

# **Project Documentation Report**

For the Development of CabMe Taxi Booking Application

A Group Coursework  
on the Applied Software Engineering Module  
for the Master of Science Degree in Information Technology

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To

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## Introduction

This report presents the journey and accomplishments of our team in developing a taxi management system application (CabMe). In this report, we will outline the project, discuss the motivation behind its creation, highlight the challenges faced by the team, and summarize the significant changes that occurred during the module. The aim of this report is to provide a comprehensive overview that explains and showcases to the reader the unique aspects of our product.

### The Project

The project is about the development of a web-based application called CabMe, for the purpose of coordinating the process taxi booking, service delivery and operations. Our aim was to create a user-friendly and efficient application that connects riders with nearby drivers, providing a seamless and convenient transportation experience, digitalizing the way people commute and handle their logistics. The application interfaces three main categories of users (the passenger, the driver, and the vehicle owner). The passenger uses the app to order a minicab, see the progress of the minicab, see how long the journey will take (predicted), plus any other features identified, track the positions of all their vehicles, allocate an appropriate minicab to a client using criteria such as time, distance, cost, etc., record the journeys undertaken and their respective timings.

### Motivation and Market Gap

Among reasons that inspired our motivation for this product stemmed from

- Bus and train staff strike actions, delays, cancellations, and its impact on passengers' flexibility.
- Environmental sustainability perspective of reducing the number of individual cars on the road,
- Social distancing and health concerns in relation to overcrowded public transport.
- Evolving bespoke needs, experience, and expectations of all stakeholders of the taxi business.

What sets our product apart is its user-centric design and emphasis on efficiency. We incorporated features such as real-time tracking, and route mapping navigation. Additionally, our product aimed to provide a streamlined onboarding process for drivers, ensuring a diverse pool of reliable and professional drivers for our riders.

Throughout the report, we will delve into the technical details and innovations that make our application stand out. We will also discuss the challenges faced by the team during the development process and the strategies employed to overcome them. Furthermore, we will highlight the significant changes that occurred throughout the module, including their motivations, descriptions, and implications.

### Challenges Encountered

Developing this application came with several challenges for our team.

Technically there was a major hurdle that we faced which was choosing a map for our development. Google Maps API was used to display maps and related works. But while developing it seemed that a payment method had to be set up before using some features, even if they were free, under a certain threshold, such as route calculations, distance matrix etc. Since adding payment methods seems to be slowing down the development,

Bing Maps API was used for route calculations, and distance matrix services as they were free to use without payment methods being set up, but under a threshold of usage.

Further, there was no API to find points between a route that were a unit distance apart while implementing /api/tick endpoint. This had to be calculated manually using current position, route path (as a polyline taken from Bing maps API), and recently passed point on the path.

Secondly, the time frame that we must met with was quite infeasible, and hence, we have to re-iterate the process and prioritize some of the features and tasks.

Thirdly, selecting tools and technologies for the development of the application. The team had to carefully navigate these challenges to create a robust and secure platform.

### Addressing the Challenges

To address the challenges, we agreed to have our scrum stand-ups during our lecture break periods and conclude the meetings after the lectures every Tuesdays and Thursdays, and subsequently (after semester lectures) on various online platforms including Google Meet, Slack, WhatsApp. We tried using the Trello board, but was not too familiar with the tool, which was taking much of our time, although we set up the board for the project, but discontinued the use of the platform.

Secondly, given the delivery deadline period, we split the project into phases and deliverable for each phase, and delegating specific product backlog item among team members.

On the other hand, in order to achieve deliver solutions that address consumer needs and expectations, we researched existing similar products, made our observations and interacted with potential users of the proposed product, in order to gather viable user requirements which determined the product features, booking a cab as a user, tracking the booked cab, check the final fare and rate the ride at the end of the journey were there. It also allows The Driver to see his past trips, money earned and finally the Manager to see all registered taxi details and customers' ride history.

Following the Applied Software Engineering Modules, Principles of Programming, Information Systems and Database Management, Internet and Web Technologies, modules of the MSc program, the team was familiar with most technology stack and tools used in the management process and development of the frontend, database, and to an extent the backend, but faced some difficulties with some backend components and integration with extension utilities, for which the team took some additional training through online courses to gain familiarity with the challenging implementations required for the project. Overall, we developed the application using the following tools:

#### 1. Python

Python was used in the project for the whole backend as it is a versatile, easy to learn, read and understand, programming language. And it has many libraries, and frameworks to achieve web programming. Since the first phase was done in python, it was continued to use throughout all backend tasks.

## 2. GoogleMaps API / Bing Maps API

Google Maps API was used to display maps and related works. But while developing it seemed that payment methods had to be set up before using some features, even if they were free under a certain threshold, such as route calculations, distance matrix etc. Since adding payment methods seems to be slowing down the development, Bing Maps API was used for route calculations, and distance matrix services as they were free to use without payment methods being set up, but yet under a threshold of usage.

## 3. Database

SQLite was used as the backend Database because it's easy to setup implement and manage the solution even after deployment. We used the Django ORM to build the models for the SQLite database.

## 4. Frontend

Frontend processing is implemented using Javascript, HTML, CSS and Bootstrap. Scripts provided by Google for using maps have been used.

Throughout the development process, our team achieved several significant milestones. We successfully created a user-friendly interface that allows seamless booking and tracking of rides, with real-time navigation which provided a smooth and hassle-free experience for both riders and drivers.

### Changes:

During the development, certain changes were made to various aspects of the project to enhance functionality, which include:

- Due to time constraints, we discovered we could not implement all the features that were captured in the phase 1 of the requirements gathering, so we decided to refine the specifications to be able to deliver a minimum viable product with priority features.
- Due to the limitations and not much familiarized with Codio platform and based on our past exposure and easiness of coding, testing and integration of certain operation, we chose Visual Studio Code, from where we commit to Github from and then push to Codio.
- For the phase 3, we used a separate repository, different from the repository for the first and second phase of the project.
- We started developing the application with SQLite and SQLAlchemy, but experienced some glitches due to insufficient familiarity, but we later switched to working with Django with which we successfully developed the application.

## 2. Customer Needs

Basically, the product has three classes of targeted users, who can be categorized under primary and secondary users/stakeholders.

## Primary Users

- The Rider (Passengers) who require transportation services. They could be commuters, travelers, tourists, or anyone in need of reliable and convenient transportation.
- The Drivers: The drivers as well as the passengers are also end-users of the application given that they interact with the passengers in the application to accept or decline a ride, rate a client, end a ride etc

## Secondary stakeholders

- The Operators (Cab Owner/Company): The operators or cab owners make use of the app to see the data of current drivers associate with the app and riders history etc.

## Stakeholders' Expectations and Why?

- The Riders: They expect seamless booking, quick response times, reliable, real-time driver tracking, clear communication, rating reviews, user-friendly interface etc. so that they can guarantee their convenience in managing their logistics with ease.
- Drivers: Drivers expect easy route navigation, booking management (accept or decline) so that they can coordinate all their activities within the app.
- Operators: want a convenient and efficient transportation solution, which can offer them a centralized management system, for the tracking of drivers and riders by retrieving data of their trip history.

## Desired overall experience

Their desired overall experience is one of convenience, reliability, and usability, an overall experience that is hassle-free, and enjoyable, which provides timely and reliable solution that maintains transparency and trust in the service.

## User Requirements

For this project, we considered several user requirements from which we concluded the SMART user requirements. The major user requirements include:

## Functional Requirements

- Ride Booking: Users should be able to select their pickup and drop-off locations, choose the desired vehicle type, and book a ride within the app.
- Real-time Driver Tracking: The app should provide real-time tracking of the assigned driver's location, allowing users to monitor their progress and estimated time of arrival.
- Fare Calculation: The app should calculate the fare for each ride based on factors such as distance, time, surge pricing, and any applicable fees.
- Driver and Rider Matching: The app should have a mechanism to match riders with available drivers based on proximity, availability, and user preferences.

- **Ratings and Feedback:** Users should be able to rate their driver and provide feedback about their ride experience, contributing to driver accountability and service improvements.
- **Ride History and Receipts:** Users should have access to their ride history, including details of past bookings, payment receipts, and the ability to review and retrieve relevant information.

#### Non-Functional Requirements:

- **Performance and Usability:** The app should be able to handle many concurrent users, providing quick response times and minimal downtime.
- **User Experience:** The app should have an intuitive and user-friendly interface, offering a seamless and pleasant experience for both riders and drivers.
- **Security and Privacy:** The app should implement robust security measures to protect user data, including secure authentication, encrypted communication, and compliance with data protection regulations.
- **Compatibility:** The app should be compatible with various operating systems and devices to ensure accessibility for a wide range of users.
- **Integration:** The app should be capable of integrating with third-party services and APIs, such as mapping services.

The following are some of the user requirements that were considered for developing this application:

#### User stories

##### Riders:

- As a rider, I want to be able to schedule a trip from the app, so that I can select a pickup location, destination, time, and date at my convenience, without going through tedious processes for availability checks or booking confirmation.

##### Achievement Criteria:

Given that I have opened the app, when I enter my pickup and drop-off addresses in the designated fields, then the app should display a map showing the selected locations and provide me with options to confirm the booking.

- As a rider, I want to be able to rate my driver after completing a ride, so that I can provide feedback on their service quality and help maintain driver accountability and trustworthiness.

##### Achievement Criteria:

Given that I have completed my ride, when I navigate to the ride history or feedback section, then the app should allow me to rate the driver and provide optional feedback to help improve the service quality. The app should also make provision for disputes resolutions on any issues or complaints.

- As a rider, I want to be able to pay for my trip within the app so that I don't have go through several processes to pay for my trips.

##### Achievement Criteria

Given that I have completed my ride, when I proceed to the payment screen, then the app should provide various payment methods (e.g., credit card, mobile wallets)

and ensure that my payment details are securely processed. I should receive a confirmation of the successful transaction.

- As a rider, I want to see the route, time, and distance between my start location and destination.

Acceptance Test:

Given that I have booked a ride and the driver has started the trip, when I open the ride details screen, then I should be able to see the route map displaying the path from my start location to the destination, and the estimated time and distance to reach the destination should be shown on the screen.

- As a rider, I want to see the fare for my ride before confirming the booking, so that I can make an informed decision and plan my budget accordingly.

Achievement Criteria:

Given that I have selected my pickup and drop-off locations, when I review the booking details, then the app should provide the cost for the ride based on the distance and any applicable surcharges.

- As a rider, I want to see the driver's and vehicle details (make, model, and license plate) before the ride, so that I can easily identify the driver and vehicle for safety purposes.

Achievement Criteria:

Given that I have confirmed a ride booking and the driver is assigned, when I view the ride details before the pickup, then the app should display the driver's profile picture, vehicle make, model, and license plate in the ride information section.

- As a rider, I want to have an option to select the type of vehicle suitable for my trip based on my preference, so that my demands are catered for beforehand.

Achievement Criteria:

Given that I have confirmed my booking, when I proceed to the vehicle selection screen, the app should display a range of vehicle options (e.g., standard, premium, shared) with details about their capacity, features, and pricing. I should be able to select the desired vehicle type, and special assistance requirements.

- As a rider, I want to see the route, time, and distance between me and the driver, so that I can determine the waiting time to expect the driver's arrival.

Achievement Criteria:

Given that I have booked a ride and the driver has accepted, when I open the ride details screen, then I should be able to see the route map showing the current location of the driver and my location, and the estimated time and distance between us should be displayed on the screen.

## Drivers:

- As a driver, I want to view a history of my completed rides and the corresponding earnings, so that I can track my earnings and review past trips for reference or reimbursement purposes.

### Achievement Criteria:

Given that I am a driver logged into the app, when I navigate to the earnings or ride history section, then the app should display a list of my completed rides, including the date, time, pickup/drop-off locations, fare, and any additional earnings or tips received.

- As a driver, I want to receive a notification when a booking is confirmed, or if a rider cancels a booking, so that I can quickly receive new ride requests and optimize my earnings.

### Achievement Criteria:

Given that I am logged in as a driver and available for rides, when a rider confirms a booking with me or cancels a booking, then I should receive a push notification on my device informing me of the booking confirmation or cancellation.

- As a driver, I want to have access to a navigation system within the app to guide me to the pickup and drop-off locations, so that I can efficiently navigate through traffic and reach the rider's destinations in a timely manner.

### Achievement Criteria:

Given that I have accepted a ride request as a driver, when I tap on the "Start Trip" button, then I should be provided with turn-by-turn directions on the app's navigation screen, guiding me to the pickup location and subsequently to the drop-off location.

- As a driver, I want to be able to decline a trip or go offline so that I can go on break when I must, or when I have some engagement and not available for trips.

### Achievement Criteria:

Given that I am logged in as a driver and available for rides, when I choose to decline a trip or go offline temporarily, then the app should update my status to indicate that I am not available for new trip requests during that period.

- As a driver, I want to have a live support access so that I can get immediate assistance, in the case of emergency or issues arise.

### Achievement Criteria:

Given that I am logged in as a driver and require immediate assistance, when I access the live support feature within the app, then I should be able to connect with a support representative in real-time to address my concerns or issues.



## Admin:

- As an Admin User, I want to be able to track all vehicles at every moment, so that I can know the location of every vehicle in real time, which driver assigned to the vehicle, if on any trip or available for booking

### Achievement Criteria

Given that I am an Admin monitoring the system, when I access the vehicle tracking dashboard or map view, when I should see the real-time locations of all vehicles, along with information on the assigned driver and their availability status.

- As an Admin User, I want to be able to track passengers and drivers' feedback so the I can evaluate driver remarks on frequent riders and well as customer ratings on driver performance.

### Achievement Criteria

Given that I am an operator accessing the feedback management section, when I view the feedback received from passengers and drivers, then I should be able to see the feedback comments and ratings, allowing me to evaluate driver performance and address any concerns raised.

- As an Admin, I want to track drivers' ride logs including accepted rides, completed rides, declined rides, offline periods, vehicle maintenance, etc.

### Achievement Criteria

Given that I am an Admin viewing the driver ride logs, when I access the driver activity or ride log section, then I should be able to see details of accepted rides, completed rides, declined rides, periods of being offline, and any other relevant driver activities or events.

## Personas

### • Vicki Torres

Age: 33

Occupation: Working Mother

Location: Glasgow, UK

Tech-savvy: Moderate

Mobility: Relies on public transportation for daily work and family obligations, child's school, shopping, other errands, etc.

Goals: Convenient and time-efficient transportation options that cater to both work and family needs, ensuring a smooth daily routine.

Pain Points: Juggling multiple responsibilities, coordinating

transportation for children's activities, and managing time constraints between work and family commitments.

### • Alex Roberts

Age: 45

Occupation: Sales and Marketing Executive

Location: Edinburgh, UK

Tech-savvy: High

Mobility: Relies on public transportation for personal and work routines, travels for sales meetings, client visits, trade shows, marketing events, etc.

Goals: Reliable transportation to reach various locations for business meetings, ensuring punctuality and a professional image.

Pain Points: Dealing with traffic congestion, managing transportation expenses, and finding transportation during busy periods or in unfamiliar cities.

- **Emily Hernandez**

Age: 19

Occupation: Ph. D Student

Location: Oxbridge, UK

Tech-savvy: High

Mobility: Relies on public transportation for studies, travels between the university, research sites, libraries, conferences, presentations, and hangouts with friends.

Goals: Convenient transportation options for commuting to the university and other research-related locations, ensuring flexibility and efficient use of time.

Pain Points: Limited parking options on campus, unpredictable public transportation schedules, and difficulty managing transportation costs on a student budget.

- **Natalie Adams**

Age: 52

Occupation: Caregiver and Social Worker

Location: Stratford, UK

Tech-savvy: Moderate

Mobility: Relies on public transportation for personal and work routines, and for transporting her patients for shopping, hospitals for checkups, home support services, etc.

Goals: Accessible and reliable transportation options to reach clients' homes, community centers, and other relevant locations.

Pain Points: Difficulty finding transportation that accommodates individuals with disabilities, lack of accessible public transportation options, and limited availability during specific hours.

- **Andrea Bill**

Age: 25

Occupation: Project Manager

Location: Birmingham, UK

Tech-savvy: High

Mobility: Relies on public transportation for personal, project sites inspections, appointment with clients and suppliers etc.

Goals: Efficient transportation to ensure timely arrival at project sites, meetings, and the ability to coordinate team members effectively.

Pain Points: Dealing with traffic congestion and transportation disruptions that may affect project schedules and client satisfaction.

- **Ryan David**

Age: 38

Occupation: Media and Digital Artist

Location: Middlesex, UK

Tech-savvy: High

Mobility: Relies on public transportation for personal and team commuting to events, social and networking activities, shooting locations, galleries, and events.

Goals: Reliable and convenient transportation for carrying

equipment, reaching shooting locations, and attending exhibitions.

Pain Points: Difficulty finding transportation that accommodates the size and requirements of art equipment, and challenges in transporting fragile artwork safely.

- **Sharon Lee**

Age: 32

Occupation: Surgeon

Location: Bristol, UK

Tech-savvy: Moderate

Mobility: Relies on public transportation for emergencies, consultancies, research trips, commuting to and from the hospital, attending medical conferences, and making home visits. etc.

Goals: Reliable transportation that ensures prompt arrival at the hospital for surgeries and transportation arrangements for emergency calls.

Pain Points: Dealing with traffic congestion during emergency situations, which can cause delays and impact patient care.

- **Emily Robb**

Age: 40

Occupation: Pregnant Teacher

Location: Essex, UK

Tech-savvy: Moderate

Mobility: Relies on public transportation for personal commutes, routine antenatal checkups, shopping, training classes, errands, etc.

Goals: Accessible and reliable transportation that accommodates the needs of a pregnant woman, ensuring comfort and convenience.

Pain Points: Difficulty finding transportation with proper seating and accessibility features, which can lead to discomfort and challenges during pregnancy.

- **Vixon Romero**

Age: 40

Occupation: Software Engineer

Location: Westminster, UK

Tech-savvy: High

Mobility: Relies on public transportation for personal and work routines, late-night development, emergency client troubleshooting services, trainings etc.

Goals: Efficient transportation options for daily commutes and convenient access to locations related to work.

Pain Points: Dealing with rush hour traffic, long commuting times, and transportation disruptions that impact productivity and work-life balance.

- **Sai Wong**

Age: 37

Occupation: Tourist / Travel Blogger

Location: Taiwan

Tech-savvy: High

Mobility: Relies on public transportation for commuting during trips to different cities and new locations

Goals: Values the convenience of booking rides easily from his smartphone, especially in places with language barriers, appreciates seeing the estimated fare upfront to plan his travel budget.

Pain Points: Often encounter language barriers when trying to

communicate with local taxi services, also struggles to estimate the appropriate fare for local rides and has faced issues with overcharging.

- **Sarah Thompson**

Age: 25

Occupation: Tourist / Travel Agent

Location: Heathrow, UK

Tech-savvy: High

Mobility: Relies on public transportation for arranging logistics and airport pick-ups for her clients especially new visitors, tourists, and business trips.

Goals: Looks for safety features, such as driver ratings and vehicle options, to ensure a secure and comfortable travel experience for customers preference.

Pain Points: Always faced challenges in finding reliable transportation options in new locations, leading to uncertainty and potential safety concerns.

- **Stacy Peters**

Age: 55

Occupation: Motivational Speaker

Location: Ilford, UK

Tech-savvy: High

Mobility: Travels to different cities and venues to deliver speeches and presentations.

Goals: Reliable transportation to reach speaking engagements on time, ensuring a smooth and stress-free travel experience.

Pain Points: Last-minute changes in travel plans, flight delays, or difficulty finding transportation to and from venues, which can disrupt schedules and cause stress.

- **Renee Gonzales**

Age: 35

Occupation: Investment Manager

Location: Brighton, UK

Tech-savvy: High

Mobility: Requires transportation for client meetings, networking events, and visits to investment firms.

Goals: Convenient and comfortable transportation to navigate between multiple locations, ensuring timely arrival for meetings.

Pain Points: Dealing with traffic congestion and unpredictable delays, which can impact scheduling and productivity.

- **Shante Quinn**

Age: 22

Occupation: Journalist / TV Presenter

Location: Heathrow, UK

Tech-savvy: High

Mobility: Travels frequently for news coverage, interviews, and reporting.

Goals: Access reliable transportation to reach various locations for assignments, ensuring punctuality and efficiency.

Pain Points: Difficulty finding transportation during peak news hours or in remote areas, which can result in missed opportunities or delays in reporting.

## Scenarios

- Shante Quinn - Journalist/TV Presenter:

Shante needs to cover breaking news at a specific location, opens the CabMe app and enters her current location and the destination. The app displays available drivers nearby, along with their estimated arrival times. Shante selects a driver and confirms the booking and sends a notification to the driver which he accepted. The app provided real-time tracking of the driver's location en-route to Shante and sends her a notification when the driver was two minutes away from the pickup location. She meets the driver, and he commute her to the destination, reaching the news location on time, she paid in-app, alighted and proceeded with her assignment to cover the story.

- Renee Gonzales - Investment Manager

Renee has multiple client meetings scheduled throughout the day, he uses the CabMe app to book a ride from his office to the first client's location, and sets the pickup time to coincide with the end of his meeting to minimize waiting time. The app assigns a driver, and Renee tracks the driver's progress on the map and rounds off his meeting as the driver got closer. He meets the driver and joins him to the destination, arrives at the meeting on time, pays for the ride and completes the ride. After the meeting, He books another ride to his next client's location, repeating the process for the rest of the day.

- Stacy Peters - Motivational Speaker

Stacy needed to travel to a conference venue, she opens the CabMe app and enters the conference venue as her destination. The app displays available vehicles, and she selected an option for a larger vehicle to accommodate her presentation equipment. She also assessed reviews on the driver's profile and vehicle details and confirms the booking. During the ride, Stacy focuses on preparing for her presentation while tracking the driver's progress. She arrives at the conference venue, made her payment and rated the driver by her travel experience with him, and alighted ready to deliver her speech.

- Vixon Romero - Software Engineer:

Vixon a regular user commutes to work daily with CabMe, he already schedules the trips beforehand, with his office location as the destination. The app sends him a reminder and notification once the driver is close, he reviews the estimated arrival time, and wait for the driver. During the ride, Alex uses the time to catch up on emails or read industry articles. The driver drops him off at the office, and the app automatically processes the payment as he marks the journey completed.

- Emily Robb - Teacher (Pregnant)

Emily, needs transportation for her medical appointments, shopping, then to her workplace, she opens the CabMe app and enters the address of her doctor's clinic as the destination, and also indicated multiple stops. She selects a vehicle with ample space and comfortable seating, and she requested for special assistance, and confirms the booking. The driver rejected the booking on the grounds of having a schedule that might clash with her multiple booking and might not be a good fit for assisting her with her condition. Emily made another booking, which the driver confirms the booking and Emily receives a confirmation notification and gets ready to join the driver. Soon, the driver arrives, helps her with her bags and ensures a comfortable ride to the clinic. The driver waits for Emily, and joins her a couple of minutes later, he drove her to the shopping mall, where she bought some drugs and groceries before he finally drove her to the school. Emily was fully satisfied and rates the driver 5star after before he drove off.

- **Alex Roberts - Sales and Marketing Executive**  
Alex's role requires him to frequently visit clients, attend networking events, and mostly travel for business. On a typical workday, Alex schedules cars for his commute to the office. Enroute, he uses the car wifi to catch up on emails and prepare for this day during the ride. But today, he is attending a trade show in a different city with his team and needs to convey his promotional materials and booth as well. He books a van which conveyed him and his team to the venue and reschedules it for a pickup later in the day.
- **Andrea Bill - Project Manager**  
Andrea has a site to visit various project sites and meet with her team members. Given that she often carries construction plans and equipment, she books for to contain her with her equipment. The driver arrives and assists her with loading the materials into the vehicle in a safe arrangement and commuted her to the site. After her site inspection, she proceeded to attend a stakeholder meeting with the clients of the project in the company's office to discuss the project progress. She booked a different CabMe car to the office, and afterwards scheduled a booking 2 hours ahead of time so she can visit the materials supplier.
- **Emily Hernandez - Ph. D. Student**  
Emily needs to attend a conference to present her research paper. She is running late and requires a quick and efficient transportation solution. Lisa opens the CabMe app and selects the closest vehicle from the list of available options, to guarantees a faster arrival time. She reaches the conference venue on time, allowing her to set up her presentation and deliver it successfully.
- **Sarah Thompson - Tourist / Travel Agent**  
Sarah is organizing a group tour to a popular tourist destination, she has some guests to go pick from the airport, and she needs to inspect hotels and local attractions for another clients. Given the flight arrival time is getting closer, she concluded she can't make it to pick the guests from the airport and decided to schedule a pickup arrangement of the guests from the airport to their hotel with Dearide. She concentrated on her errands and the CabMe handle her other logistics for her.
- **Sharon Lee - Surgeon**  
Dr Sharon just got home from work when she received an emergency call from her hospital of an accident victim, she was too tired to drive through the traffic since her driver has closed work for the day, she also needs to direct the team on ground on what to do, to prep the theatre for surgery, so she booked the nearest CabMe. During the ride, she engaged the team on video call, directing them, and on getting to the hospital, she paid and went straight to the theatre.
- **Natalie Adams - Caregiver and Social Worker**  
Natalie was in a rush to her patients place when her car unexpectedly broke down. Being a sensitive patient that is recovering from critical surgery, she needed to be there immediately to be handed over by her colleague whose closing time is almost complete. She booked a CabMe which was luckily few meters away from her. Enroute the ride, she contacted her mechanic to go fix the car and drive it

to her office after his job on the vehicle. All went as she planned, and she achieved her tasks for the day.

- Sai Wong - Tourist / Travel Blogger

Wong is visiting London for the first time, as a tourist, she is excited to explore the city, but unfamiliar with the public transport system, and does not want to rent a car, also because of her not being too fluent with English language and currency exchange issues. She decided to use CabMe to move around during her trip. Upon arrival at the airport, she downloaded the CabMe app and books a ride to her hotel in the city center. The following day she books another ride that took her to her sight-seeing destinations.

- Vicki Torres - Working Mother

As a regular user, Vicki uses CabMe to schedule her daily commute of dropping her child at school while going to work and picking her from school while returning from work. Today, Vicki needs to pick up her child from school and take her to her friend's birthday. She books the CabMe car as usual, the driver came to her office, picked, and drove to her child's school before driving them to the birthday party. During the ride Vicki changed her daughter's wear inside the car and got her ready for joining the birthday party, soon they arrived, paid the driver and alighted.

- Ryan David - Digital and Media Artist

Ryan needs to transport his large multimedia installation and his team of photographers, videographers, writers etc., to an art gallery and product launch for an exhibition. He books the van, which provides vehicles with extra space and secure handling options for delicate artwork. The driver arrives with a vehicle equipped with special art transportation features, such as padding and proper securing mechanisms. Ryan's artwork reaches the gallery safely and is ready to be displayed, ensuring a successful and visually stunning exhibition. Midway into the event, the need arose for him to attend a press conference, he booked a CabMe car, which listed several options in the same venue, he picked one and left immediately.

## **Features identification**

1. Login  
Login is cookie-based authorization system. Session is maintained for users. This is implemented using flask\_login. Main UI is inaccessible without signing in using user email and password. Currently registering new user is not implemented. Adding users can be done by editing and running the code.
2. Google Maps and Main UI Interface  
The Main UI shows the greeting message with the logged in user's name at the top left corner. Link to logout is below the greeting. Map is shown on the right side with vehicles that are currently not booked by any other users.
3. Previous Journey History  
Shows lists of journeys previous taken by the rider, information includes journey id, vehicle type, vehicle license number, driver name, start data and time, end date and time, driver rating.
4. Vehicle Booking Form  
The booking section provide the rider with an input section for selecting the start location and the destination and vehicle type.
5. Selecting Vehicle Type  
The application enables the rider to choose a type of vehicle that is suitable for their trip. The options provided is for choosing between any of car, bus or Van
6. Distance/Time Calculation
7. Fare Calculation
8. Booking Confirmation
9. Driver Rating
10. Start Journey and End Journey
11. Status
12. Tick
13. Reset



## Project Goals

This application sets to address several customer problems in the context of a taxi booking system. Here are some customer problems that the application helps to solve:

- Difficulty in finding available taxi nearby.
- Difficulty in booking a taxi and wasting time searching for available vehicles.
- Transportation needs in crowded or underserved areas.
- Difficulty in booking a taxi.
- Frustration caused by inconsistencies in wait times or long wait times for a taxi to arrive.
- Uncertainty about car availability, without any feedback.
- Inefficient car allocation, delays, or outright disappointment
- Lack of transparency in fares charges
- Inconvenience during worker strikes or disruptions caused by schedule cancellations and delays.
- Safety concerns and trust in identifying a driver and vehicle.
- Environmental concerns regarding unnecessary car trips and increased emissions.

## User Benefits Provided by the System

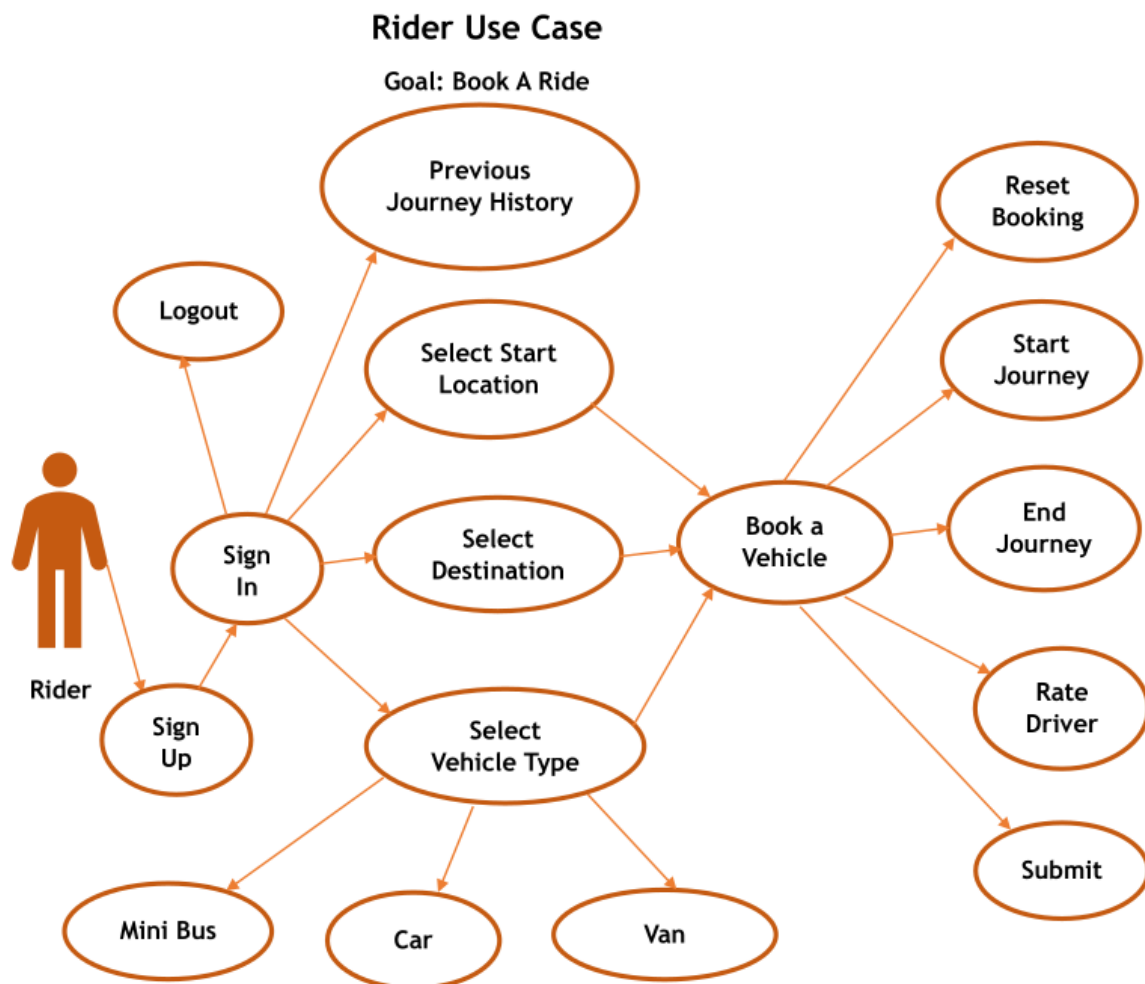
- Reliability and Availability: Users can rely on the system to promptly respond to their booking requests and provide a consistent and available transportation service.
- Privacy and convenience: The application offers an easy and convenient system for customers to book a ride, while staying away from the public.
- Transparency in fares charges and pricing
- Reduced wait times for quicker pickups and specific taxi arrival time.
- Real-time tracking of the assigned vehicle for improved transparency and arrival time estimation.
- Enhanced safety and security through driver profile and vehicle verification.
- Alternative transportation option during worker strikes or service disruptions.
- Instant booking options to overcome schedule cancellations and delays.
- Health and social distancing support system.
- Contribution to environmental sustainability by optimizing car allocation and reducing emissions.

## How the benefits support the customers' desired overall experience

- User-Friendly Interface: The app has a clean and intuitive interface that is easy to navigate, for users to be able to quickly understand how to request a ride, set the pickup and drop-off locations, and view relevant information.
- Visual Navigation Tracking: The system's feature of real-time car tracking empowers customers to track the location of their assigned car, providing them with transparency and visibility throughout their journey.
- Contactless Experience: By minimizing physical contact, the system supports the customers with a safe and secure travel experience.
- Seamless Booking Process and Certainty: The system offers simple booking process that allows customers to easily make bookings remotely in a couple of seconds, avoiding unnecessary travel or waiting.

- On-the-go availability: With remote accessibility, customers can access the system and book a taxi from anywhere, and at any time. They are not limited to physical locations or specific operating hours of traditional taxi services.
- Personalized services: The user benefits from bespoke features like preferred driver or vehicle selection, previous trip history etc.
- Compatibility: The user can access the app from any kind of device, without the need for any third-party applications or device.
- Clear Pricing and Payment: The users should have a clear understanding of the fare calculation, any additional charges, and the payment methods available.
- Rating and Feedback: The users rating their driver and provide feedback after the ride allows for accountability and quality control, even for potential users.

#### How the idea was validated



#### ▪ Alternative Flow: Track Driver's Location and Estimated Arrival Time

**Description:** The rider can track the driver's location and estimated arrival time in real-time through the ride-hailing app.

**Connection to Basic Flow:** This alternative flow is integrated into the main flow, providing the rider with real-time updates on the driver's location and estimated arrival time, which is displayed in the panel attached to the book a vehicle form after booking is confirmed.

- Alternative Flow: Provide Feedback, Ratings, and Reviews

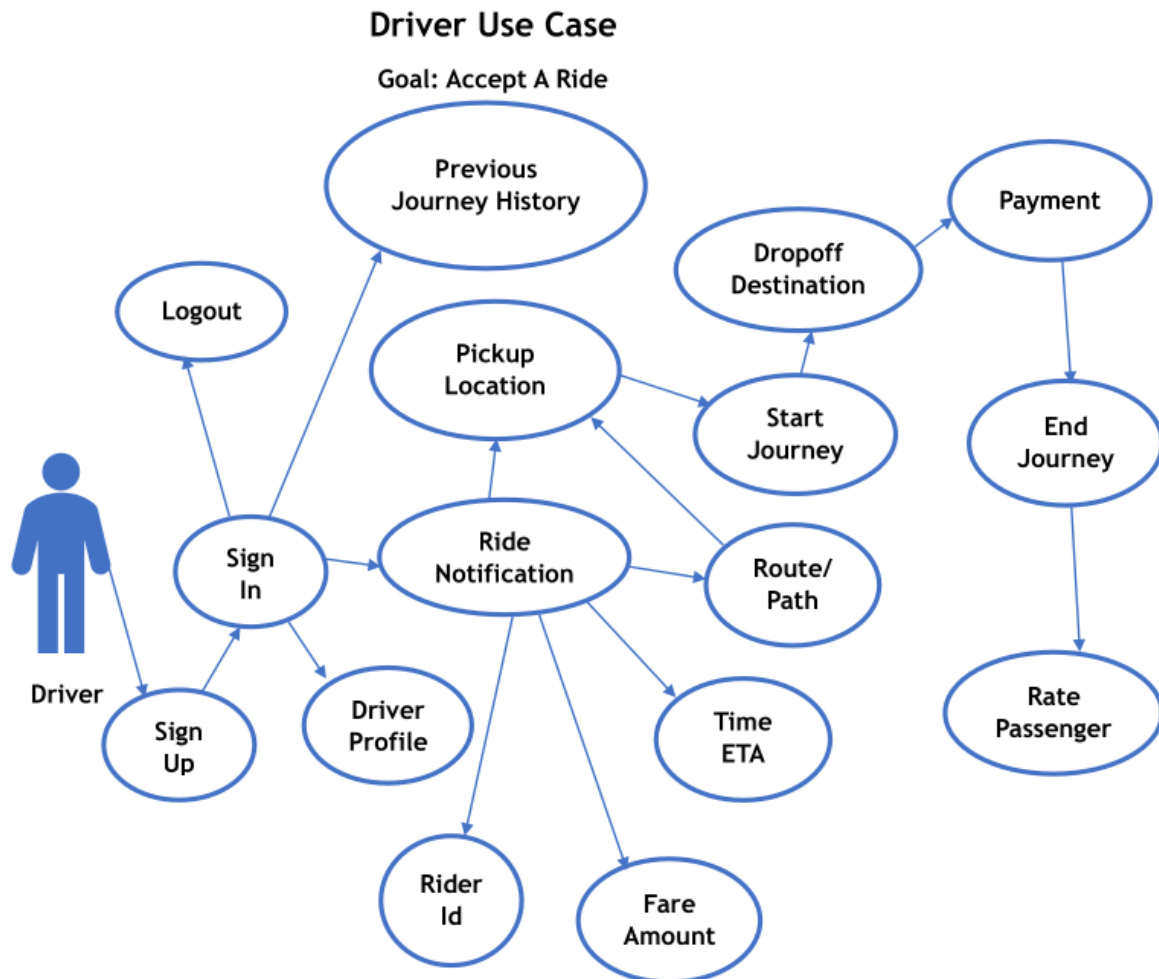
Description: The rider can provide feedback, ratings, and reviews for the driver and the overall experience.

Connection to Basic Flow: This alternative flow occurs after the completion of the ride, allowing the rider to provide feedback, ratings, and reviews through the app after ending the trip.

- Alternative Flow: Reset Booking

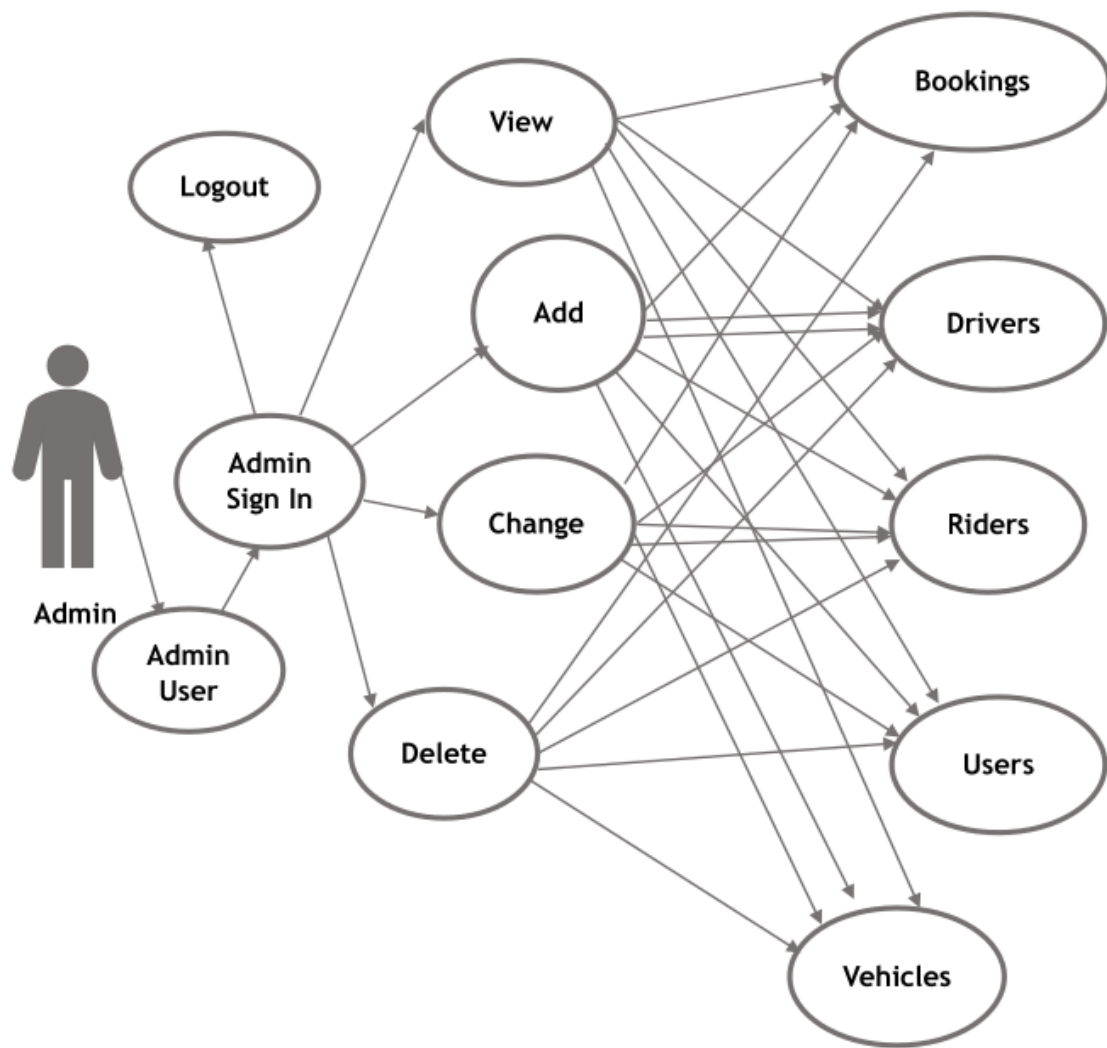
Description: The rider can reset the vehicles and bookings if no available driver or preferred vehicle type is found and can choose to try again later or explore alternative transportation options.

Connection with Basic Flow: The reset alternative flow is connected to the main flow of the application when the user chooses to reset the system data. It clears the existing bookings and reset vehicle positions to a fresh state for the application to handle new bookings and provide accurate data to the users.



# Admin Use Case

Manage Application Users



## SYSTEM DESCRIPTION

### System Overview

The application is a cab booking application, designed to connect riders with drivers for convenient and efficient transportation services. The main challenge we encountered in developing this system is to create a reliable and user-intuitive solution that seamlessly handles the complex tasks of matching riders with available drivers, providing real-time updates and map navigation, ensuring secure payments, and delivering a smooth overall experience.

Not only that, but we also strived to build backend that handles concurrent requests, manage driver availability and routing, efficiently process ride bookings, and matching riders with drivers based on proximity, availability, and other criteria. Nevertheless, handling access authorization, for security and privacy of user data such as user profiles, payment details, and ride history, were adequately given attention to, including the use of Flask Werkzeug library for security and password encryption, while adhering to data protection regulations and implementing strong security measures to prevent unauthorized access or data breaches.

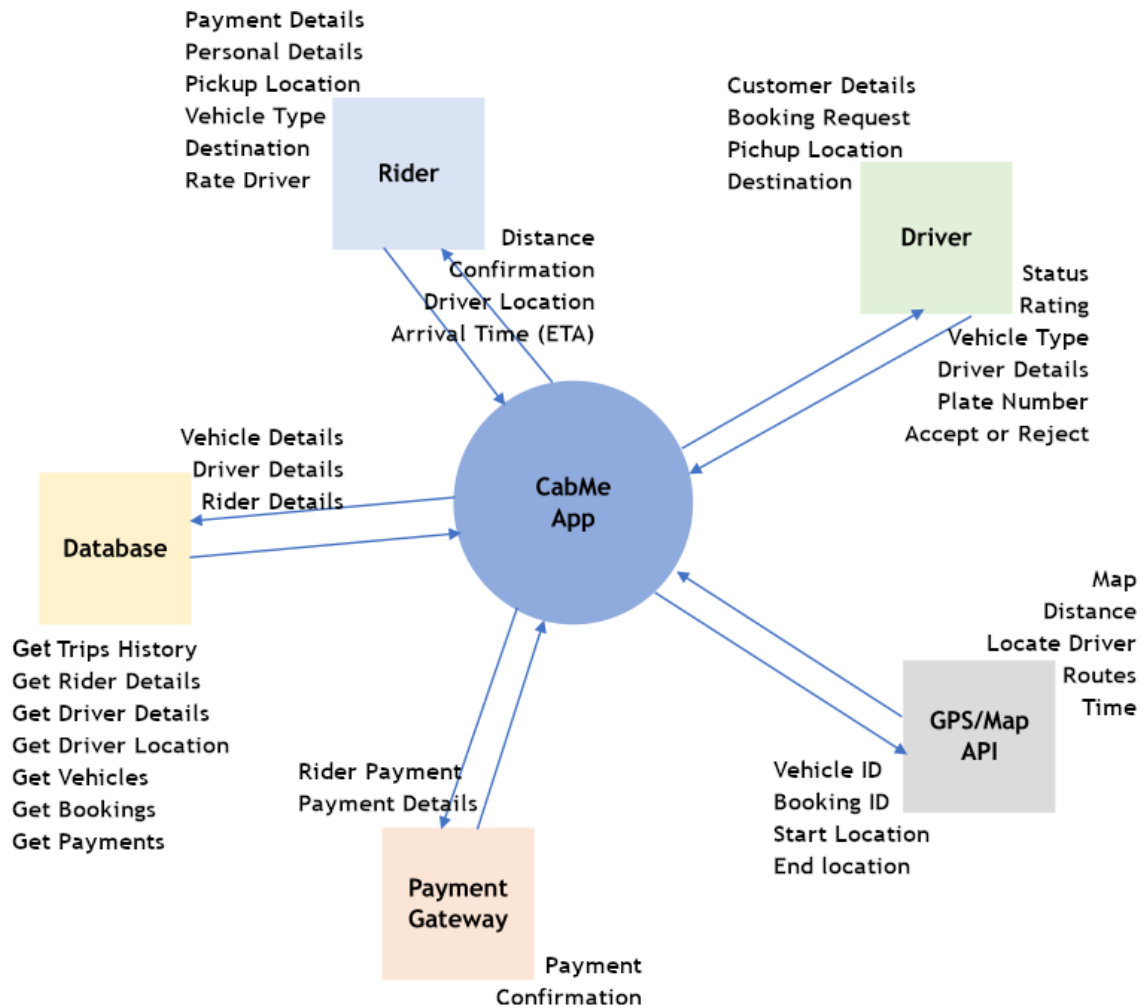
### Rationale for the design

The design for the application is driven by the need to provide a convenient, efficient, and user-friendly platform for connecting riders with drivers, with the primary goal of enabling users to easily book rides, track their drivers, and reach their destinations with minimal hassle.

The key factors incorporated in the design include:

- **User Experience:** To provide a user-friendly interface with intuitive navigation, clear information display, and easy-to-use features. The design focuses on minimizing the steps required for booking a ride, providing real-time updates on driver location, estimated time of arrival, and trip details.
- **Driver Matching:** Efficiently matching riders with available drivers based on various factors such as proximity, driver availability, and ride preferences. The goal is to ensure quick and accurate driver assignments to minimize waiting times and maximize rider satisfaction.
- **Location Tracking:** Utilizes Google and Bing GPS Map technologies to accurately track the location of riders and drivers in real-time, which enables seamless tracking of the driver's route and estimated time of arrival for the rider, enhancing transparency and reducing uncertainty during the ride.
- **Payment Integration:** The design incorporates secure and convenient payment options, allowing riders to easily pay for their rides within the application. Integration with popular payment gateways ensures smooth and secure transactions, eliminating the need for cash payments and streamlining the overall payment process.
- **Security and Privacy:** The design prioritizes the security and privacy of user data, implementing stringent security measures to enforce user authentication and protecting personal information, financial transactions, and sensitive data.

## CABME CONTEXT DIAGRAM



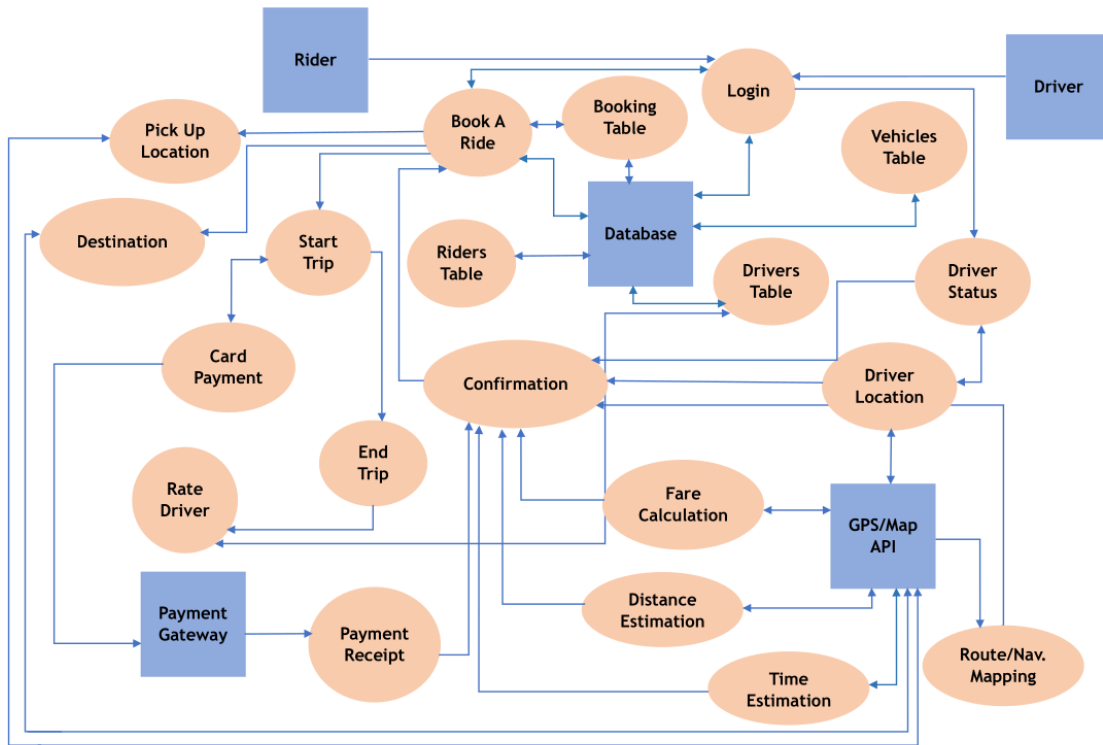
### System External Interactions

The CabMe system interacts with various external entities to fulfill its functionalities. Here is a brief explanation of the system's external interactions:

- **Riders:** The riders are the primary user of the application. The request rides, view driver details, track their rides, provide pickup and drop-off locations, provide feedback and interact with the application through user frontend interfaces using internet enabled mobile devices.
- **Drivers** interact with the application to accept ride requests, navigate to pickup and drop-off locations, and receive payment information.
- **Map and GPS Services:** The application integrates with Google and Bing Maps to retrieve map data, calculate distances, find optimal routes, and display maps to users, which enables the system to provide real-time location tracking, navigation, and route optimization.
- **Payment Gateway:** The payment gateway processes in-app riders payment transactions. It securely handles payment information, validates payments, and ensures the seamless transfer of funds and accountability.

- Database: The database store and retrieve user information, driver details, vehicle data, and booking records, enabling the system to maintain records and keep track of relevant data.

## MAIN ARCHITECTURAL VIEWS



## CabMe DataFlow Diagram



In the provided entity relationship diagram (ERD), we have five entities:

Vehicle, Vehicle Position, Booking, Driver and User, which represent different classes of the app's data model.

- The Vehicle entity stores information about vehicles, including their ID, license plate number, driver name, vehicle model, and type. The type also has an extended attributes of bus, car or van. Each vehicle is uniquely identified by its ID.

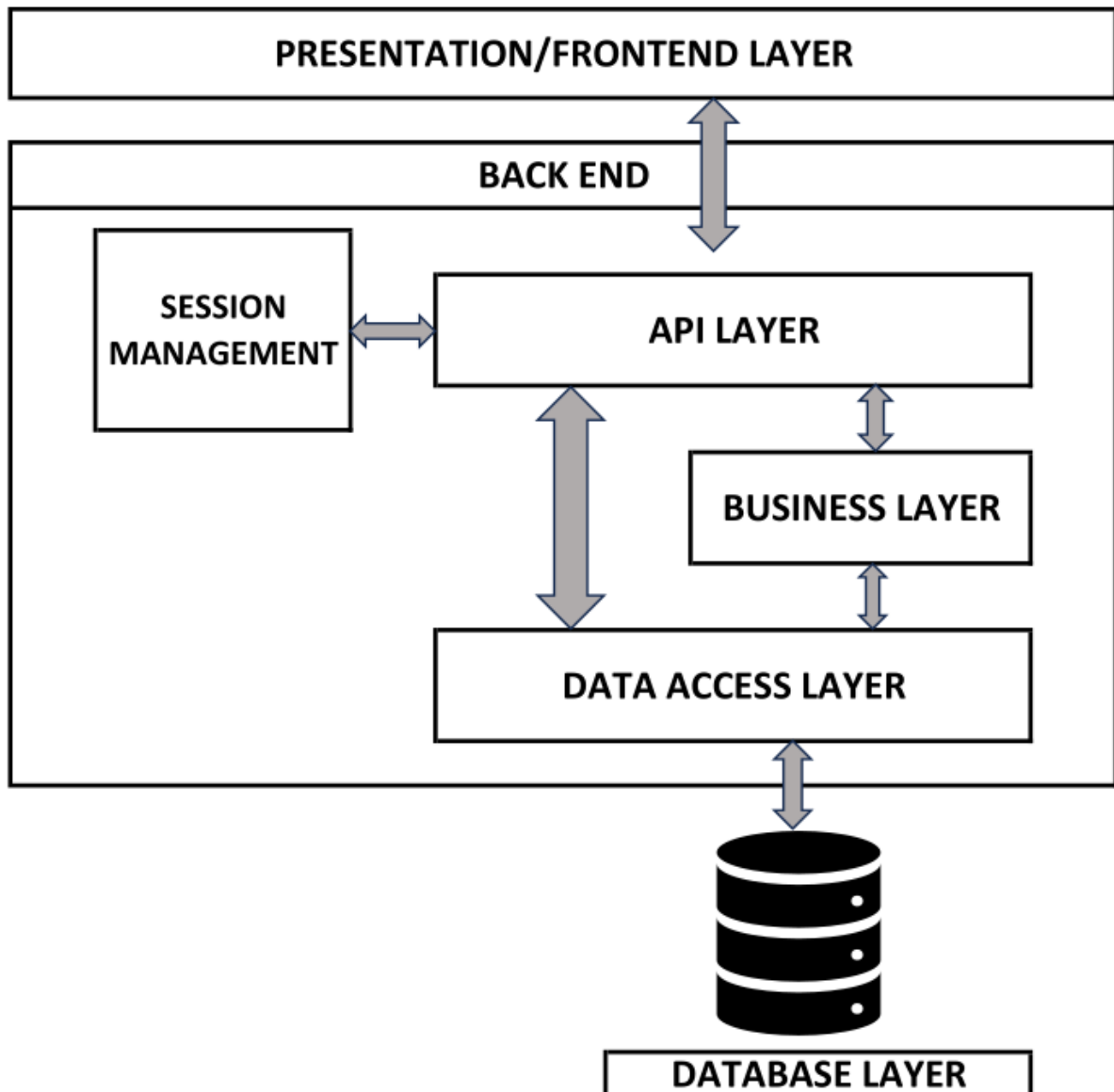


- The Vehicle Position entity represents the positions of the vehicles. It has attributes of the vehicle ID, latitude (lat), and longitude (lng). The vehicle and vehicle position entities have one-to-one relationship and shares a common primary key "id.", which allows each vehicle to have a corresponding position entry. There is also a link between the vehicle position and the booking start position which helps to calculate the distance, path and time between the driver and the rider.
- The Booking entity contains information about individual bookings made by users. It includes attributes such as the booking ID, vehicle ID, vehicle's booking status (booked or available), start and end positions (x and y), user ID, start and end times.
- The "user\_id" foreign key in the Booking entity references the ID of the corresponding user, creating a one-to-many relationship between User and Booking. Each booking is associated with a specific user, and multiple bookings can belong to the same user.
- The User entity represents user information, including their ID, email, name, and password, which stores data related to app users, such as riders and drivers.

### Entity Relationships

- The relationship function establishes a many-to-many relationship between User and Vehicle. Each User can be associated to different vehicles at different times, and a single vehicle can also be associated with multiple Users.
- One Driver can have many Users and each User can be associated with many Driver (many-to-one relationship).
- Vehicle - Vehicle Position Relationship: There is no explicit relationship defined between vehicle and vehiclePosition, although it seems that an implied one-to-one relationship exists between them, invariably, each vehicle should have a one-to-one mapping with a vehiclePosition.
- A one-to-many relationship exists between User and Booking, where each User can have multiple associated bookings, but a single Booking is associated with only one User.
- A one-to-many relationship exists between Vehicle and Booking, where each Vehicle can have multiple associated bookings, but a single Booking is associated with only one Vehicle.

## System Layered Architecture



Title: Presentation/Front End Layer:

Purpose: Handles user interactions and presenting data to users through a web interface. It handles the front-end components, including HTML, CSS, JavaScript, Flask, and templates like bootstrap, to create an interactive and user-friendly interface.

Key Features:

UI/UX performance

Owner: Adebowale Banjo

Title: Application/Back End Layer:

Purpose: Handles the application logic and business logic components. It processes user requests, interacts with the presentation and data layer, to process backend algorithm, and return appropriate responses to the user queries. The components here include Python, Google Map and Bing Map APIs etc.

Key Features:

Backend and Business Logic Algorithms

Owner: Ravee Athapattu Hunkiri

Title: Data/Database Layer:

Purpose:

Handles interactions with managing the data used by the application using SQLite Database Django Object-Relational Mapping (ORM), to perform CRUD operations in the database, which involves tables and schemas that represent the users, drivers, vehicles, bookings entities and more. The database layer ensures data integrity and efficient retrieval and storage of information.

Key Features:

Database and Authentication Management

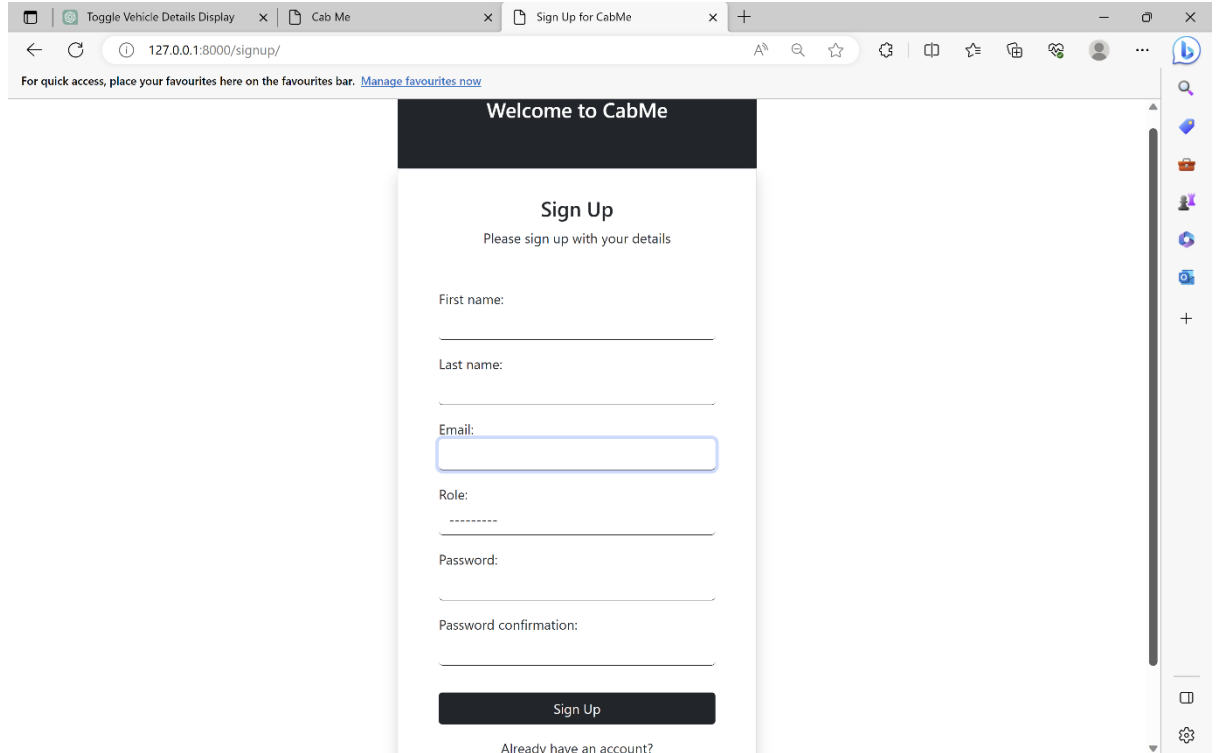
Owner: Emeka Udeze

## FINAL STATUS

- What works? Include screenshots.

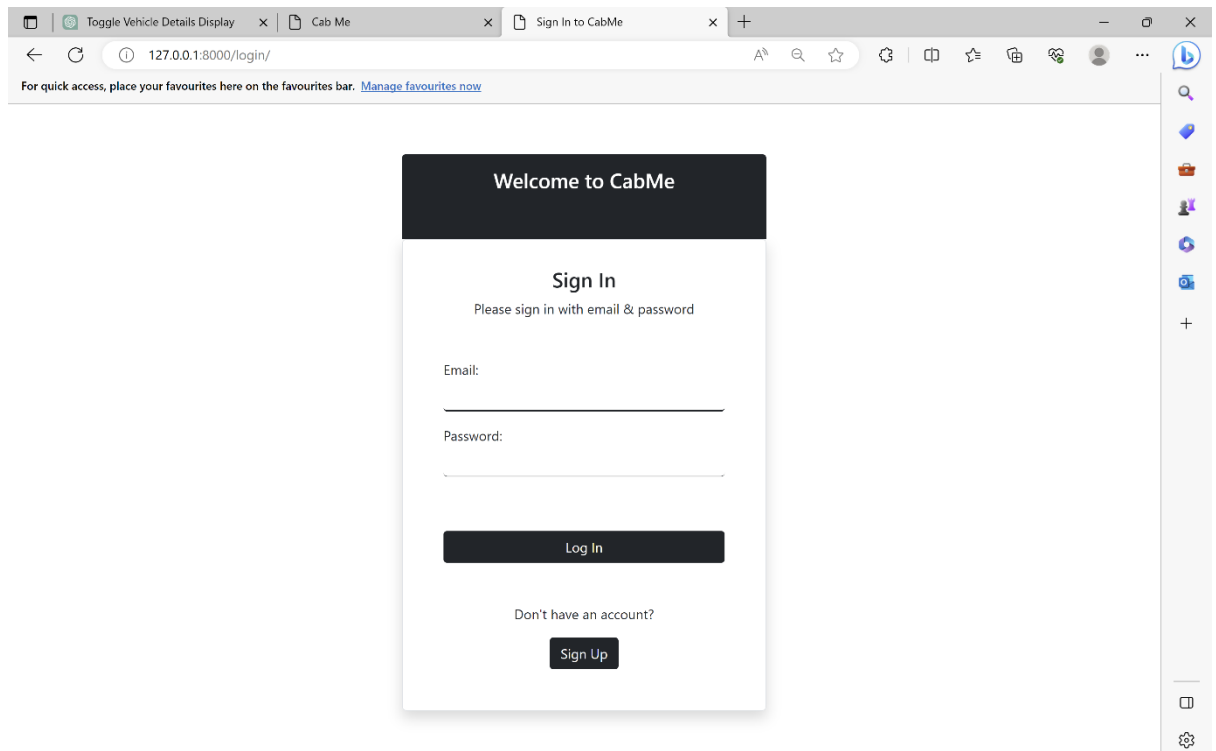
The application has a signup interface, which can be used to create new users, after, signup, the users are routed to login page, which directs them to the home page after authentication. On successful login, drivers are identified by their account type and routed to driver page, and riders are routed to home page. Admin Users are created by Admin. Vehicles are added by Admin. Admin has a different login, /admin

### Signup



The screenshot shows a web browser window with the URL `127.0.0.1:8000/signup/`. The page has a dark header with the text "Welcome to CabMe". Below the header is a white card titled "Sign Up" with the subtitle "Please sign up with your details". The card contains the following form fields: "First name:" with a text input, "Last name:" with a text input, "Email:" with a text input (highlighted with a blue border), "Role:" with a dropdown menu showing "-----", "Password:" with a text input, and "Password confirmation:" with a text input. At the bottom of the card is a dark "Sign Up" button. Below the card, the text "Already have an account?" is visible.

### SignIn



The screenshot shows a web browser window with the URL `127.0.0.1:8000/login/`. The page has a dark header with the text "Welcome to CabMe". Below the header is a white card titled "Sign In" with the subtitle "Please sign in with email & password". The card contains the following form fields: "Email:" with a text input and "Password:" with a text input. At the bottom of the card is a dark "Log In" button. Below the card, the text "Don't have an account?" is visible, followed by a dark "Sign Up" button.

## Admin Login

Toggle Vehicle Details Display | screen recorder windows 11 - Se | How to use Windows 11's new s | Log in | CabMe

127.0.0.1:8000/admin/login?next=/admin/

For quick access, place your favourites here on the favourites bar. [Manage favourites now](#)

CabMe Admin

Email:

Password:

Log in

## Homepage

Toggle Vehicle Details Display | screen recorder windows 11 - Se | How to use Windows 11's new s | CabMe

127.0.0.1:8000

For quick access, place your favourites here on the favourites bar. [Manage favourites now](#)

Hello, Christian Hanks

[Logout](#) • [Previous Journeys](#)

Start

Destination

Type

☒ Car ☐ Van ☐ Mini Bus

[Book A Vehicle](#)

Map of London showing various locations and landmarks.

What tests have you run?

We ran our tests using the local development server <http://127.0.0.1:8000/>, /admin, /driver\_profile, etc, and also hosting the application on the BBK Department of Computer Science H-Drive, which both an the application successfully, testing the different components of the application, from signing up and logging of users, to booking a ride, accepting the ride, fare calculations, navigation etc.

Did you use any existing codebases?

Yes, given its framework, libraries, and built-in functionalities, which provide a high-level and robust structure for handling various aspects of web development, such as URL routing, database management, forms handling, user authentication, and more, saving time and effort, we took advantage of the Django codebase, although this was at a very later stage of the project development, but this speed up the development process for the team.

What existing systems did you use as motivation?

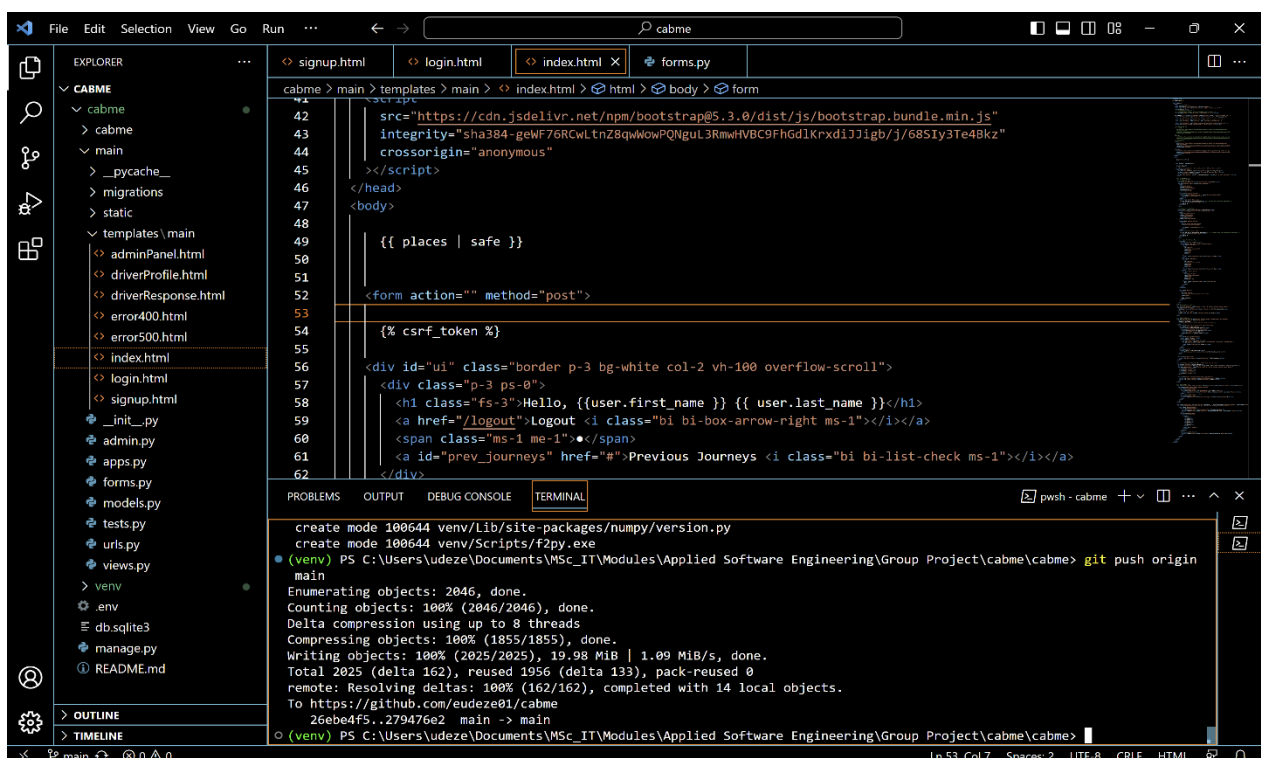
We used the Uber application as a motivation and reference case study for this project, being a very well-known popular taxi platform. Studying its architecture and model provided us insights into how real-world ride applications are operated, also given that their application handles interactions that involve ride booking, riders, drivers, vehicles, mapping etc.

When and how often did the team meet?

Initially we often meet at the Birkbeck MAL Room 403 after our lectures and during break periods, but midway through, our lectures and academic sessions came to an end, and so most of our meetings mostly became virtually across various platforms which included Slack, Google Meet, and WhatsApp (Group Video Calls). Also, we communicated via phone calls and WhatsApp group chats.

Structure of your CODIO repository

- What is the folder structure of your CODIO box, and why.



The screenshot shows a VS Code editor with a project named 'cabme'. The Explorer panel on the left displays the folder structure:

- cabme
  - cabme
    - cabme
    - main
      - \_pycache\_
      - migrations
      - static
      - templates/main
        - adminPanel.html
        - driverProfile.html
        - driverResponse.html
        - error400.html
        - error500.html
        - index.html
        - login.html
        - signup.html
    - \_init\_.py
    - admin.py
    - apps.py
    - forms.py
    - models.py
    - tests.py
    - urls.py
    - views.py
  - venv
  - env
  - db.sqlite3
  - manage.py
  - README.md

The main editor shows the content of 'index.html', which includes a Bootstrap 5.3.0 bundle and a form for user login. The terminal window at the bottom shows the output of a 'git push' command, indicating a successful push to the 'origin' branch.

- Where are the documentation files?

<https://github.com/eudeze01/cabme>

<https://github.com/eudeze01/ASE-Group-4>

- Provide a link to your Slack group.

<https://app.slack.com/client/T05CBNQR8Q3/C05CQGBNJ9X>

- Where are the SCRUM "standup" files located

## 7. Team

### Backgrounds

- What were the backgrounds of the team members?

Non-IT background

- Did anyone have prior internships or work experience related to software?

No

- Has anyone on the team built something like this before?

No

- Were the tools known or new to the team?

Yes

- Did you make use of CoPilot, GhostWriter, ChatGPT, etc.?

No