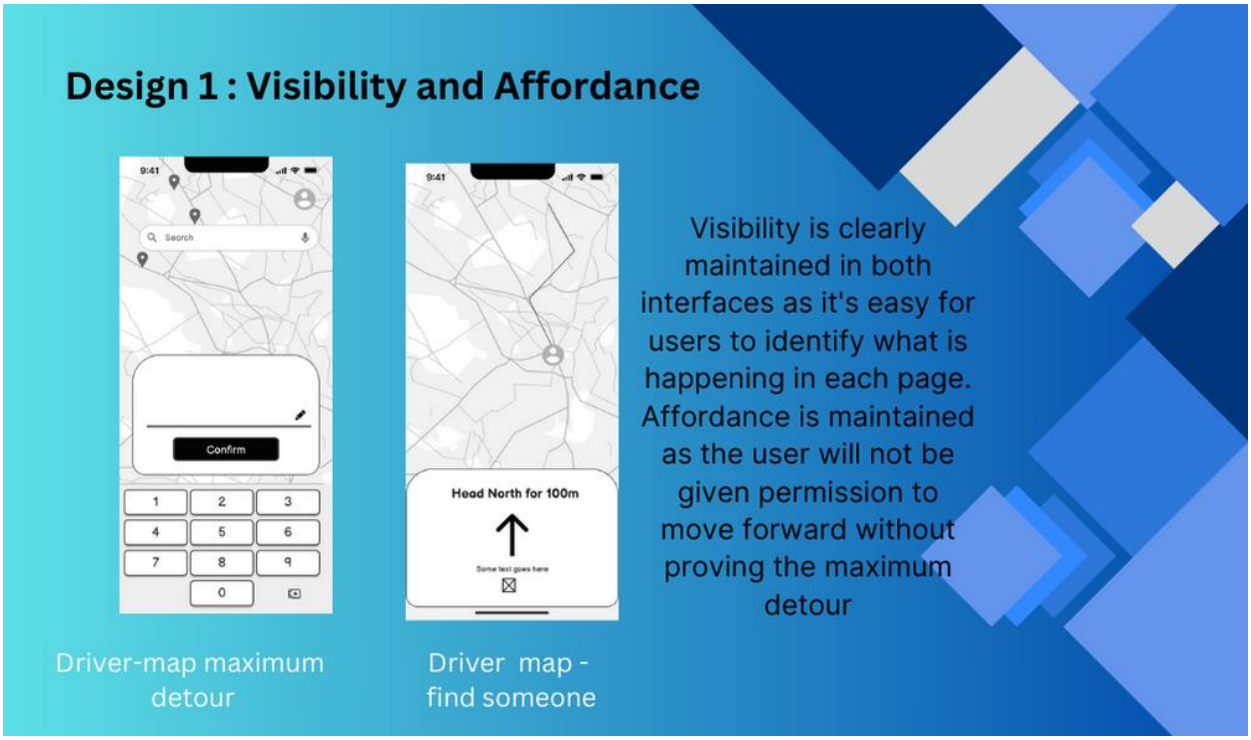
Link to the Rider's POV Low-fidelity prototypes – [Rider's POV]

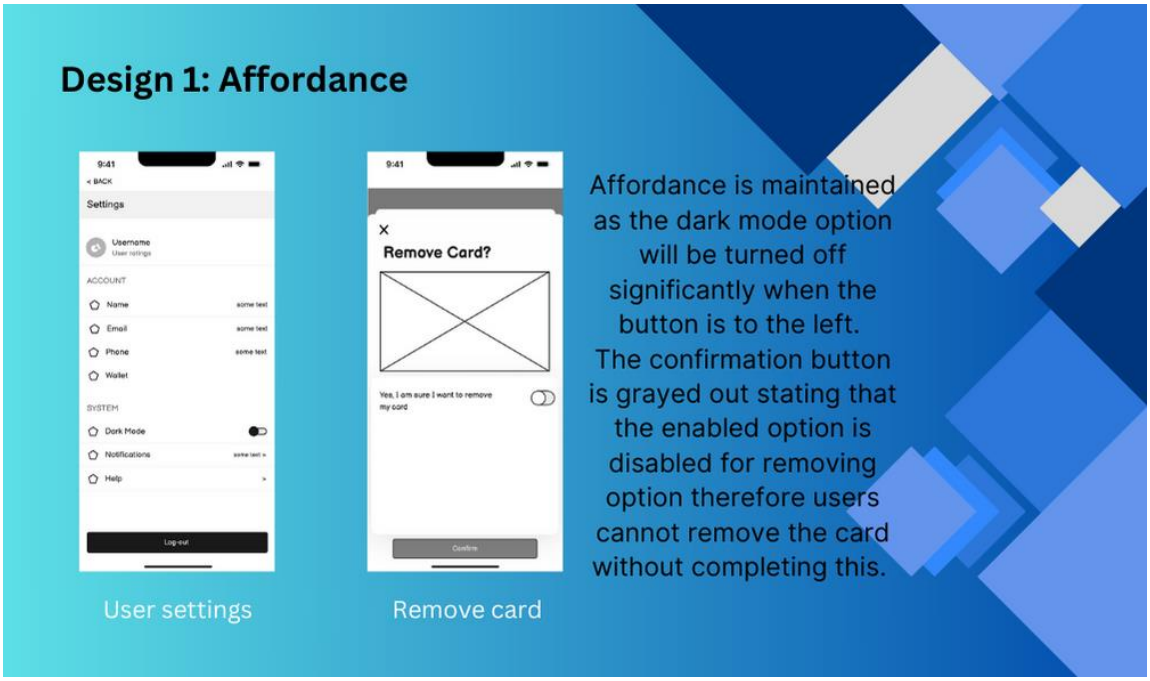
Link to the Driver's POV Low-fidelity prototypes – [Driver's POV]

The *landing page*, *sign-in page*, *and sign-up pages* follow the design principles of visibility, as each prototype shows a clear understanding of what is happening and affordance is maintained as the sign-up button is grayed out as shown below so when incorrect input is provided, the system will not let the user complete and wait till the button appears colored (blue in high-fidelity).



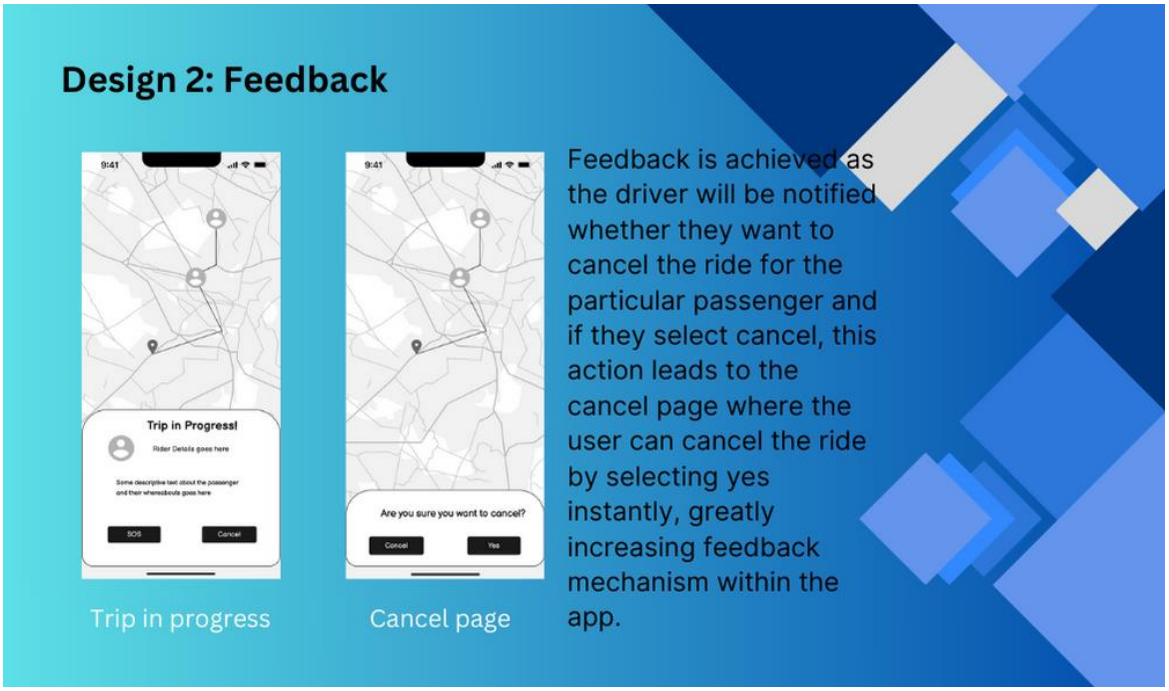
When we take driver POV pages, it makes use of visibility effectively as the prototypes are kept simple and intuitive (shown below).

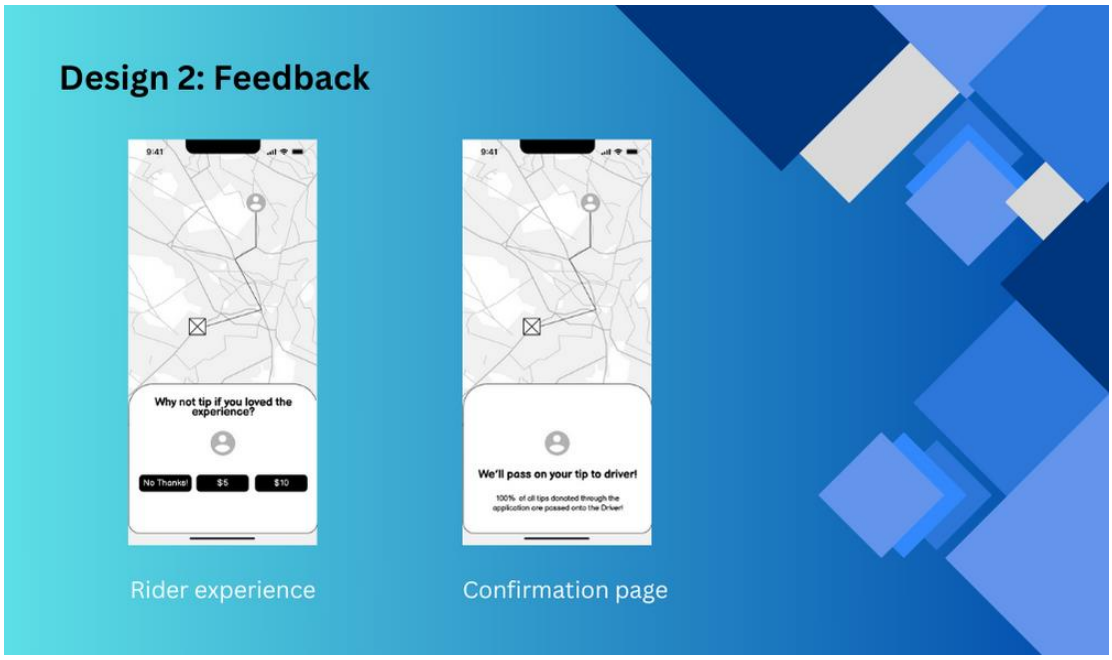




11.2 Design 2: Feedback

Feedback is achieved by involving a cancellation button where needed.

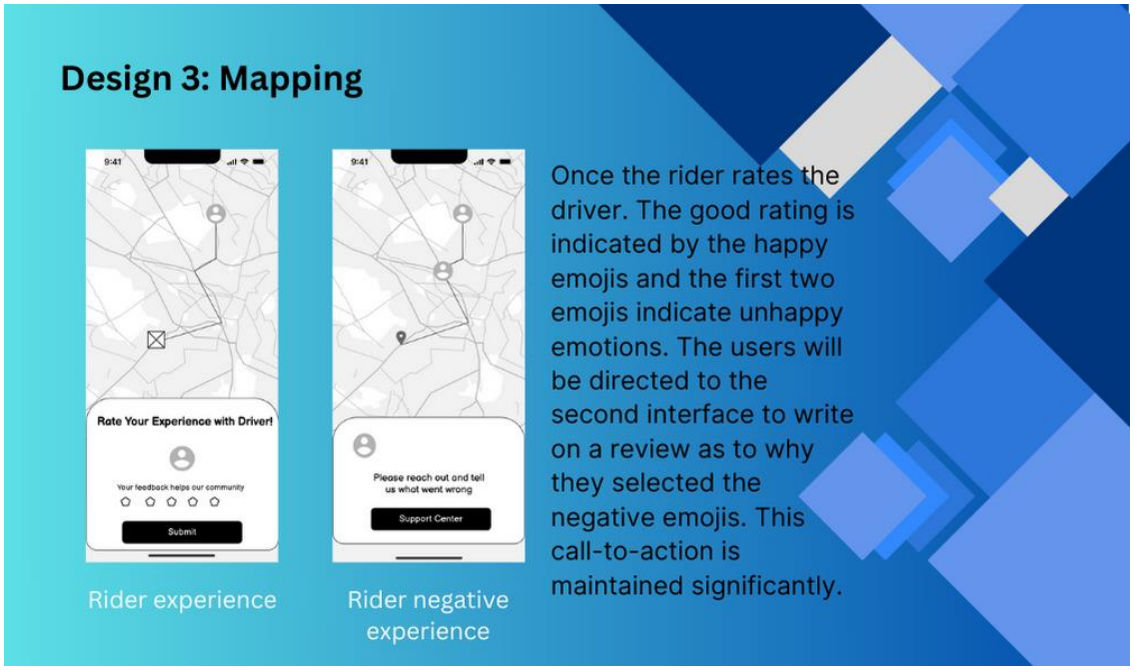




Another example that covers feedback can be when the rider wants to submit a tip for the driver, where the rider is allowed to select between $5, $10, or the No Thanks option. And where after a selection, riders get a confirmation page providing that the tip will be passed on to the driver making users feel happy and content that the tip is passed on without waiting in anxiety without clarification.

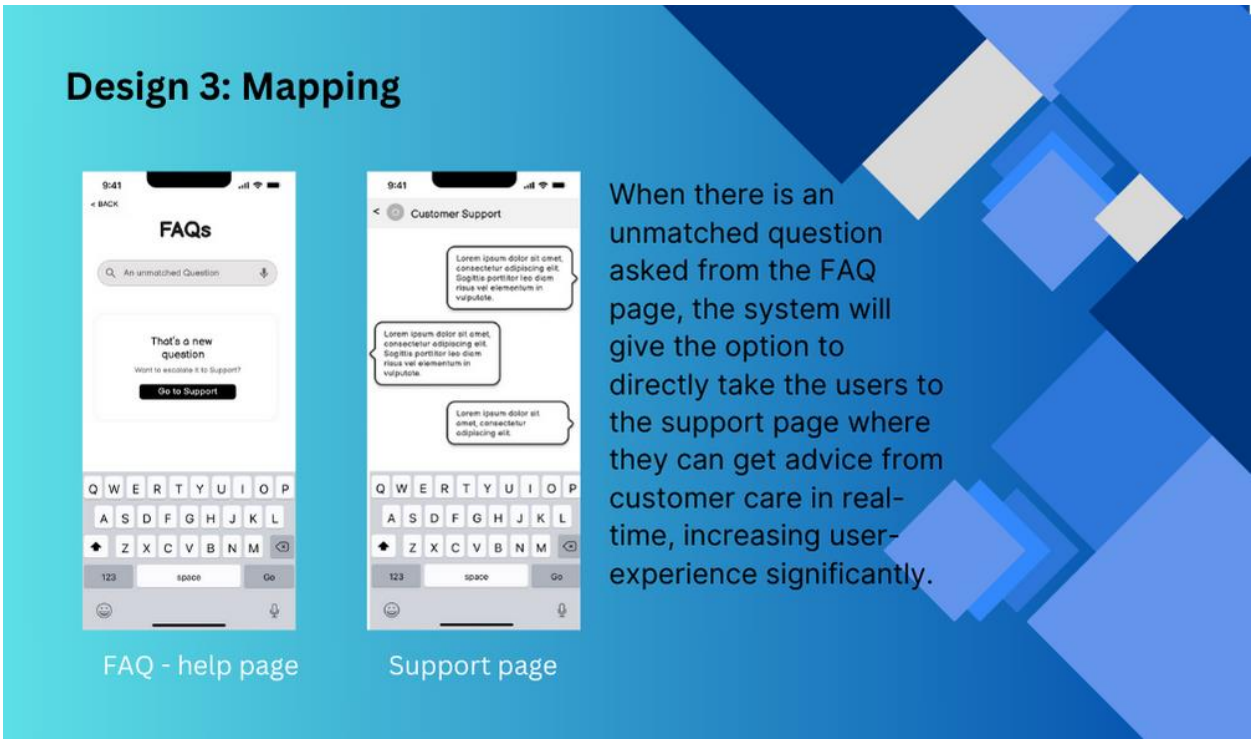
11.3 Design 3: Mapping

Mapping every call to action is important and is covered as follows:



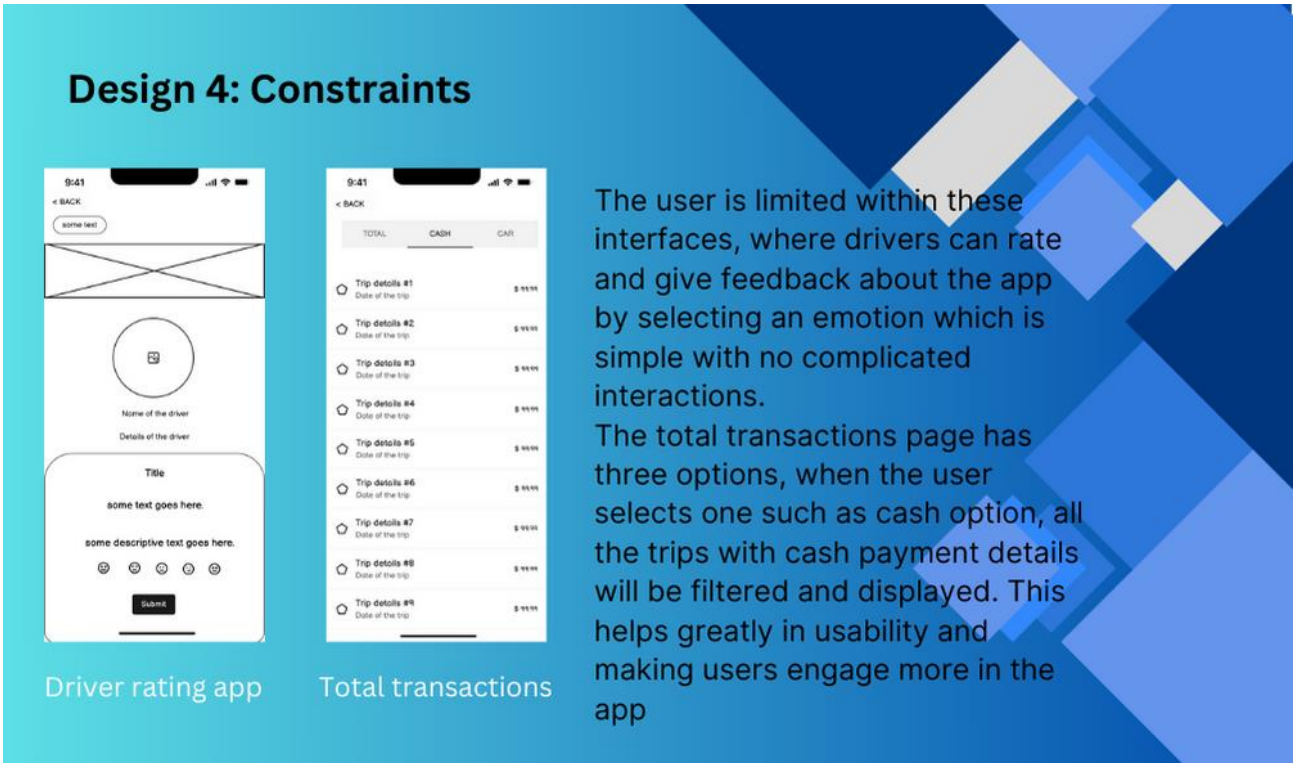
For rating the users, the emotion rating system will be used for its simplicity, and to get feedback more emotionally from the users.

Another example is when there are no matches on the frequently asked questions help page as shown below:

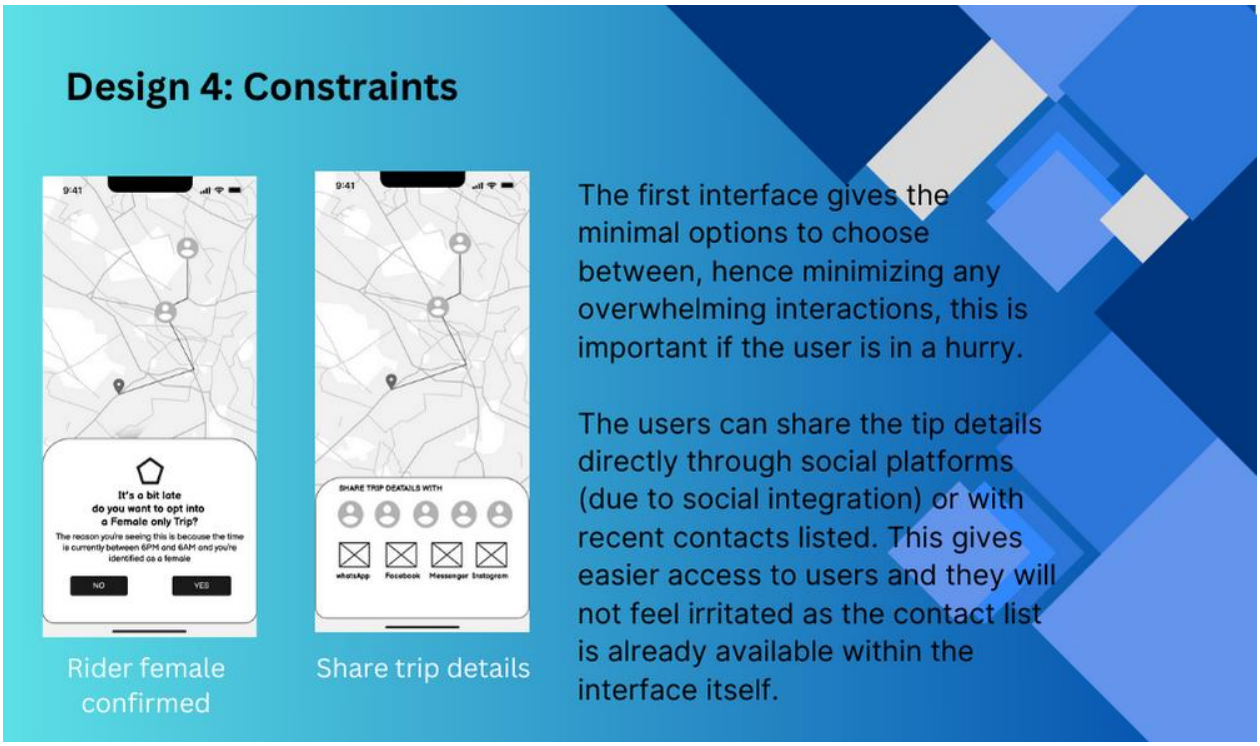


11.4 Design 4: Constraints

Shows the minimal interactions between interfaces and avoid overwhelming its users.

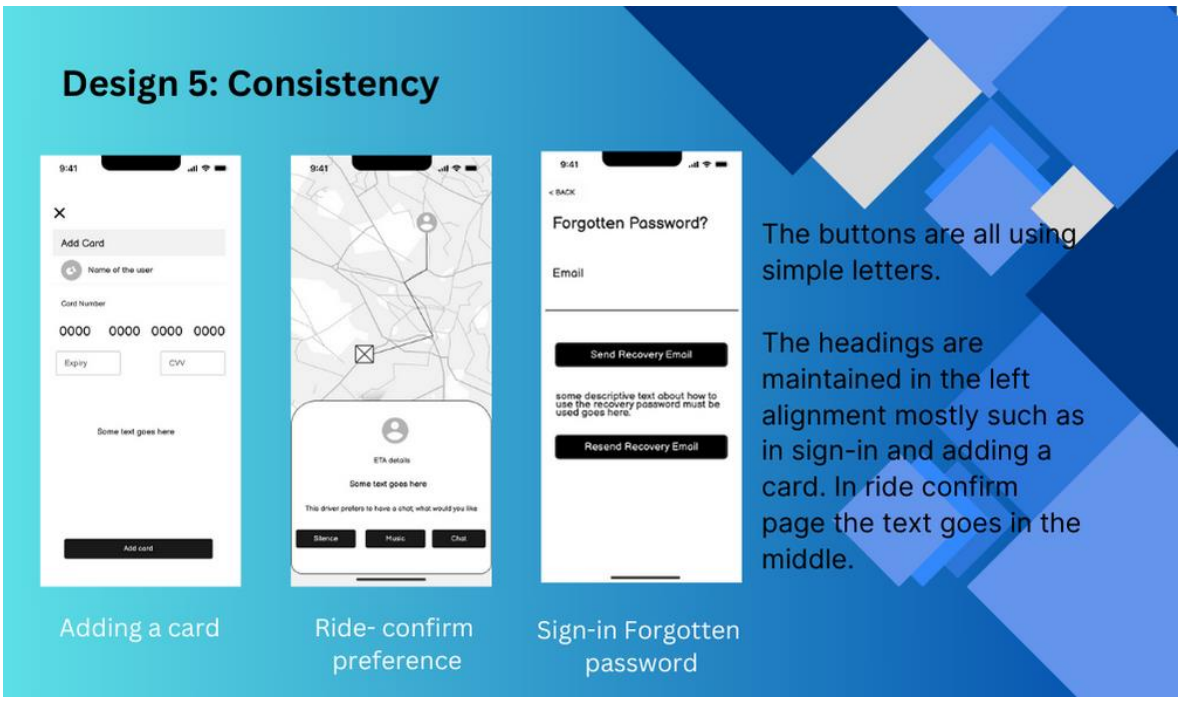


As the contact list is available within the interface itself as shown below, there is no need for the users to be redirected to the phone contact list to share the trip details.



11.5 Design 5: Consistency

The font style which is used for low-fidelity is Balsamiq Sans and the font size differs with headings, if is main heading size is 32. If it is a subheading, the size is 24.



The buttons perform significantly the needed requirements. This maintains consistency.

12 Expert Review

12.1 Performing Expert Review

Design by team: SLIIT_01

Project name: EcoLife - Sustainability Application

Reviewing team: SLIIT_12

Date: 4th of April 2023

Few Strengths are shown below:

Strength #1

Usability strength: Easy exit/cancel options are provided in each interface.

Applicable heuristic: "User control and freedom"

Description: All necessary interfaces are equipped with a *Back* button that allows users to go back to the previous screen. *Back* buttons are also easily discoverable and help towards good UX.

Strength #2

Usability strength: The interfaces have been designed with optimal component spacing and effective use of white space.

Applicable heuristic: "Aesthetic and minimalist design"

Description: The layout of all the interface components has been carefully arranged, effectively using white space to avoid clutter and maintain a clean and visually balanced design. Each component has ample space to stand out, allowing for easy and intuitive navigation for the user.

Strength #3

Usability strength: Providing SSO options from Google and Facebook

Applicable heuristic: "Flexibility and efficiency of use"

Description: Offering SSO logins help reduce the cognitive load on the user and helps save time and effort spent on lengthy registration forms. SSO logins are a great way to keep the application simple and engaging ensuring user engagement and streamlining the user registration process.

Strength #4

Usability strength: The "About Us" interface improves the perceived credibility of the application. Users are more likely to trust an application and be inclined to utilize the application when they perceive a company or organization to be open and honest about its goals and values.

Applicable heuristic: “Visibility of System Status”, where it provides users access to information on the state of the business or organization that created the application.

Description: Users can learn more about the goals and principles of the organization that created the application by visiting the "About Us" section. The users can better comprehend the context of the application and make more educated decisions about its use by being aware of the goals and principles of the business or organization. The “About us“ page can also make users feel more connected to the app by adding a humanizing factor, in addition to increasing the application's perceived credibility.

Strength #5

Usability strength: An application's personalization feature can greatly improve the user experience by giving users a unique and customized experience.

Applicable heuristic: "Flexibility and Efficiency of Use”, as customizing options can increase the application's effectiveness and user-friendliness. The user is more likely to find the app easy to use and intuitive if the interface is tailored to suit their preferences and needs.

Description: The ability of users to customize the application to suit their needs and tastes by altering the color scheme, text size, or interface layout is described as the strength. As a result of being able to design an interface that suits their needs best, users may feel more at ease and in control of the application.

Few of the weaknesses are shown below:

Weakness #1

Usability weakness: Absence of sufficient user input validation: *Signup page and Login Page*

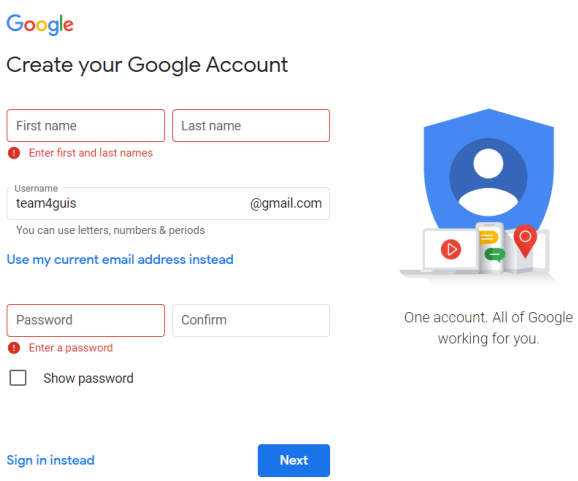
Applicable heuristic: "Visibility of system status", Help users recognize, diagnose, and recover from errors.

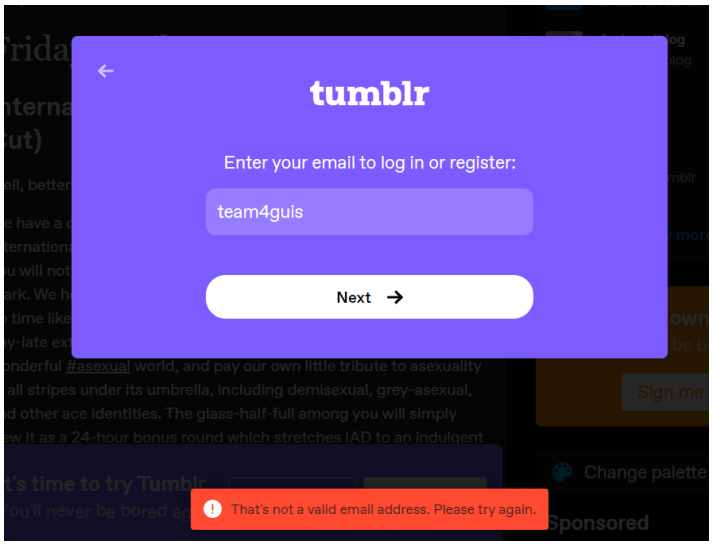
Description: The Sign-Up page prototype does not display any validation messages or actions that should be taken if a user provides inaccurate or incomplete information during the signup process. Users may accidentally enter invalid information, such as incorrectly formatted or non-existent email addresses, and may continue with the remaining steps of the signup process and confirm, ultimately leaving them perplexed as to why the system won't allow them to create a registered account since the system offers no feedback as to what specifically went wrong.

Recommendation: Add clear yet concise prompts as soon as an error/mistake is made during the signup process to save time and effort on the user's side. These prompts could be pop-ups or highlighted/colored texts to catch the user's attention in the shortest possible time.

Severity: High

Best Practice Example:





Weakness #2

Usability weakness: Absence of what the ratings for each product represent: *Product Rating Page*

Applicable heuristic: "Visibility of system status" in the context of the absence of information.

Description: The product rating page only shows a numerical rating for each product without indicating what the rating scale is or providing any information on the meaning of the rating. This lack of context can be confusing for users who may not understand what the number represents, whether it is good or bad, or how it relates to other products.

Recommendation: To address this issue, a potential solution would be to incorporate a color-coded system that highlights good and bad ratings. For instance, a green color could indicate a positive rating, while red could signify a negative rating. Alternatively, rather than solely displaying a numerical value, the product rating page could explicitly state what each rating means, what it is out of, and how it compares to other products. This approach would provide users with a better understanding of the product's rating and make it easier for them to evaluate the product.

Severity: High

Best Practice Example:

Weakness #3

Usability weakness: Absence of a Search bar to quickly find recycling centers: *Local Resources Page*

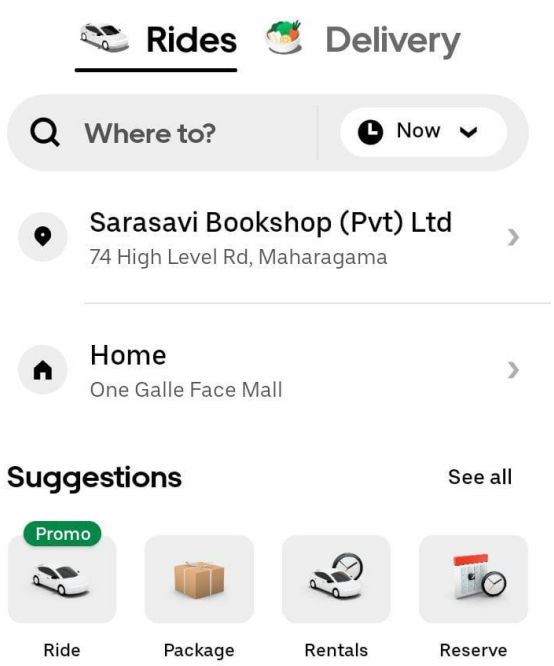
Applicable heuristic: “Flexibility and efficiency of use”, “Recognition rather than recall”

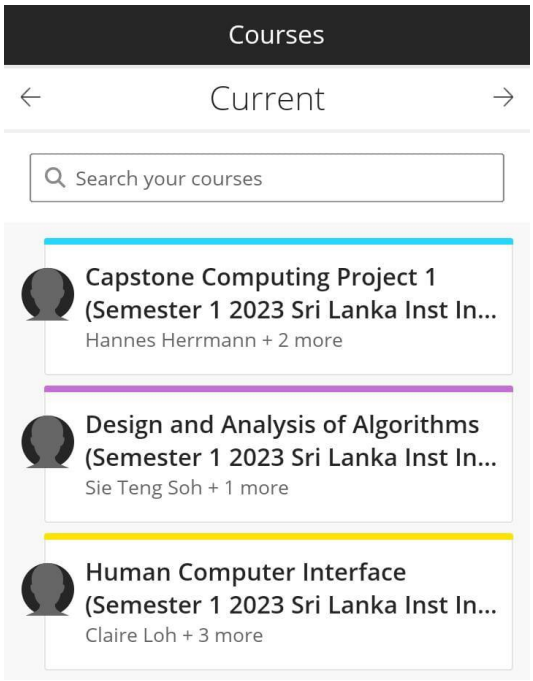
Description: It is an important UX decision to include a search bar wherever possible as it is what users will immediately turn to look up at a recycling center. Excluding a search bar option will force the user to scroll through a list of recycling centers which can be both tedious and repetitive, causing the user to quickly lose interest and reduce the application’s ability to retain its users. Additionally, including a search bar can help users find what they want quickly and save time, thereby improving UX.

Recommendation: Include a Search bar placed so it is easy to find and easy to recognize, coupled with hint text that calls the user to an action.

Severity: Mid

Best Practice Example:





Weakness #4

Usability weakness: Absence of the option where a user can delete the account or log out of the account or add a new account. *Settings page*

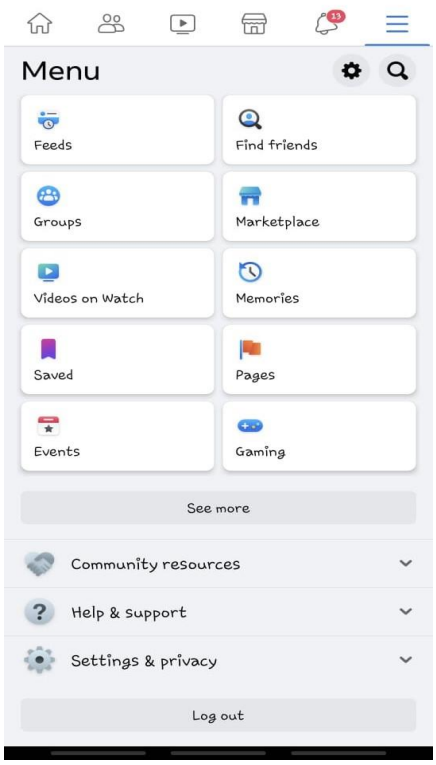
Applicable heuristic: "User Control and Freedom" since users should be able to manage their own accounts and access the application. Users could feel confined or unable to make changes to their accounts without these alternatives.

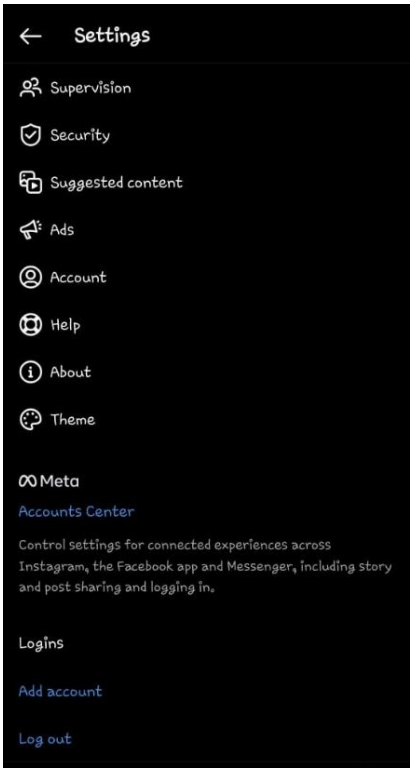
Description: If users are unable to cancel their account, log out of their account, or add a new account, they may feel dissatisfied or helpless. Because of this, consumers could have a negative user experience and stop using the application completely.

Recommendation: A hamburger icon can be added to the settings page in which the user is given the option to log out of the current account, add a new account, or delete the account. Users' experiences would be enhanced, and frustration levels would be lower by giving users access to their own accounts and application access.

Severity: Mid

Best Practice Example:





12.2 Revision Post Feedback

Group_01 team reviewed our low-fidelity prototypes and gave us insightful feedback (Attached to Appendix C). All the strengths were kept within our prototypes except for the calendar option. The weaknesses stated were accepted/discarded as follows:

- Menu icon is not standard → We decided to use the user profile icon to get to user settings.
- No constant bottom navigation bar → used a constant navigation bar which consists of three (this reduces clutter) main icons such as home icon, Analytics, and help.
- Buttons spaces are too close and cluttered hence making it harder for the user to click and navigate through the application →Buttons were implemented at least 1.0 mm away from each other.
- "Your finances", "Faq" and "Terms and Conditions" pages have asymmetric headings comparative to their bodies →The terms and conditions page was discarded from our prototypes. The FAQ heading was made asymmetric after this comment but your finances page heading was not made asymmetric.

13 High-Fidelity Prototype

There were two iterations done for high-fidelity prototypes. The second iteration was more related to the design principles stated above and it received more positive feedback from our user base as well as the instructors, hence this was our final choice.

The link to the initial high-fidelity prototypes – High-fidelity prototype brainstorming

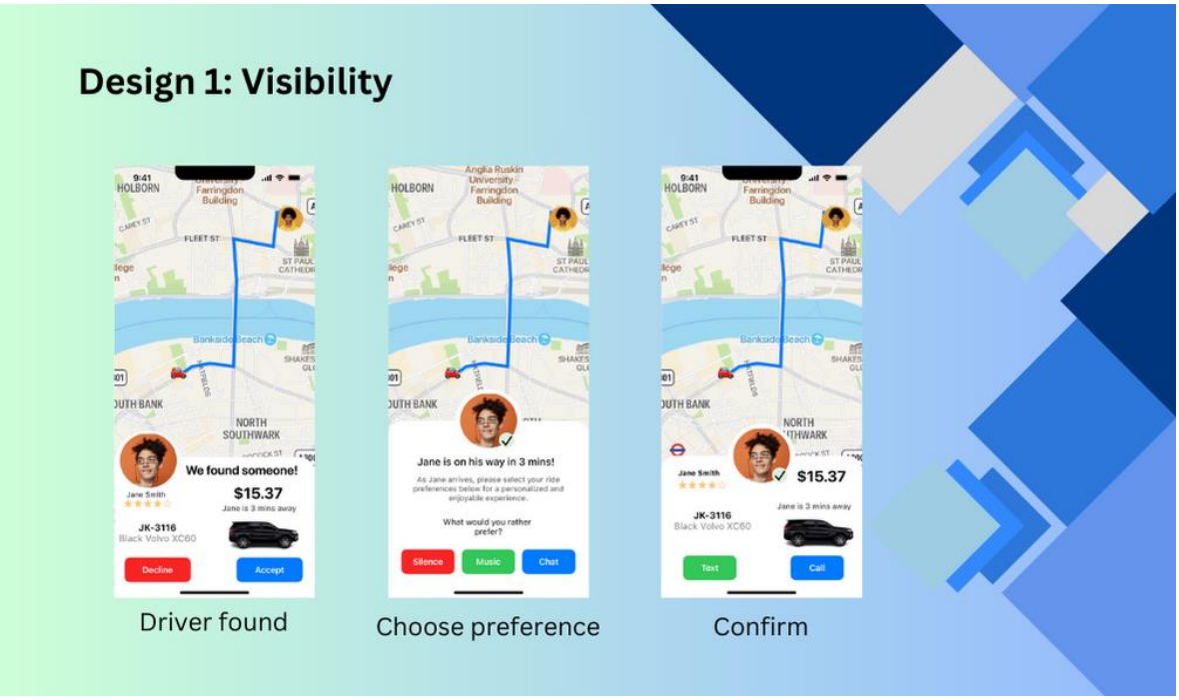
The link to the first iteration is as follows - High-fidelity iteration one

Link to the Rider's POV high-fidelity prototypes – Rider's POV

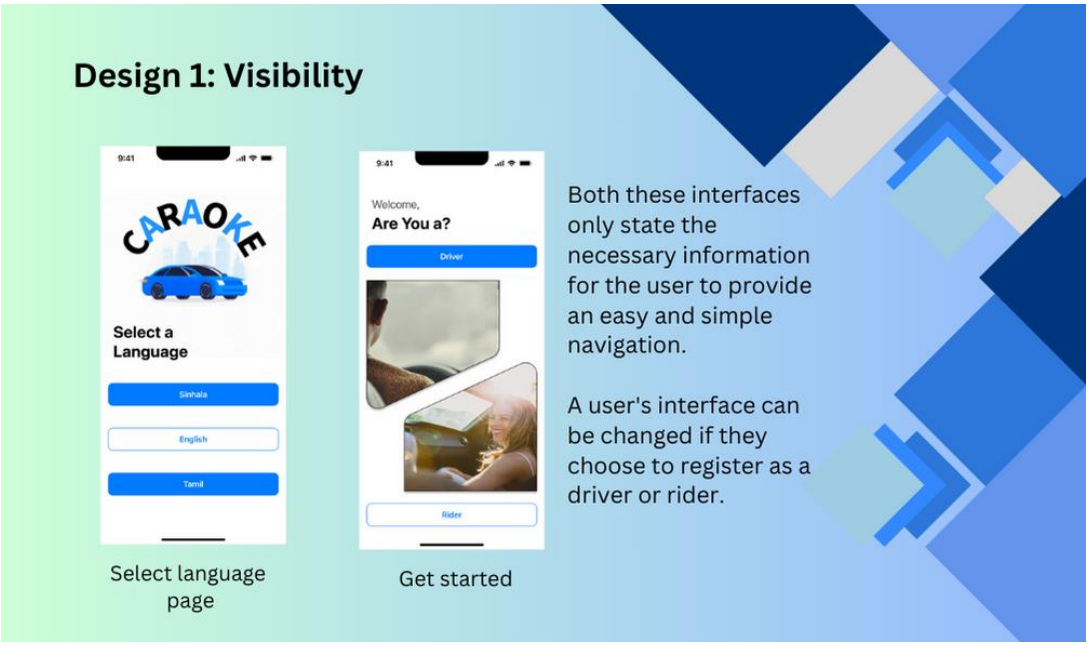
Link to the Driver's POV high-fidelity prototypes – Driver's POV

13.1 Design 1: Visibility

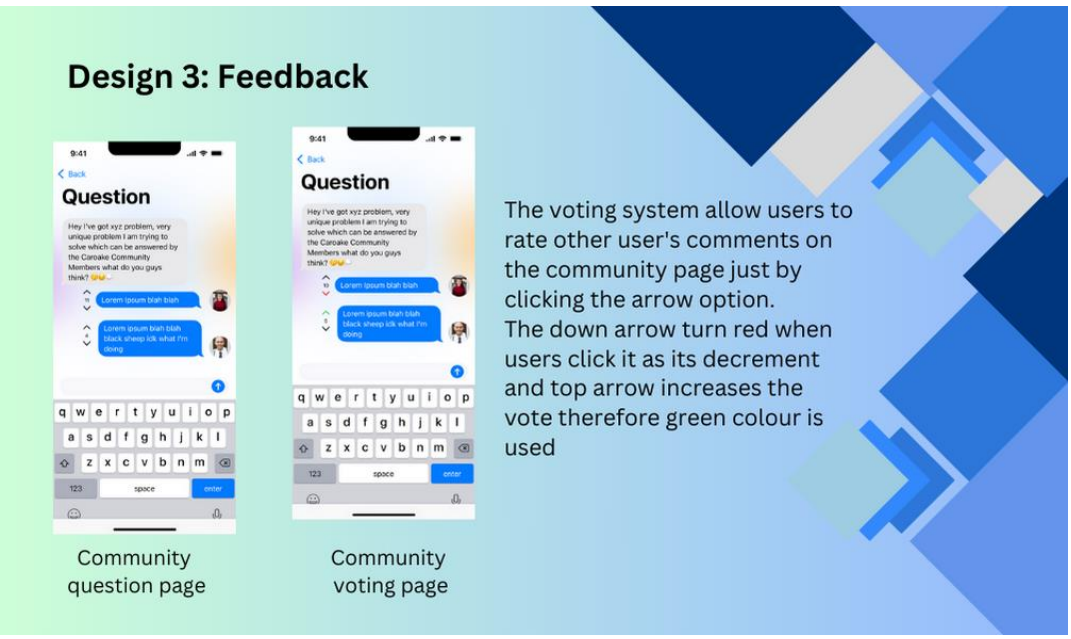
At all times the User is aware of all possible combinations of options in our applications with extra icons suggesting standard ideas such as the share button being the same standard in iOS Applications.



The above UIs express that the users can easily understand what are the core functionalities done by each interface. The driver-found page allows the user to either decline or confirm after checking the driver details. The preference page allows the user to choose a preference, increasing user experience.



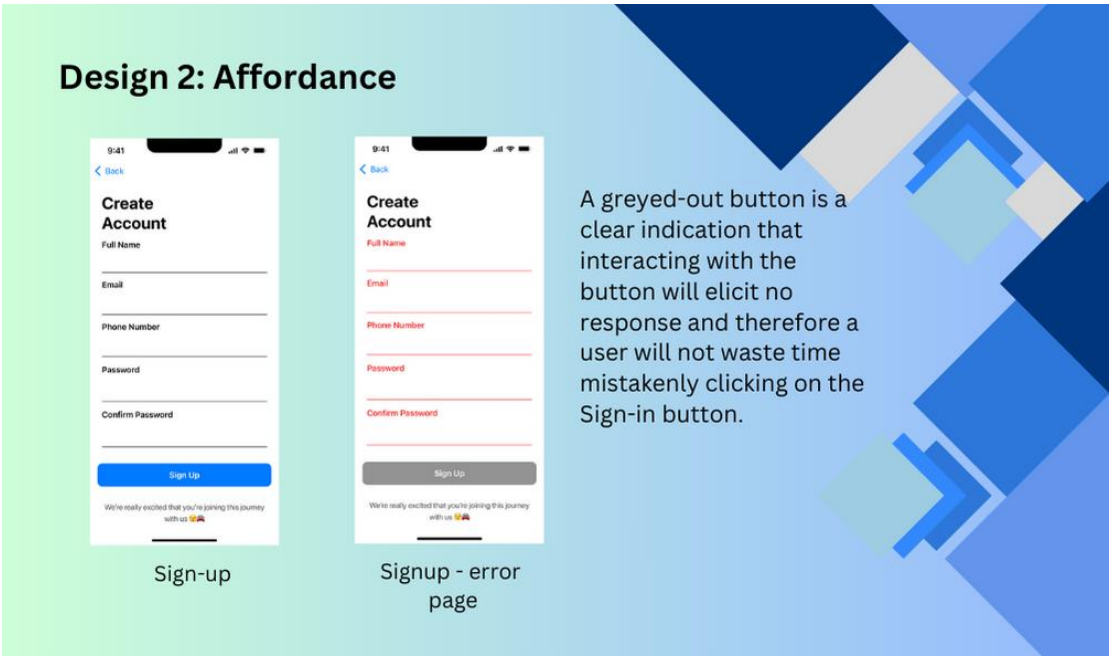
Using simple and intuitive interfaces greatly increases the user base as being familiarised with the new user interfaces can be challenging for some users.



Another simple example(community pages) is shown below from our application and as you can see it is extremely intuitive that the buttons next to the answers suggest voting the answer up or down and you get visual feedback once you do click on the upvoting or downvoting symbol.

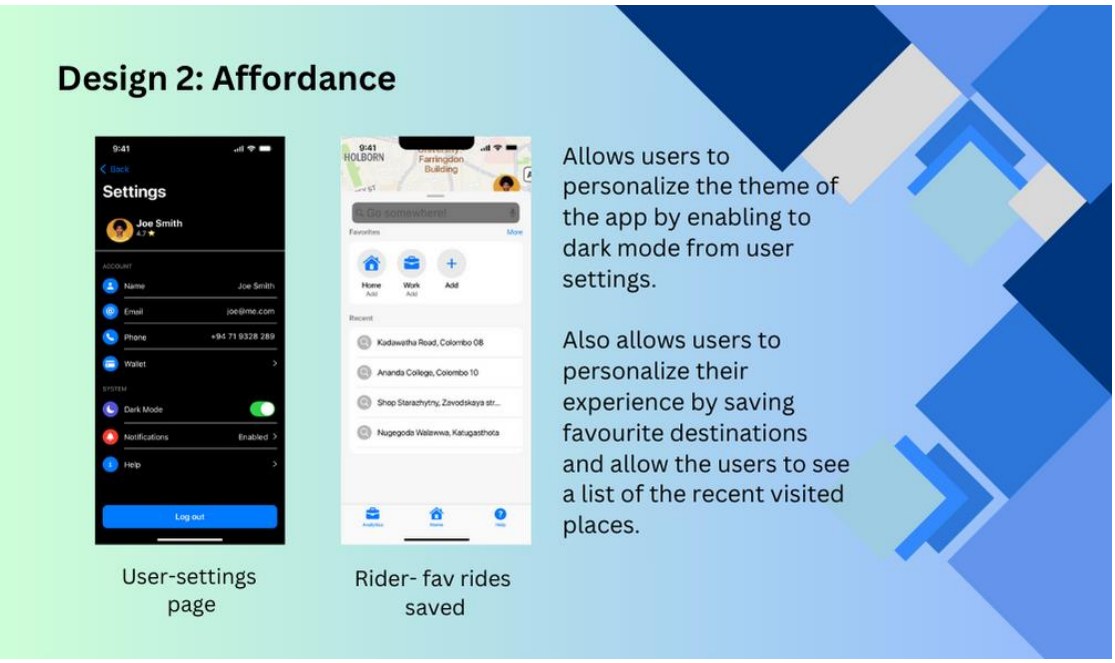
13.2 Design 2: Affordance

For sections where we need increased User Focus, we limit them using Greyscaled options suggesting criteria is to be fulfilled before moving on, so the users can easily understand the UI to navigate through.

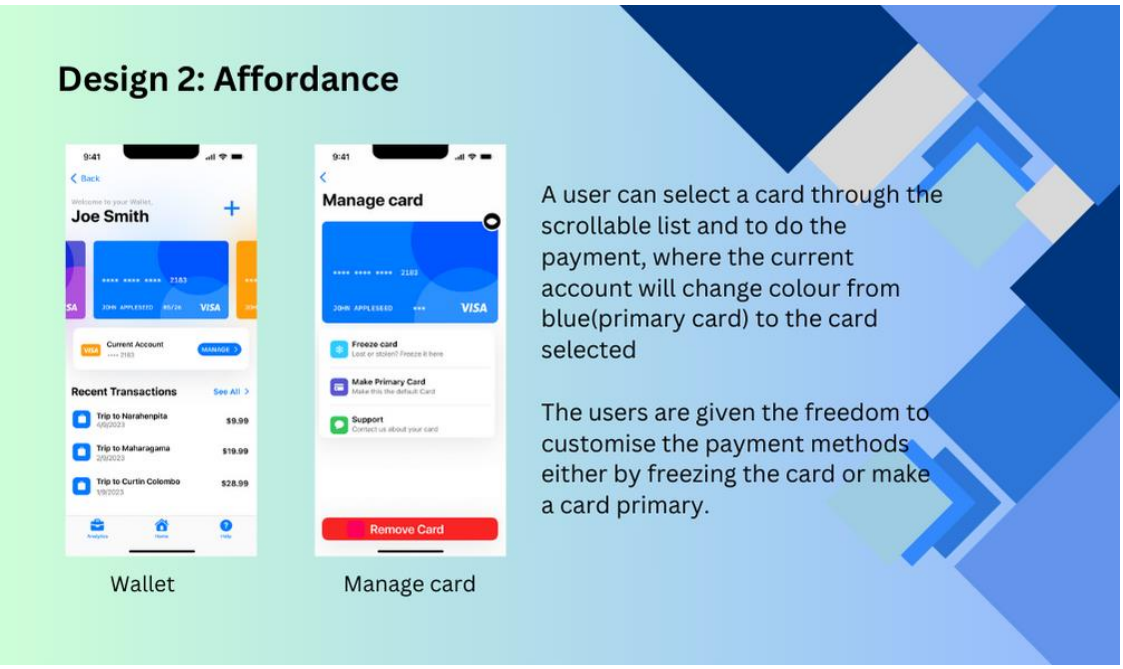


The app also allows for customization options as shown below which greatly increases the user experience:

1. Allowing dark mode and saving favorite rides



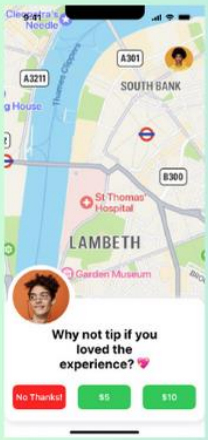
2. Setting the default payment card option and being able to remove the card.



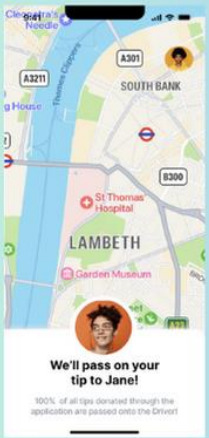
13.3 Design 3: Feedback

Each of the user's actions on the application is acknowledged to some extent such as the tipping section:

Design 3: Feedback



Rider- experience page

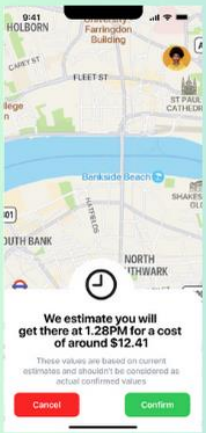


Rider-experience page confirmation

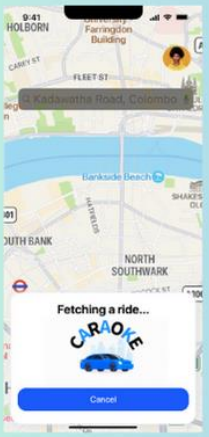
A user is offered with a feedback page after they tip the driver, which increases the user experience for the customer. The confirmation page is a clarification for users therefore users can feel more content that the money they tipped was transferred successfully.

Like Google Chrome, once you book a ride which is our core functionality, you get a loading screen to suggest we're searching for a ride as follows;

Design 3: Feedback



Rider-looking for ride page



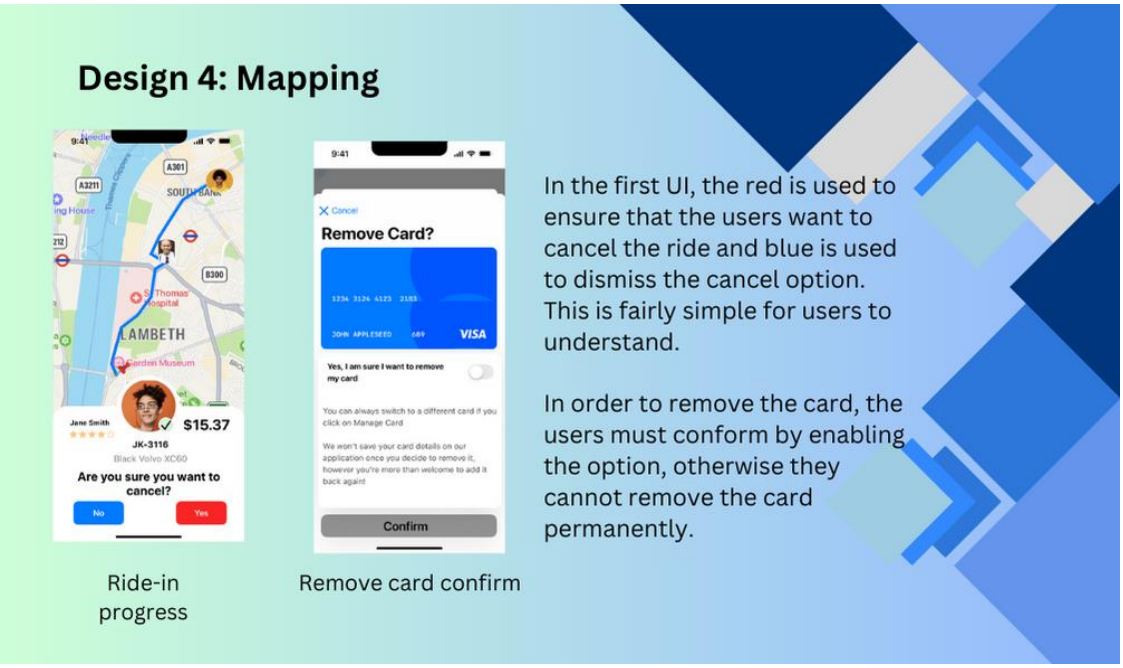
Rider- searching

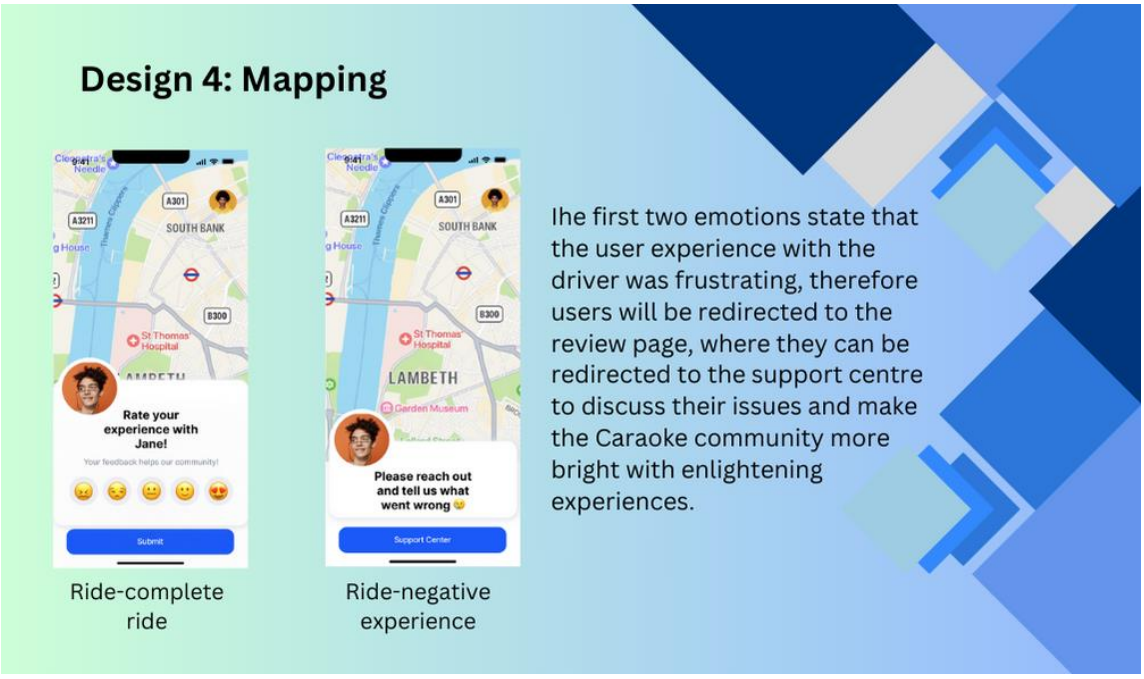
This shows that after a user types the address, and click confirm the searching page will be available until a ride pops up. This increases the usability and user experience without frustarting the users as they know that the app is trying to connect their request with a driver.

13.4 Design 4: Mapping

Each button is directly mapped to a certain set of colours with blue suggesting an affirmative response and red suggesting a negative response.

For sections where we need increased User Focus, we limit them using Greyscaled options suggesting criteria is to be fulfilled before moving on as such.

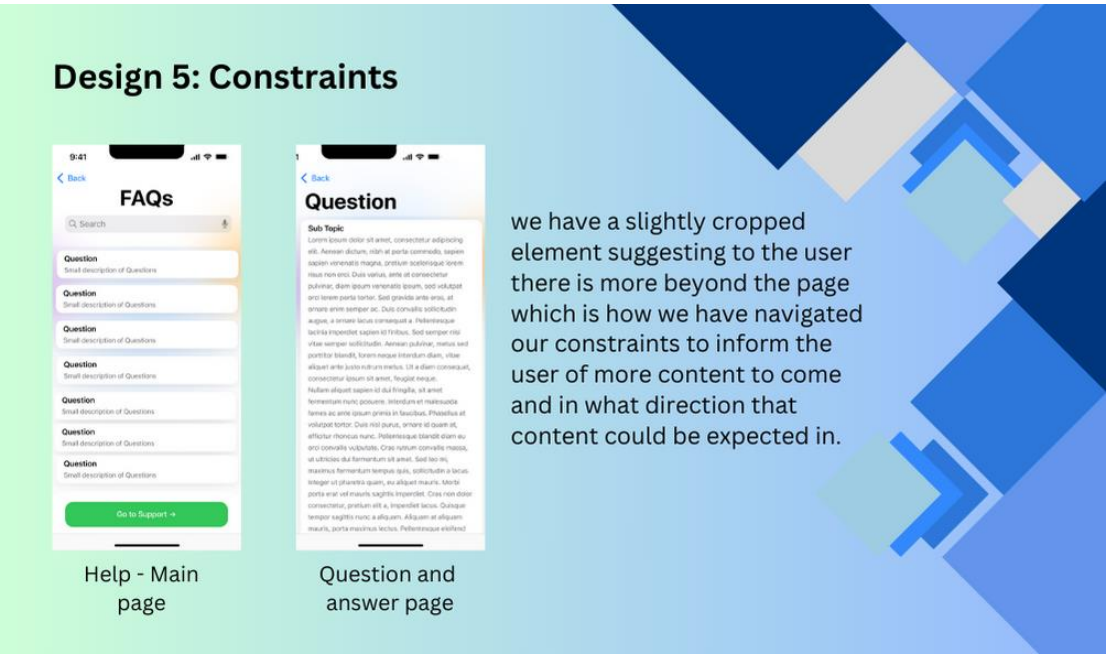




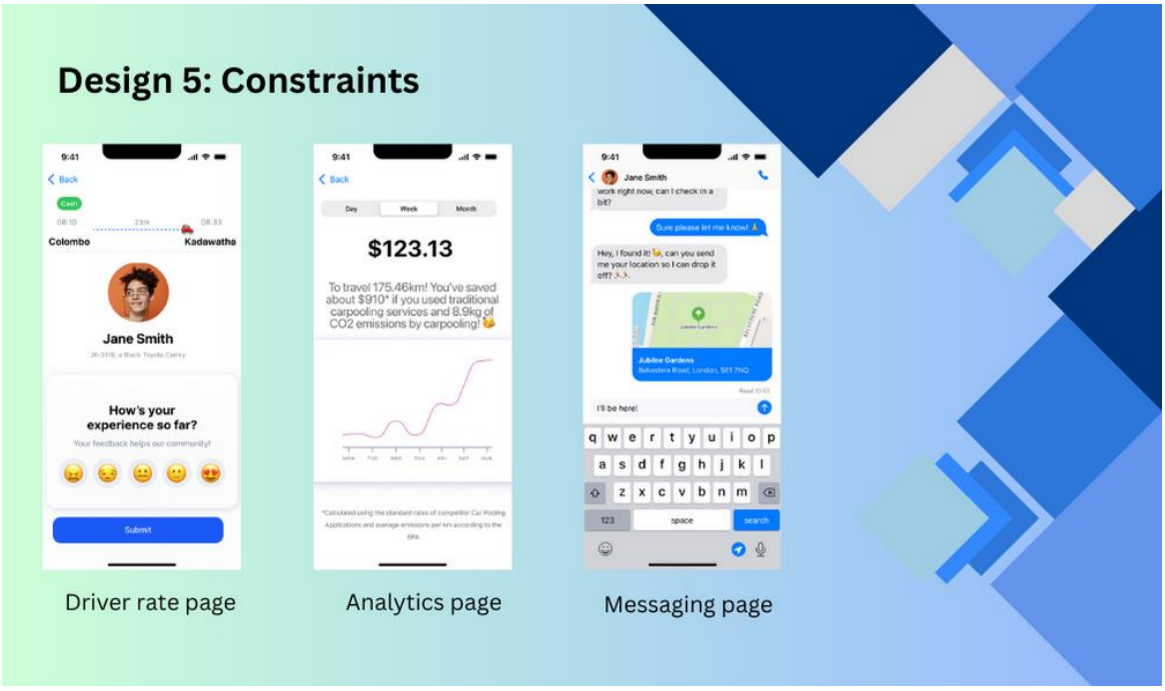
When the users share their ride experience, mapping is done successfully to get essential feedback so issues can be avoided next time.

13.5 Design 5: Constraints

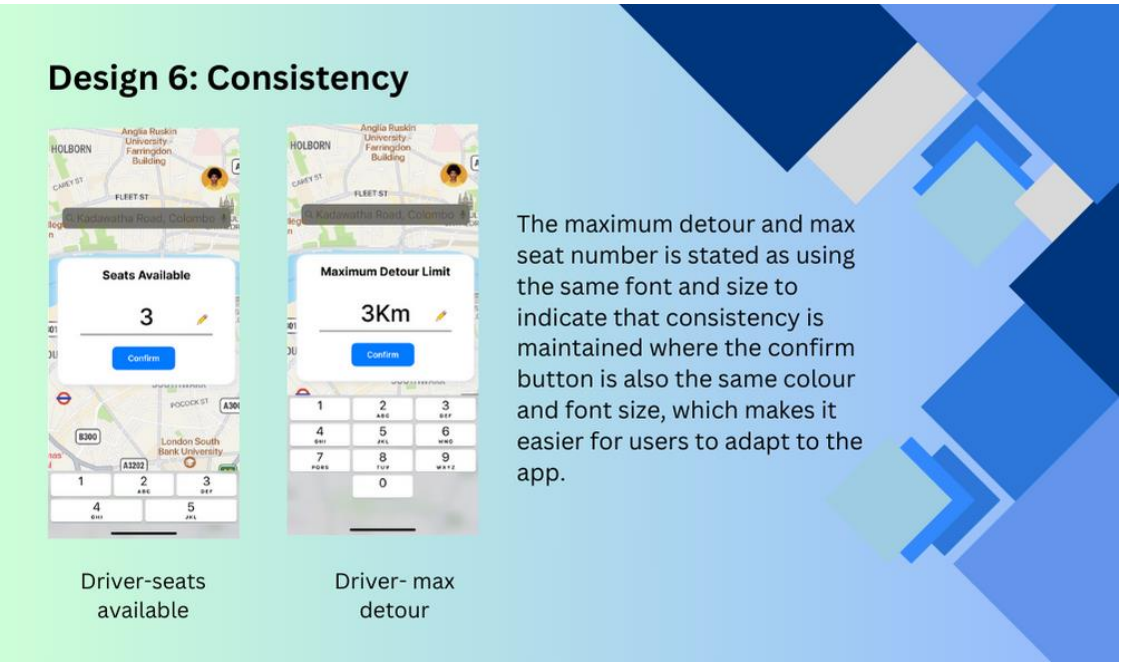
We've used nuanced constraints by having peeking effectively used in areas of overflow.



The below diagram shows that the driver rate page will be only limited to the range of emotions that the user has to submit to receive feedback. This is easy and does not frustrate the customer as opposed to long feedback methods. The analytics page shows filtered carbon emissions between day, week, and month options. The users are can message without any limitation and even call their driver in real time.



13.6 Design 6: Consistency



13.7 Design Specifications for Handoff

- Style Guide

Throughout we use, the Apple San Francisco Pro family and SF Pro Display to Display Texts and SF Pro Text in the Messaging Application which is standard Apple Practice.

- Color

Used high-contrast colours, the hexa values of each colour are shown below:

Blue – 007AFF

Green – 34C759

Red - F92525

- Typography

Typography used

- Assets and Icons

iOS kit (Community)

SF Symbols (Community)

App Ratings Animation (Community)

Responsive Bar and Line Graphs (Community)

14 Project Management

Primarily, the design process was established to identify the user base hence, we put forward pain points, evaluated them into problem statements, and found a suitable ideate solution for our application. The worksheet01 (2023) contains a majority of the design process evaluation completed, this was completed during the 1st two weeks of the semester. The empathy maps, user personas, and user journeys, competitor analysis were drawn in the 2nd week of March after confirming the project, Caraoke App. The use case was drawn for the overall system hence, it will be easy for anyone to understand the actors involved and the actions distributed.

The interview that was conducted with Supun Wickramasignhe was done on the timeline of worksheet01 therefore, this was our first initial interview conducted to get the necessary observation. The Google survey was conducted during the Pain points week submission from the 17th to the 21st of April. The data analysed by both interviews and surveys encouraged the design team to come up with user-experienced functional requirements and non-functional requirements which refined our initial ideate solutions. During the high-fidelity prototyping, each team member made sure the interfaces covered the desired UI/UX goals by mapping to the design principles stated. The user feedback was carried out on the 16th of April for the high-fidelity prototypes which helped immersively for the team to finalize the design principles and move forward with one iteration. Our main purpose was to make sure that the design solutions were in accordance with the original design objectives.

14.1 Meetings

Before the sessions began, we established precise goals to avoid moving away from the purpose of the meeting. We had our meetings on the Google Meet platform and collaborated on google docs at times to distribute our ideas equally (The links to these google docs will be linked under Appendix E). The interview questions were made in google docs together and when the interview was conducted the answers were noted down in the same google doc. Our weekly process was discussed physically in team meetings, where on certain Tuesdays after our tutorial

session we would discuss our agenda for the next weekly submission that will help us to complete assignment 1. These kinds of productive meeting management improved goal-setting and project-management skills.

In terms of frequency, we held weekly meetings for five weeks during the assignment 1 time period. During the high-fidelity period, the team conducted team meetings consecutively to design the best-suited prototypes for our application, and the user feedback session was conducted through Zoom, which helped in finalizing our product. We used a project management tool known as Jira, which incorporates confluence, where a majority of our knowledge-sharing and collaborations took place (The links will be available in Appendix E).

14.2 Risk Management

As this project requires two functionality-based interfaces that is Passenger and Driver POV, it is hard to accomplish the requirements to the point. This application was solely developed to address sustainable development goals 11 and 12 but it would be quite hard to successfully meet the needs to maximize the goals in the real world as increasing the user base for the Caraoke App can be unyielding.

The following risks can be considered with ways to avoid this risk:

Identifying pressing needs – It is essential to have proper engagement with the associated use base otherwise the required needs can be ignored which can negatively affect the growth of the application. This should be achieved by conducting informal meetings with the end-to-end users such as through weekly focus group meetings. Even though we receive user feedback for prototypes, requesting feedback from multiple users at the same time is more effective.

Reluctant risk to using carpooling - According to the survey responses received, we can conclude that most of the users were reluctant to the idea of carpooling with a stranger, which can significantly affect the application growth. Hence, the application must be made to socialize with the drivers and other users in the app through a community feature so users can get closer.

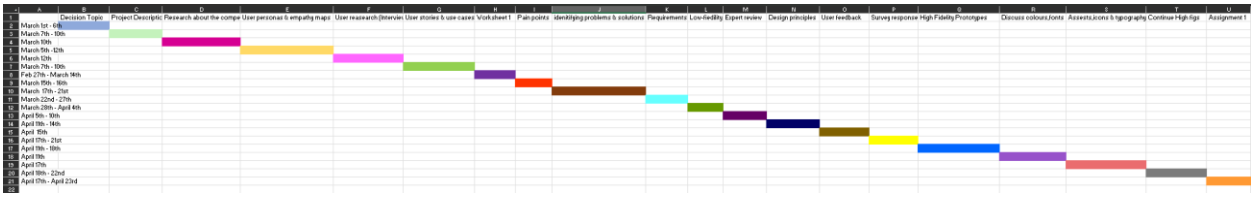
Risk of having more competitors in the industry – As carpooling is not a new concept it is hard to be 100% unique regarding our end achievement. With successful competitors in the industry such as Uber (which has a user base of more than a 500Million+) there is a higher risk of losing marketing space in the industry to attract customers they will be biased with the current competitors available. This can be avoided by attracting users not with only a carpooling

experience but using the main aspect of reducing carbon emissions to the environment by having less number of vehicles. Therefore there is a **Risk of building an app that is not desired by the target audience.** However, by using the correct perspective aspects we can build a more lively application that meets the purpose of addressing sustainable development goals such as 11 and 12.

Risk of security aspects – When driver and rider verifications are not completed properly can cause disadvantages to the users, so we need to make sure proper error messages are associated with the interfaces. Caraoke application gathers and preserves private user information. Any security or data disclosure may have negative legal and reputational repercussions. To secure user data, it's critical to evaluate security and privacy threats and apply strong security policies.

14.3 Milestones

The milestones for assignment 1 from Worksheet 01 to Worksheet 06 were covered as shown below:



Date	Milestone
March 1st -6th	Decision topic
March 17th – 10th	Project Description
March 10th	Research about the competitors
March 5th -12th	User personas & empathy maps (User flows, user journeys)
March 7th -10th	User stories & Use cases
March 12th	User Research (interview)
Feb 27th – March 14th	Worksheet01
March 15th -16th	Pain points
March 17th to 21st	identifying problems & solutions
March 22nd – 27th	Requirements
March 28th – April 4th	Low fidelity prototypes

April 5th - 10th	Expert review
April 11th - 14th	Design Principles
April 16th	User feedback
April 17th - 21st	Survey responses
April 11th - 18th	High fidelity prototypes
April 11th	Discuss color, fonts
April 17th	Discuss hierarchy, assets, & typography
April 18th - 22nd	Continue high fidelities
April 17th - April 23rd	Assignment 1

The assignment 1 task (which is on the week 7 sprint), was further divided into subtasks where each of them was achieved as follows (Autogenerated from Jiara):

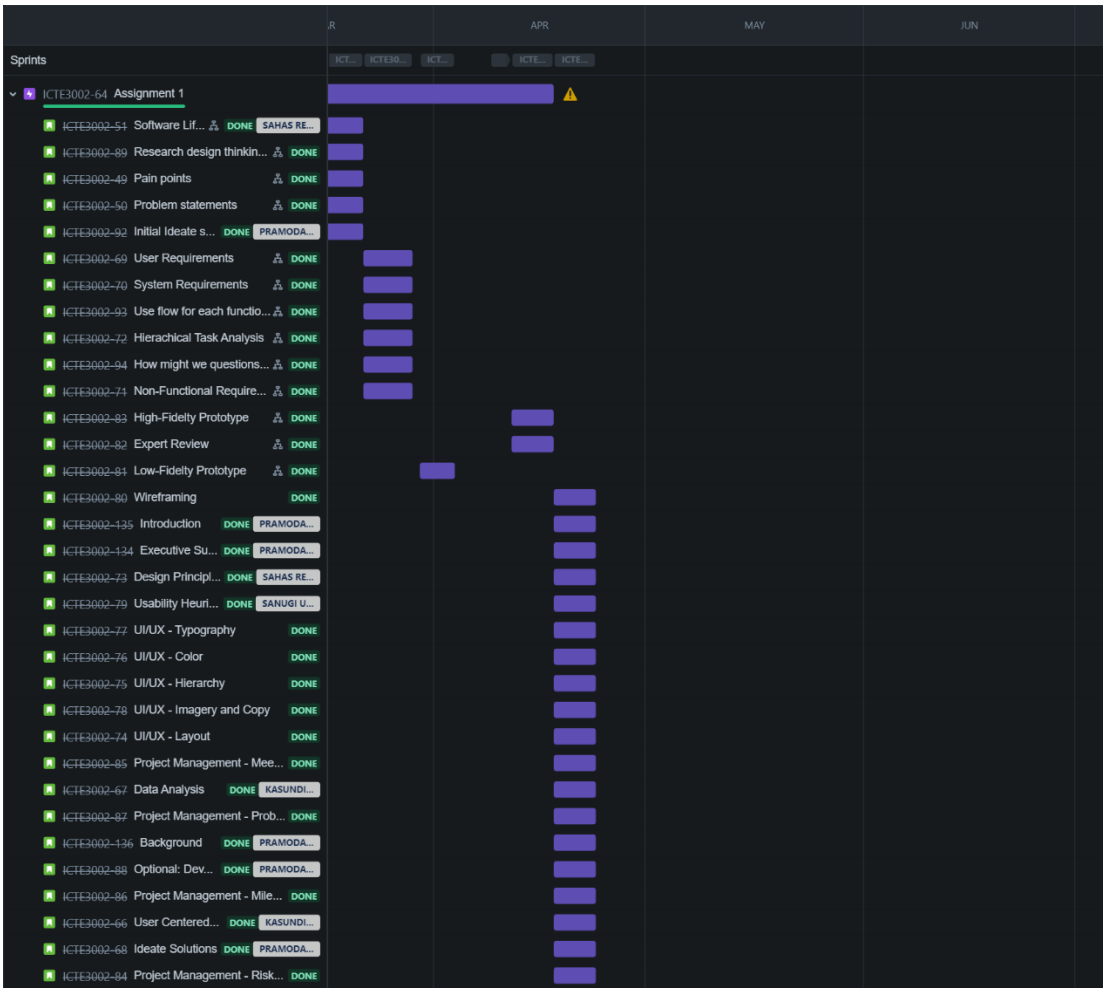


Figure 24: Milestones achieved for Assignment 1

14.4 Problems Encountered

There were no significant issues that affected the project deeply. However, during the interviews and user feedback sessions, the users were hesitant to be recorded, therefore we only had the right to write meeting minutes. The interviews that were conducted were done online and not physically therefore we could not see the reaction in person to some questions.

15 Development

This section gives a brief idea of what technology stack would be used if the Caraoke application were to be implemented in the software industry (Worksheet01 2023). Deciding on which technology stack to use is very important as this builds the foundation of the application (Worksheet01 2023).

The Caraoke App will be available *mainly on iOS (expected to be extended to Android in the future)*. The **native technology stack** will be used for the Caraoke application as it is currently the best tech stack development available. Due to their platform-specific optimization and ability to access all of the hardware features of the device, native apps provide the best performance and user experience (Mendes, 2023).

Tech stack

The mobile stack can be categorized into these components. It consists of the platforms, tools, frameworks, and programming languages to employ and execute the project (Worksheet01 2023).:

- *Frontend* – will be written in Objective-C and Swift for iOS, whereas the Android application is written in Java. Android SDK (in Android Studio) is used with React to build an efficient frontend and various other open-source libraries can be used such as RxJava (Bhati 2022). The iOS frontend system can be implemented with Flutter with the UIKit (iOS kit) and Masonry which is a JavaScript grid layout library to fix the sizes (Bhati 2022).
- *Backend* – The backend languages will be Python and JavaScript. For the integration part of the app, we can use Node.js and Go. Go with Python is used to enhance performance such as when writing the matching driver to passengers algorithm, etc (Bhati 2022). Primarily, Node.js will be used as developers can exchange JavaScript code between the server and client easily. Since NodeJS is a popular framework, any vulnerabilities can be easily patched out with

updates to Nodes. And due to its asynchronous and single-thread event loop, it is highly reliable so a large number of user requests can be handled (Bhati 2022).

- *Middleware* - Express.js can be used as it is an open-source framework for developing web applications. It allows Node. js-based applications to create RESTful APIs. Although Express is a very lightweight and minimalistic framework that provides comprehensive features, it doesn't limit the performance of existing Node features (Bhati 2022).
- *Database* – LevelDB handles the storage needs of mobile applications, whereas MySQL (relational database) handles the back-end systems. LevelDB is a quick key-value storage library that offers an ordered mapping from string keys to string values. A very quick, multi-threaded, multi-user, and reliable SQL (Structured Query Language) database server is provided by the MySQL software (Bhati 2022).

16 Conclusion

In conclusion, the FourGUIs team aimed to thoroughly investigate the domain pertaining to ride-sharing /car-pooling applications, and identify the current problems within the domain, its users - their needs, and pain points. Hands-on surveys, one-on-one interviews conducted, and feedback received throughout the creation of the Caraoke application to observe the domain and users, have contributed to a significant rise in both UI/UX skill set and the positive attitude of the team towards discovering sustainable solutions.

As Team FourGUIs, we are confident that during the past few weeks leading up to handing over Assignment 1, all members have gained a great deal of knowledge regarding Human-Computer Interaction (HCI), its significance, and utilization of good practices relating to HCI to help develop a UI/UX that is focused on enhancing capabilities of its users (abled or differently- abled) rather than hindering them.

Finally, Team FourGUIs sincerely hope that the Caraoke application will contribute to the United Nations' vision of a "*Shared blueprint for peace and prosperity for people and the planet, now and into the future.*", as stated in their Sustainable Development Goals by raising awareness regarding ride-sharing applications as a solution to reduce carbon emissions around the world.

17 Acknowledgements

We would like to acknowledge everyone who helped us make Assignment 1 successful. We would like to extend thankful hands to Supun Wickramasinghe for contributing and sitting with us online for the user interview, and we are also grateful to Odara Chandrasena who gave us valuable and insightful feedback for our high-fidelity prototypes. A special thank you to the lecturer in charge, Mr.Jagth, and the instructors, Miss Divya Manatunga and Sir Praveen for giving us valuable insights throughout assignment one. Finally, a warm thank you is extended to people who contributed to our survey with their responses and group 01 (Codemonekys) for conducting an expert review on our low fidelity prototypes.

18 References

Worksheet01. March 14, 2023. "W01_SLIIT_12_Project Proposal". Accessed April 17, 2023. https://drive.google.com/file/d/15DayvsrYezvmf2w2PbOSALrVqZftZamh/view?usp=share_link

Worksheet02. March 21, 2023. "W02_SLIIT_12_Pain Points". Accessed April 17, 2023. https://drive.google.com/file/d/1Tlsvv4XtGis3ffegCof07Ol0DQ1pEHOB/view?usp=share_link

Worksheet03. March 27, 2023. "W03_SLIIT_12_Requirements". Accessed April 17, 2023. https://drive.google.com/file/d/1Im4A4IvtFqJ7_7DxUU3Hw3RNmc3NGpjh/view?usp=share_link

Worksheet05. April 10, 2023. "W05_SLIIT_12_Expert_Review". Accessed April 12, 2023. https://drive.google.com/file/d/1hRwuXtqQCSKZw8HmgoMl0kV4sSAyNrk0/view?usp=share_link

Behance. n.d. "Carpooling App UX Case Study". Accessed March 16, 2023. https://www.behance.net/gallery/135109869/Car-pooling-App-UX-Case-Study.

Bhati, Naren. 2022. "Uber Tech Stack & Software Architecture - How Was Uber Built?" Tech Blog. Accessed April 19, 2023. https://www.emizentech.com/blog/uber-tech-stack-software-architecture.html.

Browne, Camren. 2021. "Design Thinking vs. User-Centered Design [Which Is Best?]." CareerFoundry, Accessed March 17, 2023. https://careerfoundry.com/en/blog/ux-design/design-thinking-vs-user-centered/#what-is-design-thinking.

Enginess. 2014. "StackPath." Accessed April 17, 2023. https://www.enginess.io/insights/6-principles-design-la-donald-norman.

United Nations. n.d. "Sustainable Cities and Human Settlements". Accessed March 16, 2023. https://sdgs.un.org/topics/sustainable-cities-and-human-settlements.

"User-Centered Design: Definition, Examples, and Tips." Inside Design Blog, 2019. Accessed March 16, 2023. https://www.invisionapp.com/inside-design/user-centered-design-definition-examples-and-tips/.

Javatpoint. 2021. "Agile Model (Software Engineering) Javatpoint." Accessed April 17, 2023. https://www.javatpoint.com/software-engineering-agile-model.

Page, Drew. 2021. "How Creating User Personas Can Affect Every Part of Your Business." TestingTime, Accessed March 17, 2023. https://www.testingtime.com/en/blog/user-personas-affect-your-business/.

Gibbons, Sarah. 2018. "Empathy Mapping: The First Step in Design Thinking." Nielsen Norman Group, Accessed April 17, 2023. https://www.nngroup.com/articles/empathy-mapping/.

RideShare.lk. 2023. "Carpool for Better Commute and Quality of Life." Accessed April 19, 2023. https://www.rideshare.lk/.

Fitzgerald, Anna. 2020. "Usability vs. User Experience: What's the Difference?" HubSpot, Accessed April 19 2023. https://blog.hubspot.com/website/usability-vs-user-experience.

Gibbons, Sarah. 2021 "Three Levels of Pain Points in Customer Experience." Nielsen Norman Group. Accessed April 19 2023. https://www.nngroup.com/articles/pain-points/.

Rosala, Maria. 2021. "Problem Statements in UX Discovery." Nielsen Norman Group. Accessed March 17, 2023. https://www.nngroup.com/articles/problem-statements/.

Elmansy, Rafiq. 2022. "Design Thinking Tools for Ideation." Designorate. Accessed March 17, 2023. https://www.designorate.com/ideation-design-thinking-tools/.

National Eye Institute. “Types of Color Blindness | National Eye Institute,” June 26, 2019. Accessed April 12, 2023. Types of Color Blindness | National Eye Institute .

Intersoft Consulting. 2022. “General Data Protection Regulation (GDPR)”. Accessed April 17. https://gdpr-info.eu/.

The Interaction Design Foundation. “What Is Color Theory?,”n.d. What is Color Theory? .

Mendes, Alexandra. 2023.“What's the Best Tech Stack for Your Mobile App in 2023?”. Imaginary Cloud, Accessed April 19th, 2023. https://www.imaginarycloud.com/blog/techstack-mobile-app/#native.

Nielsen, Jakob. “10 Usability Heuristics for User Interface Design.” Nielsen Norman Group, 2020. https://www.nngroup.com/articles/ten-usability-heuristics/.

Moreno, Leonardo. 2021. “Fundamentals of Color in User Interface Design (UI).” *Medium*, https://uxdesign.cc/fundamentals-of-color-in-interface-design-ui-8127149f13e6.

Apple Inc. “Color - Foundations - Human Interface Guidelines - Design - Apple Developer,” n.d. https://developer.apple.com/design/human-interface-guidelines/foundations/color.

19 Glossary

Consistency - Consistency ensures that users do not have to learn different representations for each activity by limiting the number of ways actions and activities are represented.

Wireframe - A wireframe is a two-dimensional representation of a page's interface that focuses on the allocation of content space and priority, available features, and desired behaviors.

Learnability - Learnability takes into account how simple a task is for users to do the first time they use the interface as well as how many times it takes for them to become proficient at it.

Technology Stack – A software program such as a website or mobile app is built and run using a combination of tools and technologies called a tech stack which is composed of various layers.

Affinity mapping - is the process of arranging thoughts written on many sticky notes on a wall according to their similarities (affinities). You can draw conclusions and themes from these categories to successfully construct toward further levels.

QoL - also known as "*Quality of Life*", in the context of a mobile application, can be a measure of the overall sense of happiness and fulfillment that the user experiences while using the application.

Risk assessment - An analysis of what might occur if a risk materializes is done through the process of risk assessment.

Niche - a particular type of market for specialized products or services.

Co-Creation - In order to direct the design process, co-creation is the technique of working with other stakeholders. In facilitated workshops, participants with different responsibilities align and provide a range of insights.

Typography - Typography is the art of positioning letters and text so that the reader can easily read, understand, and find the material visually pleasing.

Color theory - is a body of rules and principles that designers employ to engage consumers through visually appealing color schemes in user interfaces. Designers employ a color wheel and comprehensively collected data about human optical ability, psychology, culture, and more to choose the ideal colors every time.

20 Appendix

Appendix A: User Survey Responses

The Q&A interview session was established from two points of view (Driver and Passenger) as shown below (Worksheet01 2023):

Driver's POV Q&A:

For the driver's POV, a user persona individual, *Supun Wickramasignhe*, was interviewed to establish answers to the questions that were derived to achieve specific user requirements for the application.

1. Tell me a bit about yourself.

I am Supun Wickramasignhe, I work as a marketing executive for a conglomerate in Colombo. Every morning at 8 am I leave my house at Baramulla and inside Colombo, I travel a lot and leave work at 6.

2. How open are you to the idea of carpooling?

Very open to the idea of carpooling as I have a 4 seated car where most of the time it's just me driving in it. So since there is extra space, I wouldn't mind assuming that the customers themselves are clean and professional. And I would love to have some company throughout my journey.

3. Have you used carpooling services before? If you have, how do you rate your experience?

I have not used any carpooling services before mainly because there aren't any accessible in Colombo at the moment that is up and running. The closest carpooling competitor of sorts would be Uber however, they are more taxi based than a carpooling application.

4. What factors usually influence your decision to carpool?

To reduce the individual trip cost, where the idea is that I can still get to go to my destination and still get paid for it or perhaps let somebody chip in for the fuel cost especially considering the fuel prices have been hyped in recent times which excites me and considering the 20 liters for fuel refill per quota is unfair and is better to offer rides to other people.

5. If you've been allowed to turn your day-to-day drives into carpools, roughly how many passengers are you comfortable carpooling with?

Since it's a 4 seated car, I would be comfortable with taking 2 more people because more often than not people also have bags and backpacks where we can use the extra seat to keep the bags so that everyone is comfortable in the car.

6. What sort of information/details would you prefer to know about potential carpooling passengers before hosting rides?

I would like to know what their past experiences are like, and I want to know if they are 5-star-rated people or 3-star-rated people that generally gives me an idea as to whether or not to accept them to my car because I do not want my early morning to be unpleasant. And as long as they are rated fine by their peers I would be fine as well.

7. What is your preferred method of receiving notifications about ride requests, updates, and cancellations?

I would prefer in-app updates so that it populates my notification bar because when I drive to work sometimes I connect my phone to my car using Bluetooth so all the notifications can be heard. Just in-app notifications would be fine.

8. What sort of driving atmosphere are you comfortable with? - Do you prefer to drive in silence or do you prefer to converse with your co-riders as you reach your destination?

I think it depends on the conversations. There are sometimes I would prefer to drive in silence and other times to talk but I think I would lean towards talking because I generally love to keep up conversations as I am an outgoing person.

9. How transparent do you want the ride fare distribution to be and what commission do you think is reasonable for the carpooling app to charge?

I wouldn't be too considerate about how much the cut is. Ideally, I think the large fair of the fee should come towards me as opposed to the ride-sharing application. But I'm not that concerned with the payment as it's nothing much to drop a person off on my way to work from home. But for obvious reasons, I would require the lion's share of the fare to come towards me, preferably about 70%.

10. How do you feel about carpooling with strangers, and what measures do you take to ensure your safety and security during a ride?

I think this has changed drastically from 10 years ago. And I think apps, like Pick Me and Uber kind of have broken down the stigma of letting strangers get into your car and Colombo, is relatively a safe city. But since I'm sharing rides in the morning commute it doesn't matter for me.

11. How would you handle customer feedback/complaints/unexpected situations/emergencies/canceled rides?

Feedback/ complaints - If there is a complaint, I would be okay to amend it because that can affect my future rides as well. Unexpected situations/emergencies/canceled rides - I think I wouldn't be too annoyed at people canceling rides because as I said I am anyway going toward my destination so it doesn't bother me when somebody cancels the ride because I am not going out of my way.

12. Are you willing to share rides during peak hours/manage your carpooling schedule alongside your personal and professional commitments?

I wouldn't mind but that kind of depends on where the locations of the pick-ups are and I'm assuming I can see where the longest detour is. I would be okay with dropping off people during peak hours because it would be the office crowd which I think is the best people to get along with.

13. What factors influence your availability?

I have to anyways show up for work and go back home between 8 am and 6 pm. But during office hours I might go out to meet clients entails maybe close to 10km or 15km and anyone during this time, I would like to give a ride as well assuming I'm not taking another sales executive with me.

14. How do you maintain your vehicle, and what expectations do you have for the cleanliness and the condition of passenger cars?

I take extremely good care of my car and I think hygiene is extremely important or else it can affect not only me but the other riders too so strictly no smoking, etc.

Passenger's POV Questions:

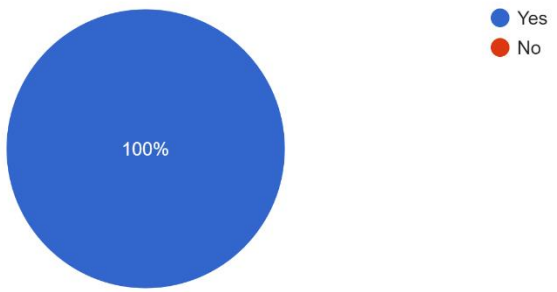
1. Tell me a bit about yourself. (student, undergraduate, working, parent, other)
2. What are your current preferred modes of transport? How often do you use these transportation methods?
3. Roughly how much do you spend on transportation per week?
4. Roughly how long is your everyday commute?
5. On a scale of 1-5, can you rate your satisfaction with the current mode of transportation? (1 is not satisfactory, 5 being very satisfactory)
6. On a scale of 1-5, how willing are you to share a ride with your colleagues to your workplace or destination (1 being least willing, 5 being most willing)?
7. On a scale of 1-5, how willing are you about sending your children to school in another parent's vehicle (1 being least willing, 5 being most willing)?
8. How important is safety to you when using a carpooling service? And what safety features do you wish the app to provide?
9. As a passenger, what are some features that you think are important and useful in a carpooling application, and what are some of the features you find unnecessary or inconvenient?
10. Do you want a communication panel to be implemented with other users who are on the ride to get current information? Y/N
11. How often would you use this application if installed on your mobile device?

How much would you be willing to pay monthly for a car-pooling application?

A Google / User survey was performed to acquire information regarding the user and system requirements of the system. In the below section the survey questions with their responses are shown:

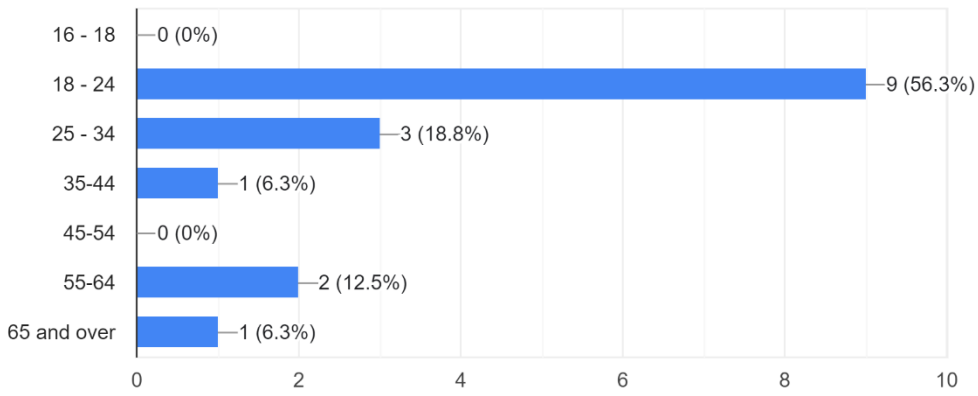
Are you 16 years of age or above?

16 responses



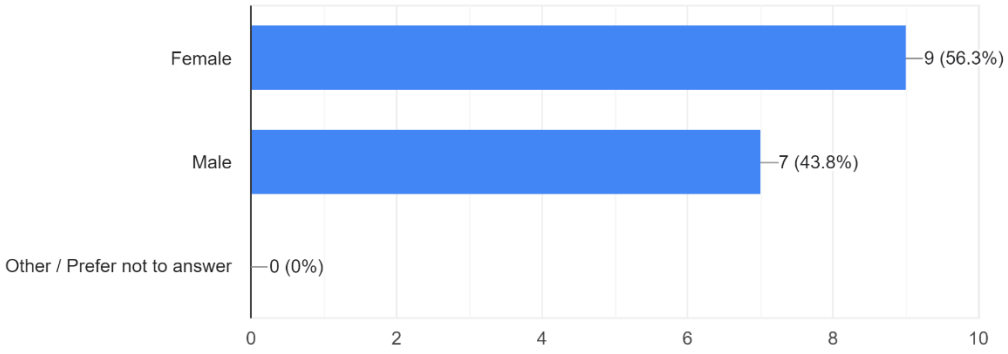
How old are you?

16 responses



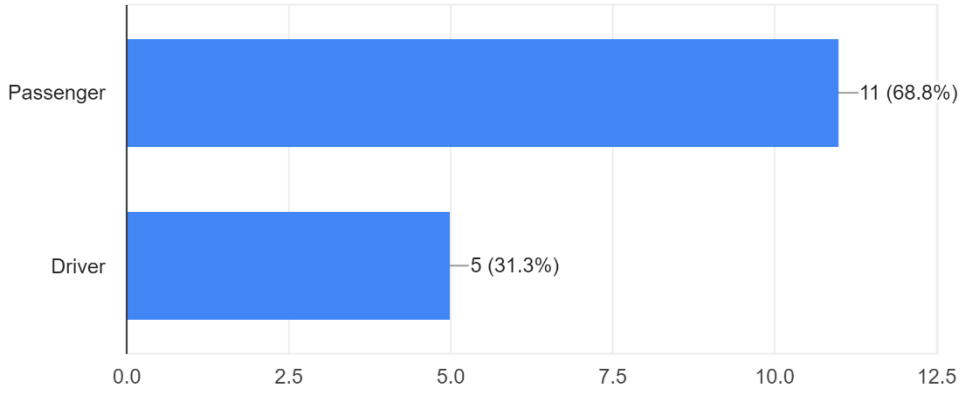
Gender

16 responses



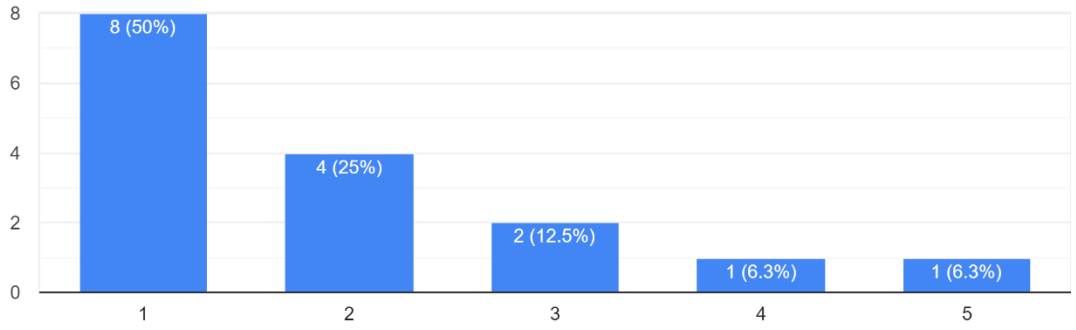
Will you be using a carpooling application primarily as a passenger (requests a carpool) or a driver (offers a carpool)?

16 responses



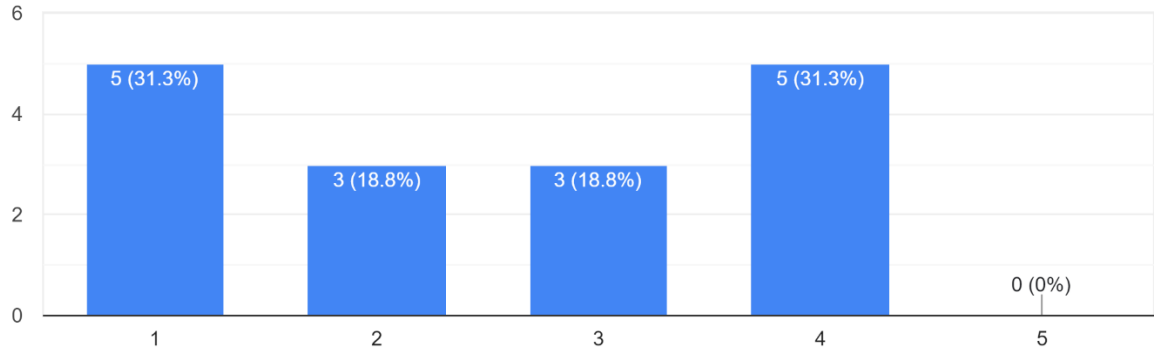
On a scale of 1 to 5, How familiar are you with ridesharing/carpooling mobile applications

16 responses



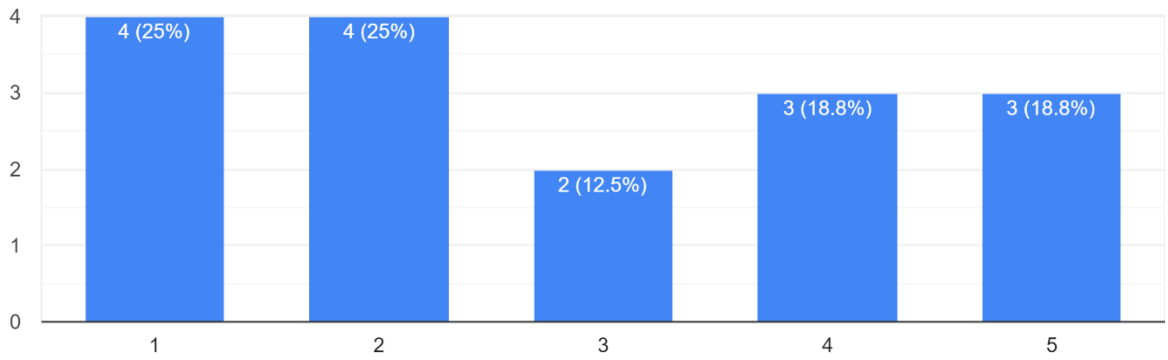
On a scale of 1 to 5, How comfortable would you be receiving a lift from /providing a lift to a stranger?

16 responses



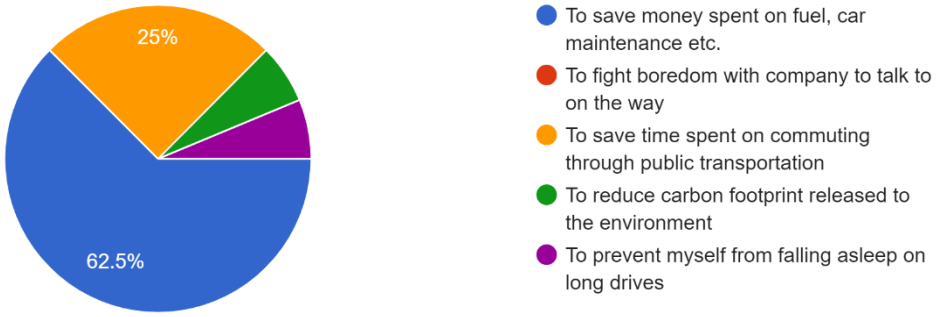
On a scale of 1 to 5, How likely would you be willing to try out a carpooling service?

16 responses



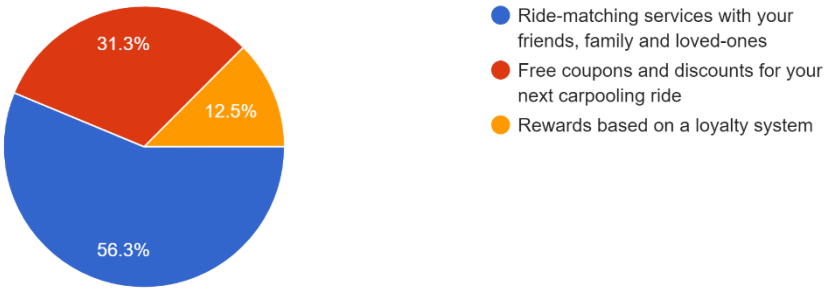
What would be your primary motivation for trying out a carpooling application?

16 responses



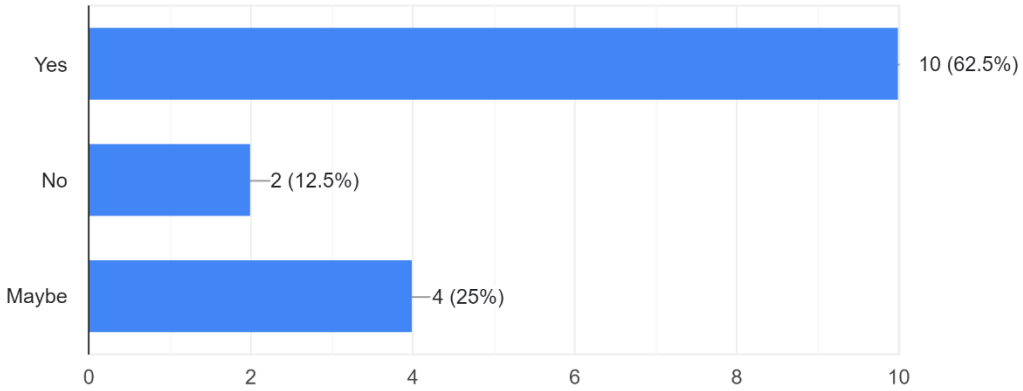
What could mostly influence your decision to carpool more frequently through a mobile application?

16 responses



Would reduced carbon footprint encourage you to use carpool?

16 responses



In your opinion, what improvements or changes could make carpooling more appealing and accessible for more people?

16 responses

- creating women-only carpooling options
- Vetting all users thoroughly so that safety of users can be ensured
- I dont know
- Speed comfort and affordability
- Proper background vetting of the drivers
- If it was readily available
- Standard Rate per Km
- No
- A carpooling community around the world

Safety measures

Accessibility options for blind people within the app

If carpooling was safer (that is instead of with strangers they reccomend friends or friends of friends)

introduce a community feature to help connect with other users

safety measures that ensures secure lifts

If the drivers also get some more advantages from carpooling

A good user experience on the app: it should show where the car is at all times and give estimates on when you need to be ready by, only wait for other people for a short duration, show where everyone is being picked up and dropped off and rough estimates of time

Have you ever had any notable negative experiences using a carpooling service? If yes, please elaborate.

11 responses

No

No

Personaly not a fan of ride sharing unless its someone I know

Have never used a carpooling service before

no

nope

Have not used previously

Taking necessary safety measures is important in a carpool to ensure a comfortable ride for everyone.

What security features are you looking for in a carpool application?

13 responses

ride sharing

A review feature for every driver and rider
A service which informs police whenever a user rings a danger alarm

The rides sharing app having full closure about the driver and all user data considered safe from the drivers end.

Emergency contact
Details of the ride and it's participants

Copy of ID of the passenger before enjoying the facility

Don't know

Driver details are correctly provided for the user to refer

Driver vehicle options available with their route details

Making sure the other passengers/driver are responsible and safe people. Perhaps consider whether they would prefer travelling with same gender. Letting them chat for a bit before choosing the people they will carpool with. Having a proper security/identity check beforehand so that people are more responsible. Maybe also check preferences such as age etc. Make sure there is a proper procedure if the ride seems dangerous.

making reviews the fellow passengers got visible to all in the ride
report and reach customer support easily

ability to share my location with loved ones

Ability to know whether passengers are safe to drive with. Knwing that you would get compensated if they damage your vehicle. Being able to talk to them prior to the carpool
Being able to maintain certain restrictions according to drivers/car owners preference (eg no eating messy food inside the car, no consuming liqour etc). Ability to know beforehand how much the petrol cost would be spilt etc.

Not too much "security", mostly the standard reviewing system so that you can see whether the rideshare you are considering has ppl who have received bad reviews

Research Participation Agreement– between the user (Supun Wickramasignhe and Team FourGUIs) for the interview conducted.

TEAM FOURGUIs (Group SLIIT_12) RESEARCH PARTICIPATION AGREEMENT

This Research Participation Agreement ("Agreement") is between **Team FourGUIs** ("**COMPANY NAME**", "us", "our") and **Supun Wickramasignhe** ("Participant", "you", "your").

We are carrying out qualitative research on our mobile application (iOS) in order to gain insights into how users engage with our application and us as an organization.

This research will be conducted by our UX Research resource **Kasundi Bandaranakaye.**

In consideration of your agreeing to participate in the Research, **Team FourGUIs** and you agree as follows:

1. **Information collected during Research;** **Team FourGUIs** may record you in any format during the Research, including recording your use of our website or services, measurements, eye movements, answers, communications, and voice through any means, including without limitation, audio, video, photography, and screen captures ("Recordings"). In addition to your information collected via Recordings, **Team FourGUIs** may also collect your information, including your name, age, gender, address, email address, phone number, opinions, response to Research questions, and personal background (this additional information, along with the Recordings, will be collectively referred to as "Personal Information").

2. **How do we use this information;** The information gotten from this research will be used to improve the current experience and interface of our website and products.

3. **Ownership of Recordings and Research Data;** All information shared with us will be treated with care according to our information security policy. We will also welcome any request to delete your information if you feel uncomfortable.

4. **Voluntary participation;** You understand that participation in this Research is entirely voluntary and that you may at any time choose to stop participating in the Research by using the contact information provided in this Agreement.

5. **Incentives;** The sum of {enter amount or incentive value} will be provided to you at the end of the research project. This is to appreciate you for the time spent and effort in assisting us with our research project.

By signing this Agreement and participating in Research, you agree to: (i) comply with the terms of this Agreement; (ii) provide true, correct, and complete information about yourself; and (iii) ensure that you engage with the Research in an honest, transparent, and good faith manner.

ACCEPTED & AGREED;

I have read and understood this Agreement. I agree to participate in the Research in accordance with this Agreement.

PARTICIPANT'S NAME: Supun Wickramasignhe

EMAIL: supunwickramasignhe26@gmail.com

SIGNATURE: *supun wickramasignhe*

DATE: 12th March 2023

Research Participation Agreement– between the user Odara Ovindi Chandrasena and Team FourGUIs for user feedback regarding the high prototypes.

TEAM FOURGUIs (Group SLIIT_12) RESEARCH PARTICIPATION AGREEMENT

This Research Participation Agreement ("Agreement") is between **Team FourGUIs** ("**COMPANY NAME**", "us", "our") and **Odara Ovindi Chandrasena** ("Participant", "you", "your").

We are carrying out qualitative research on our mobile application (iOS) in order to gain insights into how users engage with our application and us as an organization.

This research will be conducted by our UX Research resource **Kasundi Bandaranakaye.**

In consideration of your agreeing to participate in the Research, **Team FourGUIs** and you agree as follows:

1. **Information collected during Research;** **Team FourGUIs** may record you in any format during the Research, including recording your use of our website or services, measurements, eye movements, answers, communications, and voice through any means, including without limitation, audio, video, photography, and screen captures ("Recordings"). In addition to your information collected via Recordings, **Team FourGUIs** may also collect your information, including your name, age, gender, address, email address, phone number, opinions, response to Research questions, and personal background (this additional information, along with the Recordings, will be collectively referred to as "Personal Information").

2. **How do we use this information;** The information gotten from this research will be used to improve the current experience and interface of our website and products.

3. **Ownership of Recordings and Research Data;** All information shared with us will be treated with care according to our information security policy. We will also welcome any request to delete your information if you feel uncomfortable.

4. **Voluntary participation;** You understand that participation in this Research is entirely voluntary and that you may at any time choose to stop participating in the Research by using the contact information provided in this Agreement.

5. **Incentives;** The sum of {enter amount or incentive value} will be provided to you at the end of the research project. This is to appreciate you for the time spent and effort in assisting us with our research project.

By signing this Agreement and participating in Research, you agree to: (i) comply with the terms of this Agreement; (ii) provide true, correct, and complete information about yourself; and (iii) ensure that you engage with the Research in an honest, transparent, and good faith manner.

ACCEPTED & AGREED;

I have read and understood this Agreement. I agree to participate in the Research in accordance with this Agreement.

PARTICIPANT'S NAME: Odara Ovindu Chandrasena

EMAIL: odaraovindu78@gmail.com

SIGNATURE: *odara chandrasena*

DATE: 15th April 2023

Appendix B: ChatGPT

Nothing was referred from ChatGPT.

Appendix C: Expert Review

Team number/name: **SLIIT_01 /Code Monkeys** Tute day/time: Tuesday 10am

Project no. / name: **Earthly** Tutor:

Student	Name	Number	Role
1	Kalindu Abesinghe	20785947	Project Manager
2	Gimantha Karunasekara	20521031	Team Lead
3	Kalana Tharusha	20783462	UI/UX Designer
4	Vinuk Atukorala	20806039	QA Officer

Date: 17/04/2023

	Usability strength or weakness	**What type of heuristic is applicable?** • **Usability heuristics** • **Design principles** • **Visual design fundamentals** • **Other (content, navigation)**	**Describe the issue you are reviewing.**	**Severity** • **High** • **Med** • **low**	**Recommendation (Clear recommendation on how to address issue)** • **Fix** • **Investigate** • **Usability testing** • **User research**	**Best practise example (link to an example or reference)**
1	Strength	Visual Design Fundamentals	Understandable UI in specific implementations (Sahas and Sanu)	Low	Usability Testing: to improve the UI in other	

					implementations	
2	Strength	Usability Heuristics	Easy to use date picker UI (Calendar)	Low	INVESTIGATE: Provide the option to enter the date manually instead of picking from the calendar as well	
3	Weakness	Usability Heuristics	Menu Icon - the icon provided is not a standard menu icon used globally	Med	FIX: Change the Menu icon to the Hamburger Menu icon	CLICK HERE TO VIEW THE EXAMPLE
4	Weakness	Usability Heuristics	Settings Icon - the icon used for settings is not used globally therefore making it hard to realise	Med	FIX: Change the Settings icon to the global standard icon which is a gear icon	CLICK HERE TO VIEW THE EXAMPLE
5	Weakness	Usability heuristic: Inconsistency among screens	Some screens have the profile Icon on top right of the screen, and Navigation drawer on top left, whereas some other screens use bottom navigation. Also, the bottom navigation bar is present in all the screens.	High	Fix: Have a consistent navigation pattern throughout the app. Either a navigation drawer or bottom navigation. Ideally, the bottom navigation bar is only present when the user is in the default page of each tab in the navigation bar	Bottom Navigation
6	Weakness	Visual design fundamentals: Layout spacing	Kasu - Buttons are spaces too close and cluttered hence making it harder for the user to click and navigate through the application	High	INVESTIGATE: change the button positions and sizes making it easy to access	
7	Strength	Design	Providing the option to pick a theme, or design custom	Med	USER RESEARCH: find statistics on	

		Principles	themes		how important this may be	
8	Weakness	Fundamentals of design: Layout Asymmetry	"Your finances", "Faq" and "Terms and Conditions" page have asymmetric heading comparative to their bodies	Med	FIX: Have a symmetric alignment of headings and their bodies in each screen.	Link

Appendix D: Meeting Minutes

The meeting minutes were recorded as follows on confluence:

[SP03] - 25/03/2023 (Weekly Scrum)

Meeting Objective	Weekly scrum for worksheet 03
Date	25/03/2023
Time	*9pm*
Platform	☐ Physical Meeting ☑ Google Meet
Attendees Present	☑ @Pramoda Gunarathne ☑ @Kasundi Bandaranayake ☑ @Sanugi Upenya Perera ☑ @Sahas Renuja Gunasekara
Notes	The requirements that were brainstormed during worksheet 2 completion was acquired and everyone worked on the user requirements and system requirements to cover the app. The non-fuctional requirements were also discovered and noted for the worksheet 03 submission. The team iterated the design thinking brainstorming section and ideate solutions during this process. 9:55pm - meeting dismissed.

All the *meeting minutes* are saved in the Google folder:

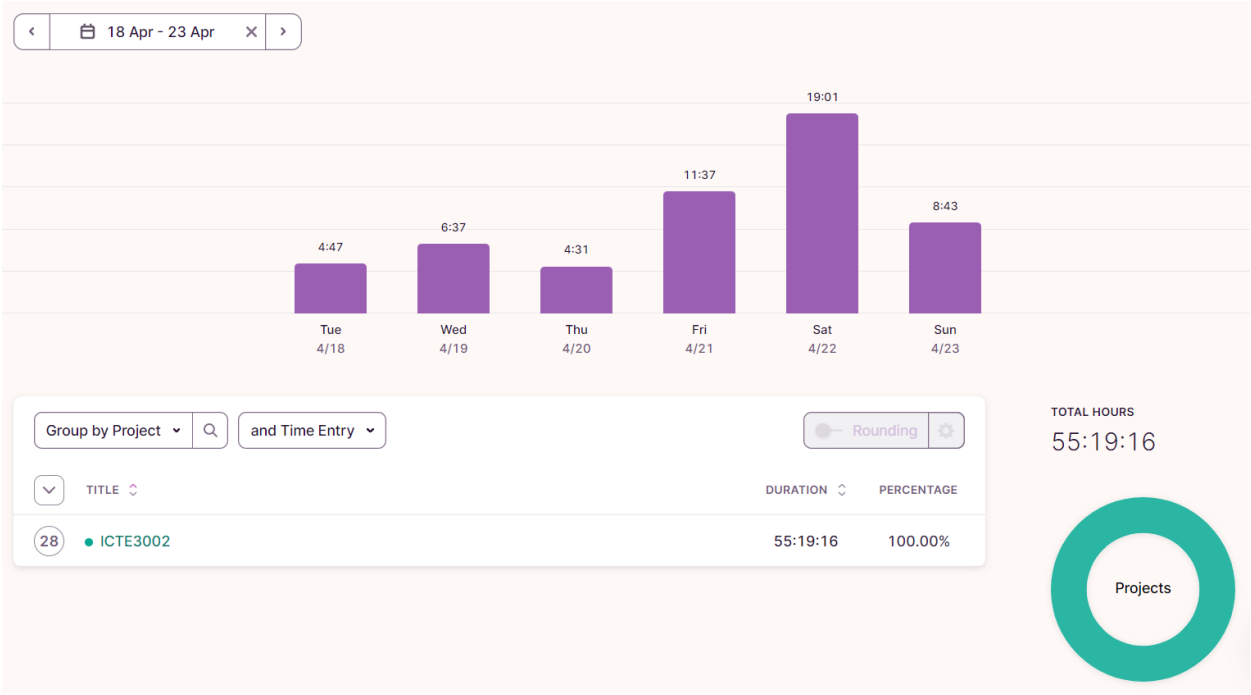
FourGUI's Meeting Space - Meeting Minutes

Link: Meeting Minutes Folder

Appendix E: Record Keeping

The following shows the *toggle time track* between sprint 01 to sprint 07, from March 1st to April 23rd:

The following shows the *toggle time track* of sprint 07 (April 18th to 23rd):



- The following link can give access to the *google docs* which were used for assignment 1:

FourGUI's Google Documents - Collaboration Work

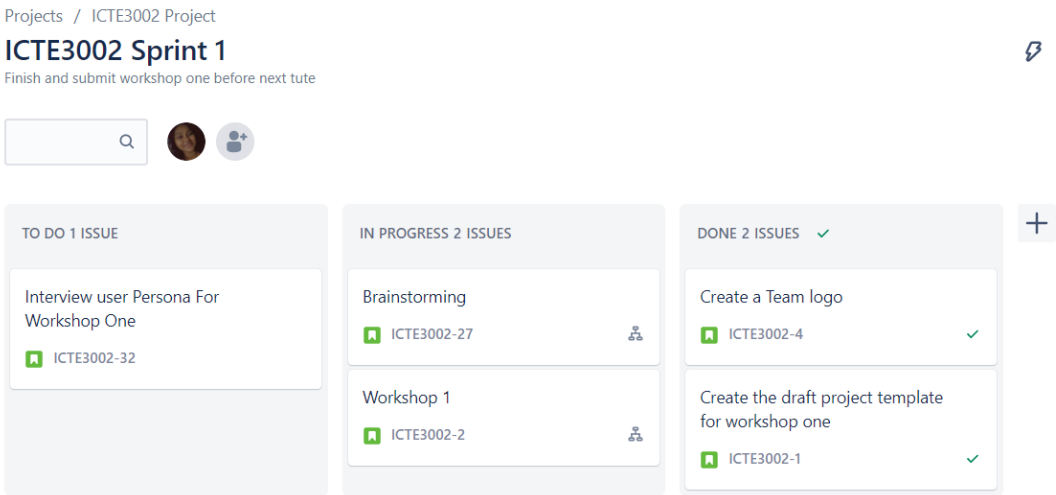
Link: [Google Docs - Collaboration Work]

- The following link can be used to gain access to the collaboration workspace (Confluence) where every member completed their work for assignment 1 collaboratively :

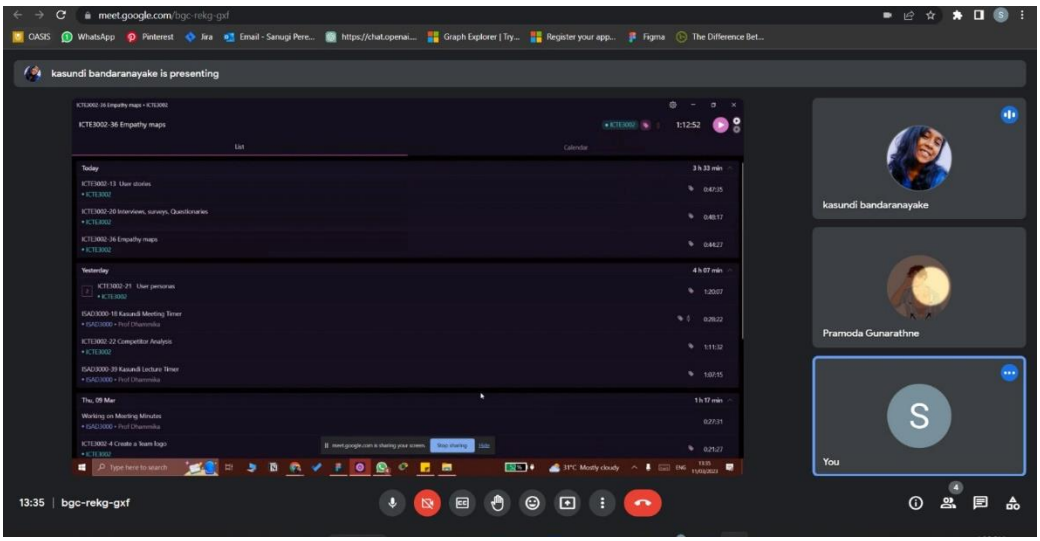
FourGUI's Confluence Workspace - Collaboration Work

Link: [Confluence Workspace - Collaboration Work]

- *Records of group work* (such as chat and screenshots during meetings)

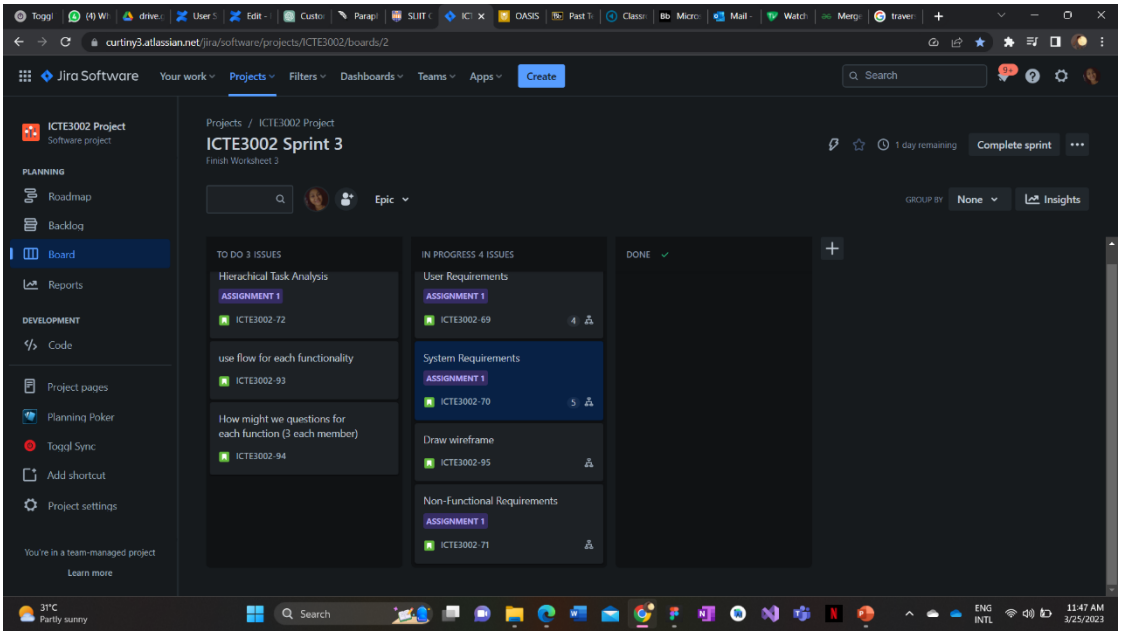


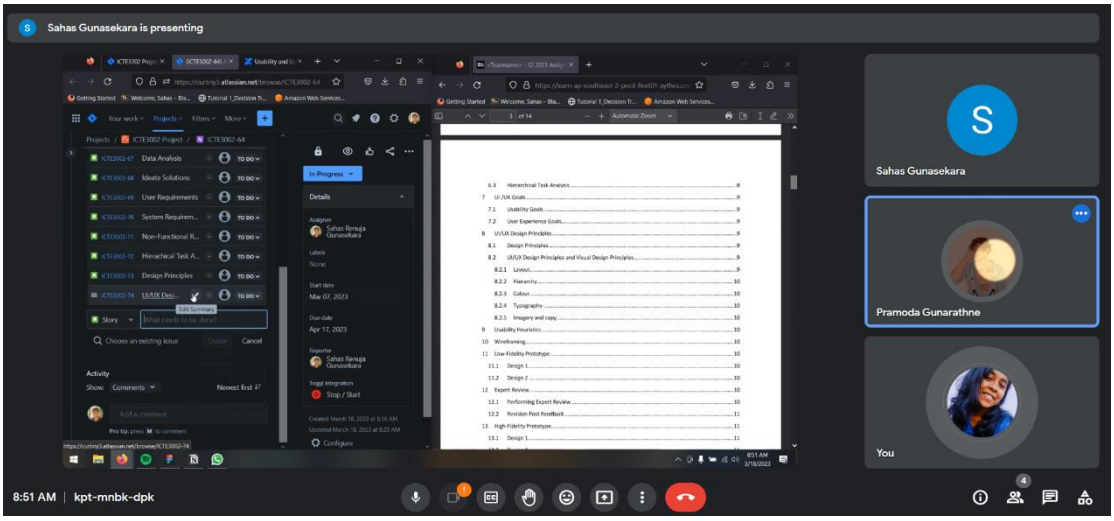
The Kanban board during 1st week of March



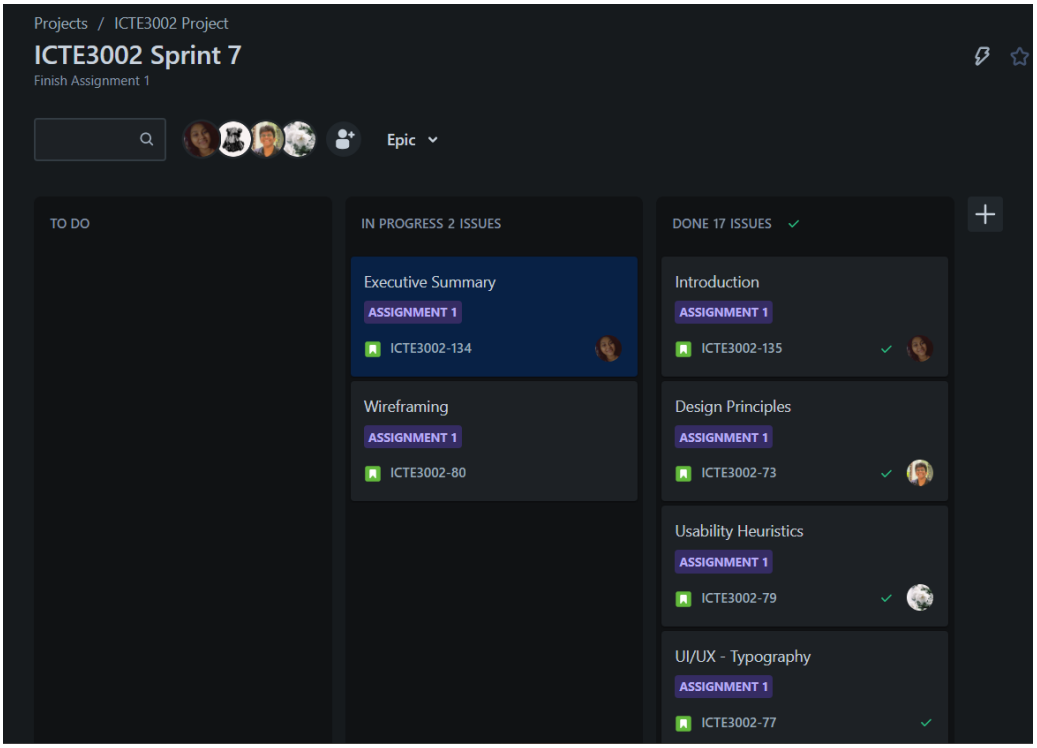
Shows the meeting for constructing the questions for the interview

Sprint 3- worksheet 3 completion on kanban board





Performing planning poker for assignment 1 tasks and creating the product backlog.



The Kanban board for sprint 7 (the last sprint before the assignment 1 deadline)

Appendix F: Contribution Table

Contribution Table

Section / Students	Pramoda Gunarathne	Harshi Kasundi Bandaranayake	Sahas Gunasekara	Sanugi Perera
Executive summary				
Introduction				
Background				
Software Engineering Lifecycle and Tools				
Design Thinking				
User-centric design				
User interviews, surveys, and questionnaires				
Data analysis				
User personas				
Empathy maps & user journeys				

User flows				
User stories & use case				
Competitor analysis				
Pain points – ideate solutions				
Requirements				
UI/UX goals				
UI/UX Design Principles				
Usability Heuristics				
Wireframes				
Low-fidelity prototypes				
Expert review				
High-fidelity prototypes				
Project Management				
Tech stack				
Conclusion				
Acknowledgments				
References & glossary				
Appendix				

Appendix G: Other teamwork evidence

- Link to the Google Form (Access is provided to view responses to the survey): Survey Link
- Results of the survey (Screenshots attached) - Survey Results - Google Drive
- Link to the recording of the feedback session - Recordings - Google Drive
- Link to the individual toggle reports of each member (for assignment 1 timeline i.e. 1st of March to 23rd of April) – Individual toggle reports
- Link to the 5-minute video of the product run-through – Product Demonstration

Appendix H: Figma Files

- Link to the Weekly Figjam board – **Caraoke FigJam**
- Link to the Design Thinking Figjam board – **Design Thinking FigJam**
- Figma link to the first iteration of low-fidelity prototypes – Low-fidelity prototypes
- Figma links to the final iteration of low-fidelity prototypes

  Rider's POV –Rider's POV

  Driver's POV – Driver's POV
- The link to the initial high-fidelity prototypes – High-fidelity prototype brainstorming
- The link to the first iteration is as follows - High-fidelity iteration one

  Rider's POV– Rider's POV

  Driver's POV – Driver's POV