SFWRENG 3A04
Group 5

Taxi Carpool Application
Deliverable 1

SE 3A04: Software Design II – Large System Design

1 Introduction

This document describes a Taxi Carpooling mobile application, integrated with an existing taxi company. This application will allow customers to share any existing taxi ride within any of the taxi company's vehicles, offering a carpool option to any nearby riders along the user's trip.

1.1 Purpose

The purpose of the SRS is to specify the requirements of a Taxi Carpooling mobile application that will allow customers to offer carpooling of their existing taxi rides, to other potential customers. The requirements specified outline the application's functions and limitations of its use, allowing customers to utilize the application to their benefit. The SRS is intended for the audience of the taxi company that is associated, and contracted by, to develop this application, integrating it with their own existing taxi system.

1.2 Scope

The application will utilize the following software products:

a) **Android Studio**: An IDE for building and test-running the Android application w/ Kotlin. Includes an Android Emulator for emulating Android **OS** devices for the application to run on.
b) **Google Maps API**: Map navigation **API** for finding the most efficient routes between pickup and dropoff destinations of each rider
c) **Google Cloud Platform**: Cloud computing service to allow the application to utilize Google's **APIs**
d) **Payment Gateway Provider**: Payment service for riders to make payment transactions to the Taxi company

The application allows for carpooling within existing Taxis, allowing for many positive benefits, such as reducing impact to the environment, convenience, cheaper travel for users that do not wish to pay for gas or parking, faster travel on **HOV** lanes, and safer travel, as taxi drivers are background-checked employees of the taxi company.

The objective of the application is to attract more customers by offering a carpooling option to users' existing taxi rides, minimizing the cost of their taxi fare, and providing carpooling options to other riders nearby. It also provides a safe option for riders to transit between two locations.

The carpool app must be able to run on an Android platform.

1.3 Definitions, Acronyms, and Abbreviations

a) Provide the definitions of all terms, acronyms, and abbreviations required to properly interpret the SRS

- **API:** Application program interface.
- **OS:** Operating system.
- **15-minute constraint:** The 15-minute constraint refers to the maximum amount of time that could be added to the full duration of the full trip.
- **HOV:** High-occupancy vehicle
- **DOB:** Date of Birth
- **PIPEDA**: Personal Information Protection and Electronic Documents Act
- **AODA**: Accessibility for Ontarians with Disability Act

1.4 References

[1] "Riding solo: What age should a child take transit alone? | Globalnews.ca," *Global News*. https://globalnews.ca/news/3721156/children-taking-transit-alone/ (accessed Feb. 20, 2023).

[2] "Legal Gambling Age in Canada - How Old to Gamble in CA?" https://www.onlinegambling.ca/guides/gambling.php (accessed Feb. 20, 2023).

[3] "Taxis and Limousines," *City of Toronto*, Nov. 19, 2017. https://www.toronto.ca/city-government/public-notices-bylaws/bylaw-enforcement/taxis-and-limousines/ (accessed Feb. 26, 2023).

[4] O. of the P. C. of Canada, "PIPEDA in brief," Jan. 09, 2018. https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/pipeda_brief/ (accessed Feb. 26, 2023).

[5] "Toronto Taxi | Co-op Cabs." https://co-opcabs.com/what-are-the-standard-rates-to-hire-a-taxi-in-toronto/ (accessed Mar. 13, 2023).

1.5 Overview

The document contains the overall functions to the application, including any constraints and assumptions that were made. User interactions with the application are described both visually and textually, describing each possible interaction that riders can perform with the application to offer and request a taxi carpooling from the system. All non-functional requirement specifications of the application are noted at the end of the document.

2 Overall Description

This section of the SRS should describe the general factors that affect the product and its requirements. It does not state specific requirements; it provides a background for those requirements and makes them easier to understand.

2.1 Product Perspective

Similar to ride-sharing applications such as Uber and Lyft, the product is an application which allows users to carpool with other riders, specifically others who are not known to each other. However, this product is specific to those who are riding with a taxi service. A main rider who starts the ride can offer carpools to other riders, and riders can request to carpool with a main rider going to the same destination. As an addition to regular taxi service, the carpooling is completely optional to the taxi rider, and available to them if they wish to reduce their taxi fare payment.

2.2 Product Functions

The main function of the app is users being able to request and offer carpools with other riders. The rider that starts the ride (the main rider) can offer carpools to other riders requesting a carpool. Users can rate other riders that they carpool with, so other users can decide if they want to carpool with certain riders. Users can also view the amount that they need to pay on the app.

In addition, users can sign up for an account, as well as sign into that account through the app so that users can keep track of their information. Users can update the information on their account at any time. Users can also delete their accounts if they wish to do so.

Lastly, users can join a coin flip "challenge" with other riders through the app for the chance to change their paying fee. The winning rider will have their fee lowered, while losing riders have their fee raised by the same amount, split evenly among the losing riders.

2.3 User Characteristics

A user is any person with the product installed on a compatible smartphone. There are two types of users: main riders who start the ride and offer carpools to other riders, and carpool riders who request to carpool with a main rider.

2.4 Constraints

The application must run on all supported Android **OS** versions, and interface with the Google Maps **API**. The budget for developing the app, excluding server costs and cost to keep the app hosted on the Google Play Store, is $0.

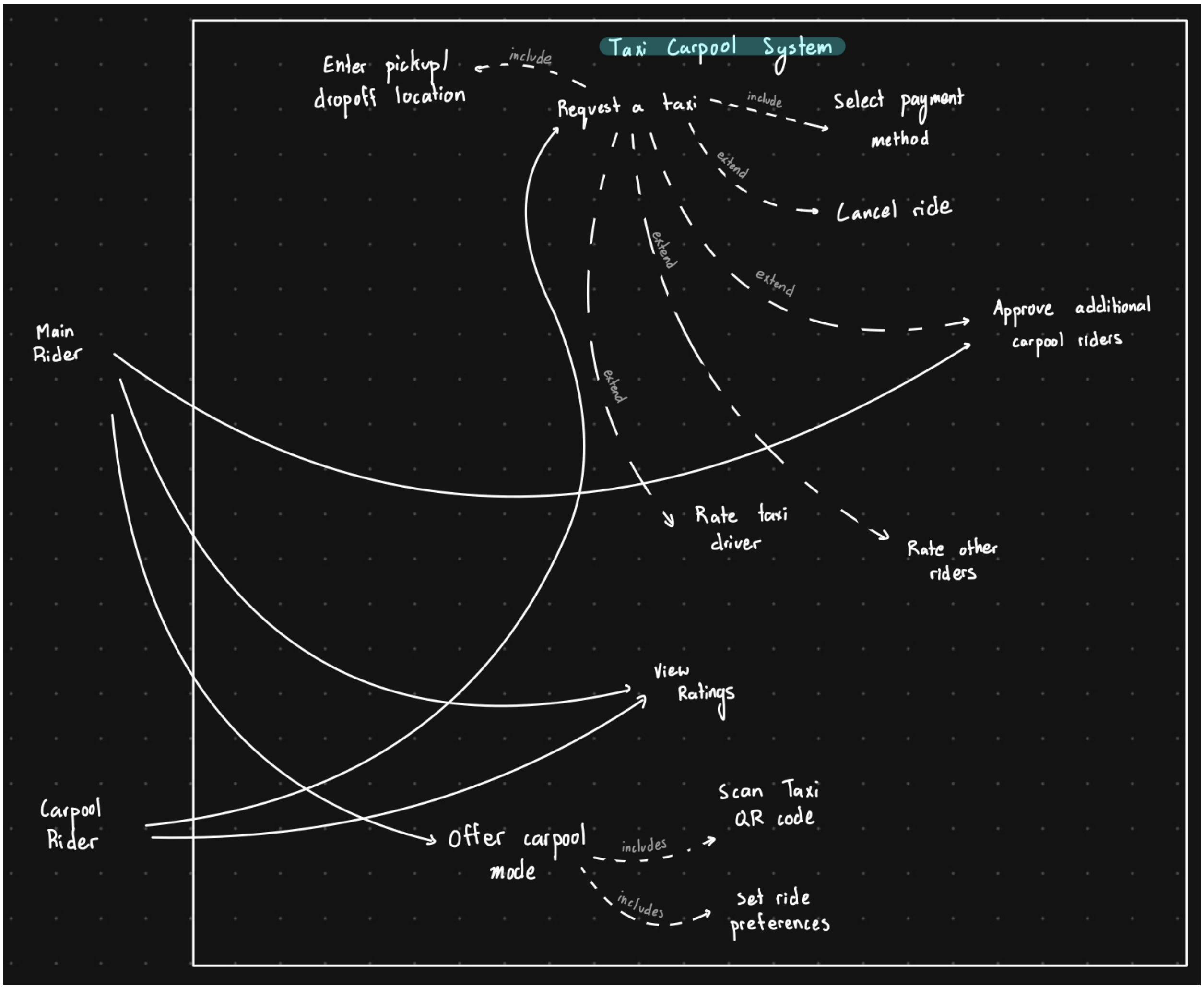
2.5 Assumptions and Dependencies

The product will be able to run on supported Android **OS** versions, and will be downloadable on the Google Play Store. It is assumed that only riders will have access to the product, and riders will pay for their ride in cash.

2.6 Apportioning of Requirements

Some features that may be delayed to future versions of the product include discount offers and coupon codes for rides, discounted fares on certain days such as holidays, booking rides for others, memberships or periodic subscriptions, sharing ride statuses with others for safety purposes, and a gift card system. Support for devices using iOS may be introduced in the future as well.

3 Use Case Diagram



4 Highlights of Functional Requirements

List of Viewpoints:

- Cab driver
- Main rider (App user)
- Carpool riders (App user)

BE1. User signs up to create a rider account

VP1.1 App User

S1: The system prompts the user to enter their personal information

E1: User enters their personal information

S2: System validates this information

S2.1: If validation fails, the system indicates that there is a failure and that the user must re-enter syntactically correct/non-conflicting information.

E2.1 The user enters their correct information.

S2.2 If verification does not fail, the system prompts the user to continue verification.

E2.2 The user continues the two factor verification.

S3: System sends a code to the user and prompts the user to enter code.

E3: User enters code.

S4: System validates verification code

S4.1:If successful, the system redirects the user to the main menu and the user gains the ability to log in to access the app's full features. End Scenario

S4.2 If validation fails, the system indicates a failure and tells the user to start the entire process again.

VP1.2 Taxi Driver

Void

Global Scenario:

S1: The system prompts the user to enter their personal information

E1: User enters their personal information

S2: System validates this information

S2.1: If validation fails, the system indicates that there is a failure and that the user must re-enter syntactically correct/non-conflicting information.

E2.1 The user enters their correct information.

S2.2 If verification does not fail, the system prompts the user to continue verification.

E2.2 The user continues the two factor verification.

S3: System sends a code to the user and prompts the user to enter code.

E3: User enters code.

S4: System validates verification code

S4.1:If successful, the system redirects the user to the main menu and the user gains the ability to log in to access the app's full features. End Scenario

S4.2 If validation fails, the system indicates a failure and tells the user to start the entire process again.

BE2. User signs in to their account to use the app

VP2.1 App User

S1: System prompts the user to enter log in information.

E1: User enters log in information.

S2: System validates the login information.

S2.1: If the system receives the correct information, it grants user access to the full environment of the app. End Scenario

S2.2: If system receives the wrong login information, system will display that the information is incorrect and return to the main menu. End Scenario

VP2.2 Taxi Driver

Void

Global Scenario:

S1: System prompts the user to enter log in information.

E1: User enters log in information.

S2: System validates the login information.

S2.1: If the system receives the correct information, it grants user access to the full environment of the app. End Scenario

S2.2: If system receives the wrong login information, system will display that the information is incorrect and return to the main menu. End Scenario

BE3. User offers taxi carpool

VP3.1 Main Rider

S1: System prompts the user to enter the number of passengers and the destination.

E1: User enters the number of passengers and destination.

S2: System prompts the user for QR code or the taxi number.

E2: Users will either scan the QR code or enter the taxi number.

S3: System updates the status of the taxi which will be displayed on each potential rider's interface, showing an active carpool rider and will wait for another user to request a taxi carpool ride that will satisfy the requirements.

S3.1: System finds a user that has confirmed a taxi carpool ride that fits the 15 minute total time duration constraint and sends the trip info (estimated arrival time, number of seats required ,updated fee) to the main rider.

S3.2: System finds a user that has requested a taxi carpool when there's only 2 minutes remaining of the trip. End Scenario

S3.3: System does not find a user that has requested a taxi carpool within the duration of the whole trip. End Scenario

E3: The rider will respond to the carpool rider's request by either approving or declining the request.

S4: If the main rider approves, the system will share the main rider's approval with the carpool rider and the taxi driver.

S4.1: The system receives the carpool rider's confirmation of the trip as well and the trip status is shared with the taxi driver, main rider, and carpool rider with all the updated trip information (updated fee, names, destinations, estimated arrival time).

S4.2: The system receives the carpool rider's decline of the trip and redirects the user back to the selection page of the possible trips.

VP3.2 Taxi Driver

S1: The system will notify the driver that the rider has offered taxi carpool mode.

E1: The driver will await further instructions on whether a match has been found or not.

S2: The system will share the status of the match making with the driver.

S2.1: The system successfully received the confirmation from both the main rider and the joining carpool rider and will now share the trip status with the user.

S2.2: The system did not receive a successful match between the main rider and carpool riders.

VP3.3 Carpool Rider

S1: Upon selection of the main rider for the trip, the system will send a confirmation request to the carpool rider.

E1: The carpool rider will take a look at the trip details and will decide whether to accept or decline the trip.

S2: The system will share the carpool rider's response with the main rider.

Global Scenario:

S1: System prompts the user to enter the number of passengers and the destination.

E1: User enters the number of passengers and destination.

S2: System prompts the user for QR code or the taxi number.

E2: Users will either scan the QR code or enter the taxi number.

S3: System updates the status of the taxi which will be displayed on each potential rider's interface, showing an active carpool rider and will wait for another user to request a taxi carpool ride that will satisfy the requirements.

S3.1: System finds a user that has requested a taxi carpool ride that fits the 15 minute total time duration constraint and sends the trip info (estimated arrival time, number of seats required ,updated fee) with the main rider.

S3.2: System finds a user that has requested a taxi carpool when there's only 2 minutes remaining of the trip. End Scenario

S3.3: System does not find a user that has requested a taxi carpool within the duration of the whole trip. End Scenario

E3: The rider will select a trip that they want to take amongst the list of presented options.

S4: The system will share the main rider's approval with the carpool rider and the taxi driver and will await for the carpool rider's confirmation.

S4.1: The system receives the carpool rider's confirmation of the trip as well and the trip status is shared with the taxi driver, main rider, and carpool rider with all the updated trip information (updated fee, names, destinations, estimated arrival time).

S4.2: The system receives the carpool rider's decline of the trip and redirects the user back to the selection page of the possible trips.

BE4. User request Taxi Carpool

VP4.1 Carpool rider

S1: System will prompt the user to enter the pick up location.

E1: User will enter pick up location and select confirm.

S2: System will prompt the user to enter the destination location and could also modify the search criteria (sort by lower price, highest price, lowest rating, highest rating, shortest duration, longest duration).

E2: User will enter the destination location and could also modify the search criteria and select confirm.

S3: System will search for an active carpool driver that will add a maximum amount of 15 minutes to the total duration of the trip in order of the highest rating.

S3.1: System searches for drivers that satisfy the 15 minutes maximum constraint and sends the taxi's information (destination and estimated time of arrival) to the user.

S3.2: System does not find any active carpool driver that fits the requirement and sends out a request to the next driver that has the closest extra time duration to the requirement. The system will then send out a request to the main rider to accept the extra time duration.

S3.2.1: The system receives the main rider’s approval and sends out the taxi’s information (destination and estimated time of arrival) to the user.

S3.2.2: The system receives the main rider’s rejection. End Scenario

S3.3: System does not find any active carpool drivers that fit the requirements and no other drivers that are close to the 15 minutes time constraint. End Scenario

E3: The user will select a ride between the available options that are presented by the system.

S4: The system will send out a request to the main rider that someone requested this ride.

S4.1: The System will return the main rider’s confirmation and the user will receive the elected driver’s information (live location, plate number, model, color, driver’s name, driver’s portrait) and estimated time of arrival.

S4.2: The System will return the main rider’s decline offer and will redirect the user to select another ride until approval.

E4: The user will have access to the driver’s information (live location, plate number, model, color, driver’s name, driver’s portrait) and estimated time of arrival.

E4.1: The user enters the taxi when it arrives.

E4.2: The user cancels the taxi ride prior to entering the car.

S5: The system updates the user’s trip status based on its previous response.

S5.1: If the user continues the trip, the system will send the user the live location, and estimated arrival time.

S5.2: If the user cancels the trip, the system will abort the trip and send a cancellation to both the drivers and carpool riders.

VP4.2 Main rider

S1: The system will receive an update on their “offer a carpool” mode

S1.1: The system will send the taxi’s potential new path and the updated fee to the rider if they are within the time constraint of adding a maximum amount of 15 minutes total time duration.

S1.2: The system will send a request to the user if the carpool rider’s not within the time constraint but is the closest rider that adds to the total duration of the trip.

E1.2: The user will respond to the request

E1.2.1: The user will accept the request and the discount fee.

E1.2.2: the user will reject the request and the discount fee.

S2.1: The system will respond to the user's request

S2.1.1: The system will send the driver's info to the main rider if the user accepted the request

S2.1.2: The system will not send any information to the main rider if the user accepted the request

VP4.3 Taxi Driver

S1: Upon the user's confirmation on starting the trip after E3 of VP3.1, the system will send out the user's info (name, phone number, and pick up location) to the driver.

Global Scenario:

S1: The system will prompt the user to enter the pickup and destination location and the search criteria.

E1: User will enter the address and could also modify the search criteria and will select confirm.

S2: System will search for an active carpool driver that will add a maximum amount of 15 minutes to the total duration of the trip in order of the highest rating.

S2.1: System finds drivers that satisfy the 15 minutes maximum constraint and sends the drivers' information to the user.

S2.2: System does not find any active carpool driver that fits the requirement and sends out a request to the next driver that has the closest extra time duration to the requirement. The system will then send out a request to the main rider to accept the extra time duration.

S2.2.1.1: The system receives the main rider's approval and sends out the driver's information to the user and the approval of the ride to the taxi driver.

S2.2.1.2: The system receives the main rider's rejection. End Scenario

S2.3: System does not find any active carpool drivers that fit the requirements and no other drivers that are close to the 15 minutes time constraint. End Scenario

E2: The user will select a ride between the available options that are presented by the system.

S3: The system will send out a request to the main rider that someone requested this ride.

S3.1: The System will return the main rider's confirmation and the user will receive the elected driver's information (live location, plate number, model, color, driver's name, driver's portrait) and estimated time of arrival.

S3.2: The System will return the main rider's decline offer and will redirect the user to select another ride until approval.

E3: The user will have access to the driver's information (live location, plate number, model, color, driver's name, driver's portrait) and estimated time of arrival.

E4: The user will have access to the driver's information (live location, plate number, model, color, driver's name, driver's portrait) and estimated time of arrival and the main rider and taxi driver will have access to the updated trip's status.

E4.1: The user enters the taxi when it arrives.

E4.2: The user cancels the taxi ride prior to entering the car.

S5: The system updates the user’s trip status based on its previous response.

S5.1: If the user continues the trip, the system will send the user the live location, and estimated arrival time.

S5.2: If the user cancels the trip, the system will abort the trip and send a cancellation to both the drivers and carpool riders.

BE5. User selects start challenge to change their paying fee

VP5.1 App User

S1: The system will send out a request including a challenge price of $1 per player to the other riders that are currently inside the car which will last for 30 seconds.

E1: The user awaits for responses within the time constraint.

S2: The system will send the responses back to the user.

S2.1: One or more of the other riders accept the request, and they will be redirected to the game environment.

S2.2: None of the users accept the challenge and will send the user a message that no participants are in the challenge. End Scenario

E2: The main challenger will now select the options between “head” or “tails”.

S3: The system will implement a random algorithm to select between head or tails. The system will then return the result.

E3: The user can now see the result of the coin toss and the winners and losers of the challenge.

S4: The system will now distribute the challenge fee between the losers and winners equally. (If three riders lose the amount of $3, they will each pay $1.)

VP5.2 Taxi Driver

Void

Global Scenario:

S1: The system will send out a request including the challenge price to the other driver’s that are currently inside the car which will last for 1 minute.

E1: The user awaits for responses within the time constraint.

S2: The system will send the responses back to the user.

S2.1: One or more of the other riders accept the request, and they will be redirected to the game environment.

S2.2: None of the users accept the challenge and will send the user a message that no participants are in the challenge. End Scenario

E2: The main challenger will now select the options between “head” or “tails”.

S3: The system will implement a random algorithm to select between head or tails. The system will then return the result to the game environment.

E3: The user can now see the result of the coin toss and the winners and losers of the challenge.

S4: The system will now distribute the challenge fee between the losers and winners fairly. (If three riders lose the amount of $3, they will each pay $1.)

BE6. Vehicle approaches destination and starts the rider rating process

VP6.1 App User

S1: The system will prompt the rider to rate their experience of the ride overall on a scale of 1 to 5, where 1 is an unfavorable experience and 5 is a very favorable experience.

E1: The user enters a number from 1 to 5.

S2: The system will prompt the rider to rate each rider on a scale of 1 to 5, 1 represents an unfavorable rider and 5 represents a very favorable rider.

E2: The user enters a number from 1 to 5.

S3: The system displays a message thanking the user and confirming that their responses have been recorded. The system will update the database and return to the main menu. End Scenario

VP6.2 Taxi Driver

Void

Global Scenario:

S1: The system will prompt the rider to rate their experience of the ride overall on a scale of 1 to 5, where 1 is an unfavorable experience and 5 is a very favorable experience.

E1: The user enters a number from 1 to 5.

S2: The system will prompt the rider to rate each rider on a scale of 1 to 5, 1 represents an unfavorable rider and 5 represents a very favorable rider.

E2: The user enters a number from 1 to 5.

S3: The system displays a message thanking the user and confirming that their responses have been recorded. The system will update the database and return to the main menu. End Scenario

BE7. Update Profile

VP7.1 App User

S1. The system will open the current profile information and gives access to edit by the user

E1. The user enters information into profile subsections

S2. The system will prompt the user to save changes

E2. User saves changes

S3. The system verifies whether changes are syntactically correct or cause conflicts with other user's data, the system will return to the main menu

S3.1 If verification fails, the system will identify the subsection causing the syntactic failure/conflict, and prompt the user to fix it until verification is successful.

E3.1 User will enter fixes and save the change

S4. Once verification is successful, the system will return to the main menu. End Scenario

VP7.2 Taxi Driver:

Void

Global scenario:

S1. The system will open the current profile information and gives access to edit by the user

E1. The user enters information into profile subsections

S2. The system will prompt the user to save changes

E2. User saves changes

S3. The system verifies whether changes are syntactically correct or cause conflicts with other user's data, the system will return to the main menu

S3.1 If verification fails, the system will identify the subsection causing the syntactic failure/conflict, and prompt the user to fix it until verification is successful.

E3.1 User will enter fixes and save the change.

S4. Once verification is successful, the system will return to the main menu. End Scenario

BE8. Delete profile

VP8.1 App User

S1. The system will open user's profile and prompts user to delete account

E1. User will confirm to delete their account

S2. System prompts user again with an additional warning, it gives the user the option to cancel and the option to confirm to delete their account

E2.1 If the user cancels their delete request.

S2.1 The system returns the user to the main menu. End Scenario

E2.2 If the user confirms to delete the account.

S2.2 The system erases all the user's information from the database and returns the user to the sign in menu. End Scenario

VP8.2 Taxi Driver:

Void

Global scenario:

S1. The system will open user's profile and prompts user to delete account

E1. User will confirm to delete their account

S2. System prompts user again with an additional warning, it gives the user the option to cancel and the option to confirm to delete their account

E2.1 If the user cancels their delete request.

S2.1 The system returns the user to the main menu. End Scenario

E2.2 If the user confirms to delete the account.

S2.2 The system erases all the user's information from the database and returns the user to the sign in menu. End Scenario

BE9. Payment calculation

VP9.1 App User

S1. System uses the distance traveled, number of carpoolers, gambling winnings/losses to calculate and displays the total fare for the user.

E1. The user will pay the driver in person and confirm that they have paid in the application

S2. The system will wait for confirmation from the driver to make sure that payment has been made in person. Once confirmed it will return to the main menu. End Scenario

VP8.2 Taxi Driver:

S1. System uses the distance traveled, number of carpoolers, gambling winnings/losses to calculate the total fare for the user.

E1. The driver will receive in person payment and confirm that they have received it from their end

S2. The system will update the database that the ride was completed. End Scenario

Global scenario:

S1. System uses the distance traveled, number of carpoolers, gambling winnings/losses to calculate and displays the total fare for the user.

E1. The user will pay the driver in person and both will confirm that the user has paid the driver.

S2. The system will wait for confirmation from the driver to make sure that payment has been made in person. Once confirmed it will update the database and return the user to the main menu. End Scenario

5 Non-Functional Requirements

5.1 Look and Feel Requirements

5.1.1 Appearance Requirements

LF1.

The application should allow the user to select the UI theme of the app, between a light mode and dark mode. The default setting will change the theme of the app as ‘automatic’, switching between the two depending on the time of day.

5.1.2 Style Requirements

LF2.

The style of the application will be given a minimalistic theme; only the necessary information will be displayed to the application user at a given time. There should not be any over cluttering of information and animations on the screen.

5.2 Usability and Humanity Requirements

5.2.1 Ease of Use Requirements

UH1.

The application must be very user-friendly to use. It must provide an easy and good user-experience, allowing users to perform their intended actions (offering a carpool, requesting a ride, etc.) with the least amount of required actions, maximum of five interactions between the app and the user.

UH2.

Any rider of the carpool must be able to cancel or report issues easily within opening the application during their ride, with a confirmation button to avoid accidental, unintended actions.

5.2.2 Personalization and Internationalization Requirements

UH3.

The application's users shall have the ability to select a system language of their choice. All messages/text within the application must reflect the language that the user selected.

UH4.

The application's users shall have the ability to modify the font size of the entire app to their choosing, within an acceptable range that will allow the application to present all the information neatly.

5.2.3 Learning Requirements

UH5.

The application must be designed to allow all users to be able to easily navigate through the application without explicit instruction or guidance. The app may present an initial tutorial for new app users upon opening the app for the first time.

5.2.4 Understandability and Politeness Requirements

UH6.

Users must not be able to include any profanity in their comments, when rating their experience riding with other passengers. Comments will be automatically scanned for unprofessional negativity before being added to the rider's rating.

UH7.

When users are receiving their ratings from other passengers, negative comments are reworded to display constructive feedback to the user. Ratings are written as anonymous to the receiver, and will not be received until the end of the day from when the ride was completed.

UH8.

Ride requests from additional carpool riders are only accepted into the carpool ride if all current riders approve of the rider, based on their rating profile. If any riders decline the request, each rider's decision remains anonymous, and the user requesting the ride will have no indication of being approved or denied, only notified when a taxi carpool has been approved and matched with them.

5.2.5 Accessibility Requirements

UH9.

In order to ensure users with physical disabilities will also have access to proper equipment that will accommodate them for a ride, the app must also indicate the taxis that can accommodate users with physical disabilities.

UH10.

There must be an indication in the preferences of the car that will accommodate a user with a pet such as dogs, cats, etc. Only cars that can accommodate for larger pets with the consent of the main rider will be considered as a potential taxi.

5.3 Performance Requirements

5.3.1 Speed and Latency Requirements

PR1.

Both the carpool riders and the taxi driver must receive a confirmation message when the trip is confirmed for both the riders and the taxi driver. This time-requirement will reduce any extra delays that could extend the duration of the car ride.

PR2.

The main rider must receive confirmation of another trip only when there is more than 2 minutes left from the total duration of the car ride. This requirement would ensure there is enough time left for the main rider to enjoy the carpool ride and participate in a challenge if wanted.

PR3.

The app will only assign a carpool rider to a main rider when it will increase the total time duration of the main rider's trip by a maximum amount of 15 minutes. This 15 minute constraint will ensure that the taxi driver and the carpool rider are not forced to experience a relatively long car ride that could be inconvenient.

PR4.

If the rider does not show up at the pick up spot for more than 5 minutes, the trip will automatically be canceled and the rider will be charged a fee. This requirement ensures that the program does not get stuck at a step and is able to move on if the rider does not follow their instructions.

5.3.2 Safety-Critical Requirements

PR5.

Riders must have an option in the app that will redirect them to contacting emergency services immediately in case an emergency situation occurs. This safety requirement will ensure the safety of both the driver and other passengers.

PR6.

Riders must have an option to share their live ride status by sending a link to someone else. This requirement would make the passenger feel safer by letting someone trustworthy knowing their current ride location in case some emergency situation occurs.

PR7.

The rider must automatically receive a notification if the ride has taken longer than 15 minutes of the estimated total duration of the ride that will ask the rider if their safety is at risk or not. If not, the taxi company will take proper action by alerting the authorities.

PR8.

The app must have an option that will report other drivers both during the ride or after the ride. In case someone is reported during the ride, the taxi driver will receive a notification and must decide whether they should drop off the reported rider at the spot or not by canceling their trip with a partial fee.

PR9.

Riders must be able to request immediate cancellation of the ride, if they feel unsafe to continue riding further, and should only be charged for the duration of the ride that they were present for. This function will give the riders the ability to avoid situations that could make them feel unsafe.

5.3.3 Precision or Accuracy Requirements

PR9.

The location of the cab driver must be updated both for the dispatcher, the riders and people who have access to the ride status in intervals of 10 seconds. This requirement will ensure the estimated arrival time of the drive is accurate.

5.3.4 Reliability and Availability Requirements

PR10.

The app must only search for users that will add a maximum amount of 15 minutes to the total duration of the trip to ensure both the riders and the taxi driver are not forced to experience a relatively long ride.

PR11.

The app must only search for other carpool riders when the main user has requested a carpool rider and more than 2 minutes remain of their car ride. This requirement will ensure the main rider will get to experience the carpool ride to its full extent by being able to initiate the challenge.

5.3.5 Robustness or Fault-Tolerance Requirements

PR12.

In case the app crashes, or deals with any assigned exceptions, it must report to the admin of the app to ensure the exceptions are handled properly within the next updates.

PR13.

The app must have an option that will enable users to submit complaints about bugs, crashes, or any other performance deficiency with the app. This report will be submitted to the admins of the app and after reviewing they could prove to be useful for the future updates.

5.3.6 Capacity Requirements

PR14.

The server must have the capacity to handle 5 000 concurrent users.

PR15.

The database must have the capacity to handle 100 000 user accounts and profiles.

5.3.7 Scalability or Extensibility Requirements

PR17.

The system must be able to accommodate a growing user base, meaning that it should be able to handle an increasing number of users without compromising performance or stability.

PR18.

The system must have the ability to support the addition of new features in the future, meaning that it should be flexible and modular enough to allow for the integration of new functionality without requiring major changes to the existing system.

5.3.8 Longevity Requirements

PR19.

The system should have the ability to perform maintenance on the server, meaning that it should have features that enable maintenance activities to be carried out, such as software updates, data backups, and performance tuning.

PR20.

The system should be maintainable and have a long lifespan, meaning that it should be designed in such a way that it is easy to maintain and update over time, and that it is able to remain in use for many years without becoming obsolete or requiring significant re-engineering.

5.4 Operational and Environmental Requirements

5.4.1 Expected Physical Environment

OE1.

The system should be available in regions with the necessary network infrastructure requirements, meaning that it should be accessible in areas where there is adequate network coverage, bandwidth, and connectivity to support the application's features and functionality.

OE2.

The application should be supported by low-spec phones, meaning that it should be compatible with smartphones and mobile devices that have lower processing power, memory, and storage capacity, as well as older operating systems or hardware versions. This ensures that a wider range of users can access and use the application, regardless of the capabilities of their devices.

5.4.2 Requirements for Interfacing with Adjacent Systems

OE3.

The system should have the ability to interface with the Google Maps **API**, which means that it should be able to integrate with and leverage the features and functionality provided by the Google Maps service, such as location data, geocoding, routing, and directions, to support the application's features and user experience.

OE4.

The application should integrate seamlessly with the payment system, meaning that it should be able to interact and process payments through a third-party payment gateway or system without any disruptions or issues. This ensures that users can pay for their rides and transactions in a fast, secure, and reliable manner, without having to worry about any technical or logistical problems.

OE5.

The system should integrate with the database for user profiles, which means that it should be able to store, retrieve, and update user account information and preferences, such as names, email addresses, passwords, payment methods, ride history, ratings, and other relevant data. This enables the system to provide a personalized and customized experience for each user, as well as to track and manage user activities and metrics.

5.4.3 Productization Requirements

OE6.

The user interface should be designed to be simple and elegant, providing a positive user experience. There should not be unnecessary interruptions or interactions for users to perform primary tasks (e.g. requesting a taxi, offering carpool, etc.). The interface should be visually clear to the user on how to perform the tasks.

OE7.

The application must comply with security and privacy requirements to ensure that user data is protected and secure. This may include measures such as encryption, secure authentication, and data protection policies.

5.4.4 Release Requirements

OE8.

The application shall support Android **OS** 10 and later, to support the availability of widely used Android smartphones around the world.

OE9.

The application shall be available for download through the App Store and Google Play Store.

5.5 Maintainability and Support Requirements

5.5.1 Maintenance Requirements

MS1.

Scheduled app maintenance must only occur between 2am-6am, once a week at maximum.

5.5.2 Supportability Requirements

MS2.

The app must be able to run on all supported Android **OS** versions (10 and later)

5.5.3 Adaptability Requirements

MS3.

The app must stay up to date and be able to adapt to run on newer operating systems

MS4.

The app must be able to support newer versions of the Google Maps **API**

5.6 Security Requirements

5.6.1 Access Requirements

SR1.

The application users shall only have the ability to create an account using a unique phone-number verification, prohibiting them from making multiple accounts under the same phone number.

SR2.

The application shall allow for any rider to use the service given that they have a valid account. Invalid accounts are accounts that have been blocked/removed from a review, for not conforming to guidelines such as age and profanity usage.

5.6.2 Integrity Requirements

SR3.

Only the developers of the application shall be granted access to the repository for addition and modifications to underlying code and database. Maintenance of the code will also be done solely by the developers.

5.6.3 Privacy Requirements

SR4.

The application shall keep users' login information (such as first name, last name and log in password) confidential. The carpooling rider will have only temporary access to the usernames of the other riders in order to rate them. This is done to protect the rider's personal information.

SR5.

The application shall keep the location of the vehicle confidential to everyone but the rider, unless the rider has offered a carpool. This would mean that additional riders will be granted location information of the vehicle and destination when the rider would like to carpool with more people. This will protect the rider's personal location.

SR6.

The application shall not collect or monitor any data except for the current location of the user, the user's past rides that were made through application, their registration information and their phone number. The user will also have the option to turn off sharing location within the application. This protects the user from having any data stolen or accessed.

SR7.

The application shall encrypt all transmitted data within the system, in order to keep data hidden from potential threats.

5.6.4 Audit Requirements

N/A

5.6.5 Immunity Requirements

N/A

5.7 Cultural and Political Requirements

5.7.1 Cultural Requirements

CP1.

The application’s gambling feature shall be completely optional and the user's choice whether to participate, as some cultures and religions do not condone such acts of gambling.

CP2.

The application will not have derogatory language to a user's culture, religion, race or sexual orientation as this may insult the user.

5.7.2 Political Requirements

N/A

5.8 Legal Requirements

5.8.1 Compliance Requirements

LR1.

The application shall only allow for ages 16 years and above to ride, as the legal age to be in a taxi alone is 16 years in Ontario [1]. Thus, each user must be at least 16 years old if they intend to be riding alone at any point of time to ensure legality and safety of the user.

LR2.

The legal age for gambling of any kind in Ontario, Canada is 19 years of age. Users must be over 19 years old if they intend to access the gambling feature [2]. The application will not prompt users that are not old enough, to gamble. This is to ensure legality and safety of the user

LR3.

The service must be provided to the first person to accept the carpool, with a maximum of additional 15 minutes added to the original trip time [3]. This is to ensure legality and to allow for carpoolers to be chosen on a fair basis.

LR4.

The service must take the shortest possible route to the destination, unless the passenger specifically asks for an alternative one [3]. This is to ensure legality.

LR5.

The service must stay up to date with the laws and regulations that may affect the application, and make necessary changes for compliance.

5.8.2 Standards Requirements

LR6.

Service must comply with the city’s standards or criminal background and driving history checks [3]. This is to ensure legality and public safety.

LR7.

The service must follow the Personal Information Protection and Electronic Documents Act (**PIPEDA**): a law to govern the collection and use of personal information in commercial activities [4]. This is essential to ensure that all users’ data is protected.

LR8.

The service must follow the Accessibility for Ontarians with Disability Act (**AODA),** to ensure that the service is available for all users.

LR9.

The service must not go past a $1 wager for each rider so that the taxi fare for the Toronto’s Taxi Cab standard is respected [5]. This is to avoid users from abusing the gambling feature.

A Division of Labour

Include a Division of Labour sheet which indicates the contributions of each team member. This sheet must be signed by all team members.

Waleed: Contributed to business events, and completed sections 5.6.3 - 5.8.2

Signature:

Willie: Contributed to use case diagram, added additional information to section 1 and completed sections 5.1.1 - 5.2.4

Signature:

William Pai

Daniel: Contributed to use case diagram, and completed sections 5.3.6 - 5.4.3

Signature:

daniel a

Matt: Completed section 2, and completed sections 5.4.4 - 5.6.2

Signature:

× Matthew Miller

Arash: Contributed to business events, and completed sections 5.2.5 - 5.3.5

Signature:

Arash Lehabrowi