Group Project of group 8

Project – Car Rental Mobile Application

Team members:

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Part A

Deliverable #1:

Section 1 “Introduction” and sub sections:

(Section 1 is in charge of Adilet Masalbekov, and rest of section 2 with 3 is in charge of Jin Hoi Lee)

1.1 Purpose: This new software product, a car rental mobile application, will address the need for a seamless and efficient car rental process. The application will allow users to sign up, browse available cars, manage their chosen car, and pay rental fees, all from the convenience of their mobile device. Additionally, it will provide navigation and route suggestions, user reviews, and a Q&A section for user support. This comprehensive solution aims to simplify the car rental experience for customers, rental agents, and administrators alike, making car rental more accessible and user-friendly.

1.2 Document Conventions:

Use of Bold Text: Bold text is used to highlight the main sections and subsections of the document, such as "Section 1 “Introduction” and sub sections" or "Section 2 “Overall description” and subscriptions". This helps to clearly delineate the different parts of the document and guide the reader's attention to key areas.

Numbered Lists: Numbered lists are used to outline the main features of the car rental mobile app, the operating environment, and assumptions and dependencies. This helps to organize information in a clear, easy-to-follow manner.

Bullet Points: Bullet points are used to list the different types of users and the software that the app will interface with. This helps to present information in a concise and visually appealing way.

Use of Parentheses: Parentheses are used to provide additional information or clarification, such as the internal or external status of users, or the specific details of the operating environment.

Stakeholder Tables: Tables are used to organize information about stakeholders, including their position, whether they are internal or external, their contact details, and their operational or executive interest. This provides a quick and easy reference for understanding the different stakeholders involved in the project.

1.3 Intended Audience and Reading Suggestions:

1. Customers: Customers would be interested in the functionalities of the app, such as sign up, browsing available cars, managing a chosen car, paying fees, and navigation features.

2. Rental Agents: Rental agents would be interested in the operational aspects of the app, such as managing car availability and bookings.

3. Investors: Investors would be interested in the overall scope of the project, its unique selling points, and the potential return on investment.

4. Administrators: Administrators would be interested in the technical aspects of the app, such as the programming language and framework used, the database management system, and error handling and crash reporting.

5. Fleet Managers: Fleet managers would be interested in how the app manages car availability and bookings, and how it interfaces with hardware devices such as GPS sensors.

6. Payment Processors: Payment processors would be interested in how the payment system is integrated into the app and the security measures in place to protect financial transactions.

7. IT Support: IT support would be interested in the technical aspects of the app, including error handling and crash reporting, and the security and integrity of the application's database.

8. Marketing Manager: The marketing manager would be interested in the unique selling points of the app, the different customer segments, and the strategies for promoting the app and managing online reviews and ratings.

1.4 Project Scope:

- The project in focus is a car rental mobile application. The software is designed to streamline the car rental process, making it more efficient and user-friendly. The application's purpose is to provide a platform where users can easily sign up, browse available cars, manage their chosen car, and pay rental fees. It also includes features for navigation and route suggestions, user reviews, and a Q&A section for user support.

- The benefits of the application include convenience for the users, who can manage their car rental needs from their mobile devices, and efficiency for rental agents and administrators, who can manage car availability and bookings through the app. The application also aims to provide a platform for user feedback and support, enhancing the overall customer experience.

- The objectives of the project include developing a user-friendly application with a wide range of features to meet the needs of different users, and ensuring the security and reliability of the application, particularly in terms of payment processing and data management.

- The goals of the project align with the corporate goals of providing high-quality services to customers, improving operational efficiency, and staying competitive in the car rental market. The application is part of the business strategy to leverage technology to enhance customer service and gain a competitive edge in the market.

1.5 References:

- https://www.grandviewresearch.com/industry-analysis/car-rental-market
- https://www.emizentech.com/blog/car-rental-mobile-app-development-cost-features.html
- https://concisesoftware.com/blog/car-rental-app-key-features/
- https://www.rst.software/blog/how-to-build-a-car-rental-app-like-enterprise-or-hertz

Section 2 “Overall description” and subscriptions:

2.1 Product Perspective: The car rental mobile app is not a product that has been copied or common in the market. It is a significant and unique product.

2.2 Product Features (Functions): The main features of the car rental mobile app include:

1. Sign up and login
2. Browsing available cars
3. Managing a chosen car
4. Paying the fees
5. Navigating and suggesting best routes
6. Commenting sections for user reviews
7. Q&A and user support

2.3 User classes and Characteristics
Customers: Rifat khan (External), Seonwoo Lee (Internal)
Administrators: Jin Hoi Lee (Internal)
Managers: Shawn San Diego (Internal), Bruce Lee (External)
Payment Processors: Alex Turner (External)
IT Support: David Johnson (Internal)

2.4 Operating Environment: Our app will work in the environments below:

1. Hardware: Mobile devices (Android)
2. OS: Android OS
3. Software components: server, database, and payment.

2.7 Assumptions and dependencies: Assumptions and dependencies for the app can contain:

1. Trustable internet connection that makes customers to use our app
2. Comprehension of payment, navigator, and user review.
3. Required legal information that are related to our services.

Section 3 “External interface requirements”:

3.1 User Interfaces: Users will reach to our product, the car rental app, by using their mobile devices. Android supports various mobile devices, and as ours uses it, it has big domain of the available devices. Its easy design will make users to do better that they can do thorough our

product, searching a car, making an appointment, and handle the appointment.

3.2 Hardware Interfaces: The car rental mobile app interface with hardware devise
For example:

1. GPS sensors
2. Scanners
3. Cameras

3.3 Software Interfaces: Other various software will be able to be interacted with our mobile app, including:

- Google maps, rocketman, etc
- Payment for secured processing
- Reviewing platform

Deliverable #2 (in charge of Rifat)

Stakeholder Name	Stakehold-er Position	External/ Internal	Stakeholder Contact Details	Operational / Executive	Interest (High/Medium/ Low)
Rifat Khan	Customer	External	rifat123@gmail.com	Operational	High
Seonwoo Lee	Rental Agent	Internal	seonwoo.lee@gmail.com	Operational	High
Adilet Masalbekov	Investor	External	adilet321@yahoo.com	Executive	High
Jin Hoi Lee	Administrator	Internal	jinhoi.lee@gmail.com	Operational	Medium
Shawn San Diego	Fleet Manager	Internal	shawn789@email.com	Operational	Medium
Alex Turner	Payment processor	External	alex@payment.com	Operational	High
David Johnson	IT Support	Internal	davidit@gmail.com	Operational	Low
Bruce Lee	Marketing Manager	Internal	brucepunchlee@email.com	Executive	High

Deliverable #3 (in charge of Adilet Masalbekov)

Interview Questions		
Question	**Stakeholder position**	**Answer**
Requirements Engineer		
1) How did you maintain traceability between high-level requirements and detailed specifications?	Requirements Engineer	We utilized a requirements management tool that allowed us to create links between high-level requirements and their corresponding detailed specifications, ensuring full traceability throughout the project.
2) What strategies did you employ to ensure requirements consistency and avoid	Requirements Engineer	Regular reviews, use of formal specification languages, and automated consistency checks in

overlaps or contradictions?		our requirements management tool helped ensure consistency.
3) How did you handle evolving requirements during the development phase?	Requirements Engineer	We implemented an iterative requirements process, allowing for regular updates. Any changes were assessed for impact and communicated to all relevant parties.
4) How did you validate technical requirements with non-technical stakeholders?	Requirements Engineer	We used visual models, mock-ups, and simple language explanations to convey technical requirements to non-technical stakeholders, ensuring their understanding and buy-in.
5) What methodologies did you use to ensure the security and privacy requirements of the application?	Requirements Engineer	We conducted threat modeling sessions and incorporated security and privacy by design principles from the initial stages of requirements gathering.
Business Analyst		

1) What methodologies or techniques did you use for gathering requirements for the car rental mobile application?	Business Analyst	We employed a combination of user interviews, surveys, and use-case modeling to gather a comprehensive set of requirements. We also used prototyping to get early feedback from potential users.
2) How did you ensure that the gathered requirements were complete, consistent, and unambiguous?	Business Analyst	We conducted regular review sessions with stakeholders and used tools like requirement traceability matrices to ensure completeness. For consistency and clarity, we used formal specification languages and visual modeling techniques.
3) How did you validate the requirements with stakeholders to ensure they align with business objectives and user needs?	Business Analyst	We organized validation workshops where stakeholders could review and validate the requirements against business objectives. We also used scenarios and user stories to ensure alignment with user needs.
4) How did you differentiate between user needs and system requirements during your analysis?	Business Analyst	User needs were derived from direct interactions with potential users, focusing on their desires and pain points. System requirements, on the other hand, were technical specifications derived from these user needs to ensure the system

		meets those desires functionally and technically.
5) Were there any challenges in aligning business goals with technical requirements?	Business Analyst	Yes, at times there were trade-offs between what the business envisioned and what was technically feasible. We addressed these through collaborative discussions, ensuring a balance between vision and feasibility.
System Architect		
1) How did the system architecture evolve based on the requirements provided?	System Architect	The architecture was designed to be modular and scalable, allowing us to adapt and refine based on changing requirements and feedback.
2) How did you ensure that the architecture would support both current and future requirements?	System Architect	We built the architecture with extensibility in mind, using design patterns that allow for easy integration of new features and scalability.

3) Were there any challenges in translating business requirements into architectural decisions?	System Architect	Some business requirements demanded innovative architectural solutions, especially when balancing performance with scalability. Collaborative discussions helped bridge any gaps.
4) How did you handle non-functional requirements, such as performance and scalability, at the architectural level?	System Architect	We incorporated performance benchmarks and scalability tests early in the design phase, ensuring the architecture would meet these non-functional requirements.
5) How did you ensure that the chosen architecture aligned with the technological trends and industry standards?	System Architect	Continuous research, attending industry seminars, and collaboration with peers ensured our architecture was in line with current trends and standards.
Project Manager		
1) How did you identify and prioritize the stakeholders for the car	Project manager	We conducted a series of stakeholder identification workshops and used techniques like stakeholder mapping to

rental mobile application project?		prioritize them based on their influence and interest in the project.
2) How do you ensure the quality of the car rental mobile application throughout its operation?	Project manager	We have a quality assurance process in place to ensure our app is of high quality. We set quality standards, perform testing at every stage. We also involve users or testers to get their feedback and make sure the app is at the highest level of quality.
3) How did you manage changes to requirements once they were documented and approved?	Project manager	We implemented a change control process where any proposed changes to the requirements were evaluated for their impact, cost, and feasibility. Only after stakeholder approval were changes incorporated.
4) What is the estimated timeline for developing the car rental mobile application?	Project manager	The estimated timeline for developing the car rental mobile application is approximately six months. This includes all the phases of development, such as requirements gathering, design, development, testing, and deployment.

5) How did you handle conflicting requirements or disagreements among stakeholders?	Project manager	We organized conflict resolution meetings where stakeholders could discuss and prioritize conflicting requirements.
User Experience (UX) Designer		
1) How did you gather user experience requirements for the car rental mobile application?	User Experience (UX) Designer	We conducted user interviews, surveys, and usability testing sessions to understand user preferences, pain points, and expectations.
2) How did you ensure that the design would cater to a diverse user base with varying tech-savviness?	User Experience (UX) Designer	We designed multiple user personas representing different user groups and ensured our designs were intuitive and user-friendly for all.
3) Were there any challenges in aligning business objectives with user experience goals?	User Experience (UX) Designer	Balancing business objectives, such as monetization strategies, with a seamless user experience was challenging. We achieved a balance through iterative design and feedback.

4) How did you validate your design decisions with actual users?	User Experience (UX) Designer	We conducted regular usability testing sessions, gathering feedback from real users and iterating on our designs based on their input.
5) How did you collaborate with developers to ensure that the design vision was realized in the final product?	User Experience (UX) Designer	Regular sync-up meetings, design handoff tools, and collaborative platforms ensured that developers had a clear understanding of the design vision and its nuances.

Deliverable #4 (in charge of Seon Woo)

Functional Requirements list

Requirement ID	Requirement title	Short Description	Priority	Requester
FR01	Log-in feature	The System should provide a secure log-in feature that allows users to create accounts, access their profiles, and perform various actions such as reserving cars or leaving reviews.	Medium	Customer, Administer
FR02	User's profiles	The System should allow users to create and manage their profiles, and administrators should provide their service base on that information	High	Customer
FR03	Car's Information	The system should display detailed information about the available cars for rental. This includes specifications, pricing, availability, images, and any additional features or restrictions.	High	Administrator
FR04	Searching and filtering	The system should offer an intuitive search and filtering functionality, allowing users to find cars based on specific criteria such as location, dates, car type, price range	High	Customer
FR05	Reserving and paying	The system should enable users to reserve their chosen car by selecting the desired rental dates and making a payment. It should provide a	High	Customer

		seamless and secure payment process, integrating with popular payment gateways.		
FR06	Review	The system should allow users to leave reviews and ratings for the cars and the overall rental experience. These reviews can help future users make informed decisions when choosing a car.	Medium	Customer
FR07	Alert	The system should have an alert feature to notify users about important updates, such as reservation confirmations, payment reminders, or changes to their rental details.	Medium	Customer
FR08	Pick-up & Return location	The system should provide a selection of pick-up and return locations for the rented cars, allowing users to choose the most convenient option for them.	High	Customer, Administer
FR09	Insurance Selection	The system should offer users the choice to select insurance options for their rental cars, providing coverage and protection during the rental period.	High	Insurance company
FR10	Frequently asked questions FAQ	The system should include a comprehensive FAQ section where users can find answers to common inquiries related to the rental process, policies, terms, and conditions.	Medium	Administrator

Nonfunctional Requirements list

Requirement ID	Requirement title	Short Description	Priority	Requester
NFR01	Security	The system should be equipped with security features to protect users' personal and payment information and to prevent illegal access or data leakage.	High	IT security officer
NFR02	Performance	The system should provide fast and efficient performance, allowing users to have a smooth experience. Quickly process rental vehicle searches, bookings, payments, etc.	High	IT administrator
NFR03	Usability	The system should provide a user-friendly interface and intuitive functionality that makes it easy for users to use.	High	IT administrator
NFR04	Mobile & Web compatibility	The system should be compatible with both mobile devices and web browsers, allowing users to use the website on any platform.	High	IT administrator
NFR05	Scalability	The system has the flexibility to respond flexibly to the growth of users or traffic. The system provides consistent performance to users by expanding or contracting resources according to load.	High	IT administrator
NFR06	Reliability	The system should provides a reliable and reliable operating environment.	High	IT administrator

Part B

Deliverable #1 (in charge of Adilet Masalbekov)

Use Case Name	List of related Requirements ID	Actor(s)	Brief Description
Subsystem: User Management			
Create Profile	FR02	Customer, Registration System	The actor will navigate to the registration page and fill out a form with personal details such as name, email, and password. After submitting the form, the system will validate the information, create a new user profile, and store this information securely for future reference.
Subsystem: Car Rental			
View Car Information	FR03	Customer, Inventory Database	The customer will navigate to the car listings page. The system will display a list of available cars with detailed information for each car, including specifications, pricing, availability, images, and any additional features.
Search and Filter Cars	FR04	Customer, Search Engine	The customer will use the search bar and filter options on the car listings page to find cars based on specific criteria such as location, dates, car type, and price range. The system will display the cars that match these criteria.

Reserve and Pay for Car	FR05	Customer, System Administrator, Payment Gateway, Inventory Database	The customer will select a car and rental dates, then navigate to the payment page. The customer will enter payment details, and the system will process the payment through a secure gateway. After successful payment, the system will confirm the reservation and send a confirmation receipt to the customer.
Select Pickup and Return Location	FR08	Customer, Location Database	During the reservation process, the customer will select the pickup and return locations for the rented car from a list of available options. The system will confirm these locations and include them in the reservation details.
Select Insurance	FR09	Customer, Insurance Company, Insurance Database	During the reservation process, the customer will be presented with various insurance options for the rented car. The customer can select an option based on their needs, and the system will include the insurance coverage in the reservation details and price.
Subsystem: Reviews and Alerts			
Leave Review	FR06	Customer, Review System	After the rental period, the customer will have the option to leave a review and rating for the rented car and overall rental experience. The customer will fill out a review form, and the system will post this review on the car's information page for future customers to see.

Receive Alerts	FR07	Customer, Notification System	The system will send alerts to the customer about important updates, such as reservation confirmations, payment reminders, or changes to rental details. These alerts can be sent via email, SMS, or in-app notifications, depending on the customer's preferences.
Subsystem: Information and Help			
Access FAQ	FR10	Customer, Administrator, FAQ System	The customer can navigate to the FAQ section to find answers to common inquiries. The system will display a list of frequently asked questions and their answers, covering topics related to the rental process, policies, terms, and conditions.
Abstract Use cases			
Log-in to the system	FR01	-	The actor will navigate to the login page and enter their username and password. The system will verify the credentials against the stored user profiles. If the credentials are valid, the system will grant access to the user's account.

Deliverable #2 (in charge of Adilet Masalbekov)

Use case: Reserve and Pay for Car
Iteration: 1, last modification: June 26 by Adilet
Primary actor: Car renter
Goal in context: To reserve a car and complete payment for the rental
Preconditions: The renter must have a valid user profile and must have selected a car for rental.
Trigger: The renter decides to reserve a car and proceed to payment.
Scenario:

1. The renter selects a car from the car listings page.
2. The renter selects the desired rental dates.
3. The system displays the total cost based on the rental period and chosen car.
4. The renter navigates to the payment page.
5. The renter enters his or her payment details.
6. The system validates the payment details and processes the payment through a secure gateway.
7. Upon successful payment, the system confirms the reservation.
8. The system sends a confirmation receipt to the customer's registered email.

Exceptions:

1. Payment details are incorrect or not recognized — see use case Validate Payment Details.
2. The selected car is not available for the chosen dates — system displays appropriate error message; see use case Check Car Availability.
3. The renter's account has insufficient balance or credit limit — system displays appropriate error message.
4. The renter's session times out during the reservation process — system prompts the renter to log in again.
5. The system experiences a technical issue and cannot process the reservation—system displays an error message and asks the renter to try again later.

Priority: High priority, to be implemented in the first increment
When available: First increment
Frequency of use: Frequent
Channel to actor: Via PC-based browser/mobile app, and Internet connection

Secondary actors: System Administrator, Payment Gateway, Inventory Database

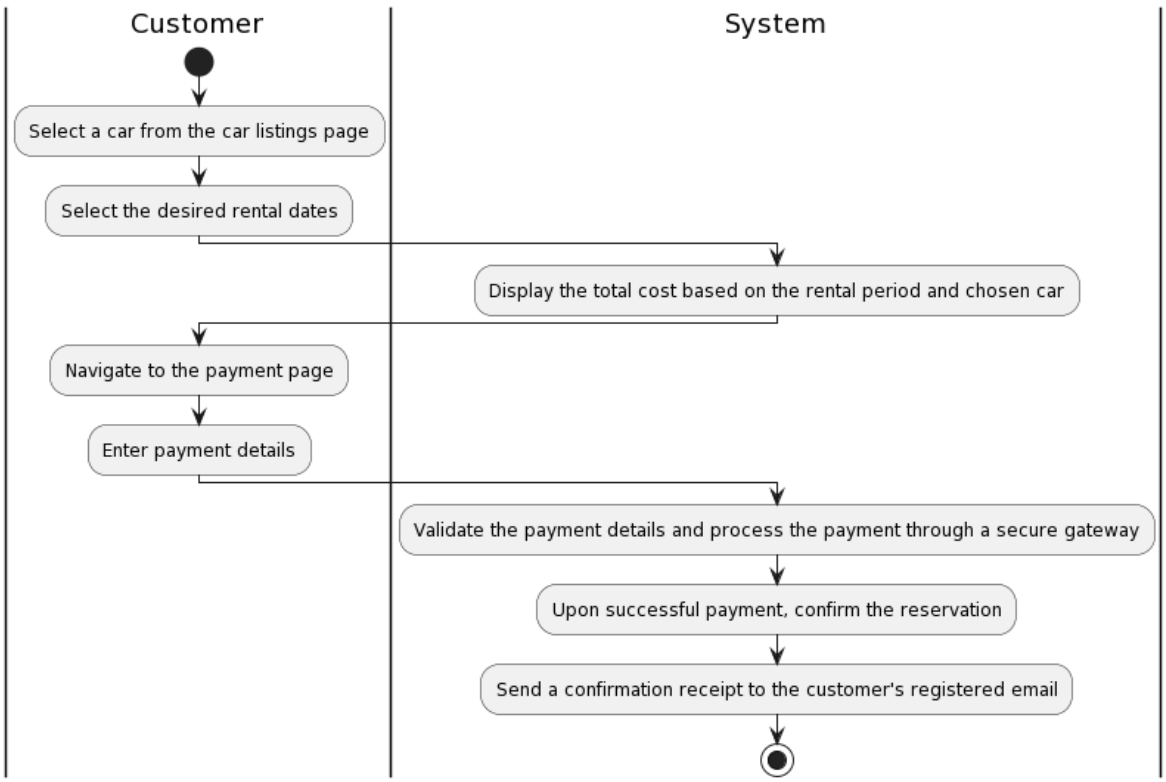
Channels to secondary actors:

1. System Administrator: PC-based system
2. Payment Gateway: Secure internet connection
3. Inventory Database: Internal system connection

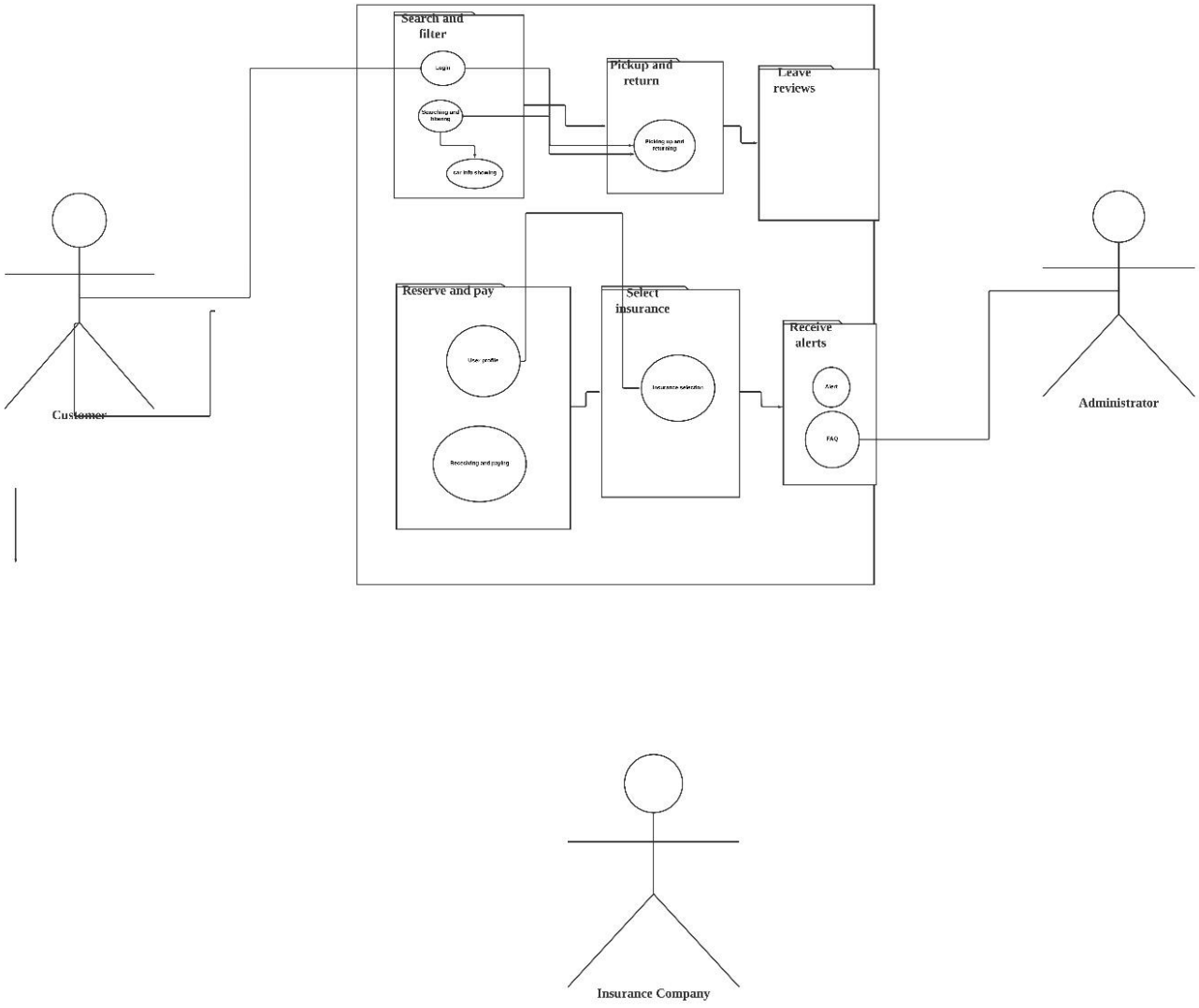
Open issues:

1. What mechanisms protect unauthorized use of the customer's payment information?
2. Is the system's response time during the payment process acceptable given the potential for high traffic?
3. How will the system handle high demand periods where multiple customers may be trying to reserve the same car at the same time?
4. How will the system ensure that the reservation process is user-friendly and intuitive, especially for first-time users?
5. Will the system offer a feature to save customer preferences for future reservations?
6. Will the system provide a feature for customers to modify or cancel their reservation after payment has been made?

Swimlane Diagram:



Deliverable #3 (in charge of Jin Hoi Lee)



Deliverable #4 (in charge of Seon Woo Lee)

Step 1:

The car rental mobile app functions by enabling customers to search and rent cars online. Customers can create accounts and provide personal details, including payment information. The app maintains a database of available cars, including their make, model, year, color, and rental rates. Customers can make rental reservations for specific cars and select rental dates. Upon confirmation, an order is generated with details such as the customer ID, car ID, rental dates, and total cost. Payment methods are securely stored and associated with the customer. The site also manages car categories and maintenance records. Customer reviews and ratings are collected for cars and the overall rental experience. The system interacts with customers through a user-friendly interface, accessible via a web browser or mobile app, allowing them to search, view car details, make reservations, and manage their bookings.

Potential Classes
Customer
Car
Rental Reservation
Order
Payment Method
Maintenance Record
Review
Location
Employees

Step 2:

Find nouns that fit the following categories.

Potential Classes	General Classification
Customer	External Entities
Car	Things
Rental Reservation	Things
Order	Things
Payment Method	Things
Maintenance Record	Things
Review	Things
Location	Places
Employees	Roles

Step 3:
Examine each noun against the class selection criteria.

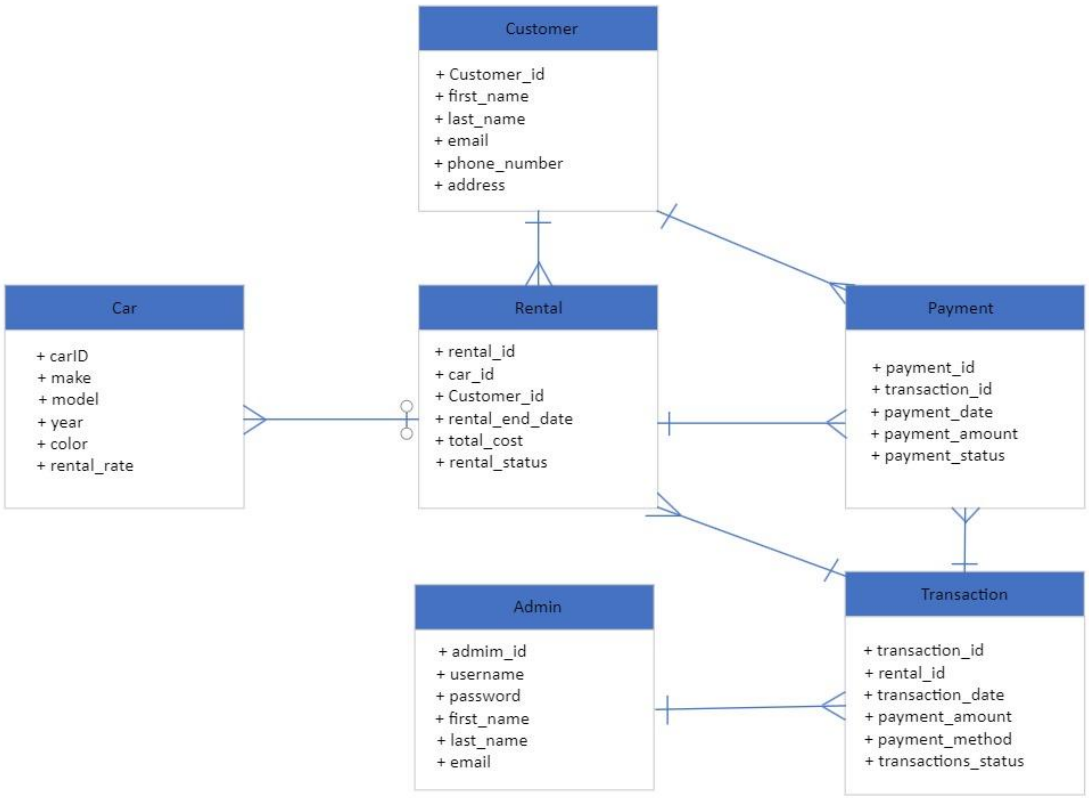
Class Selection Criteria

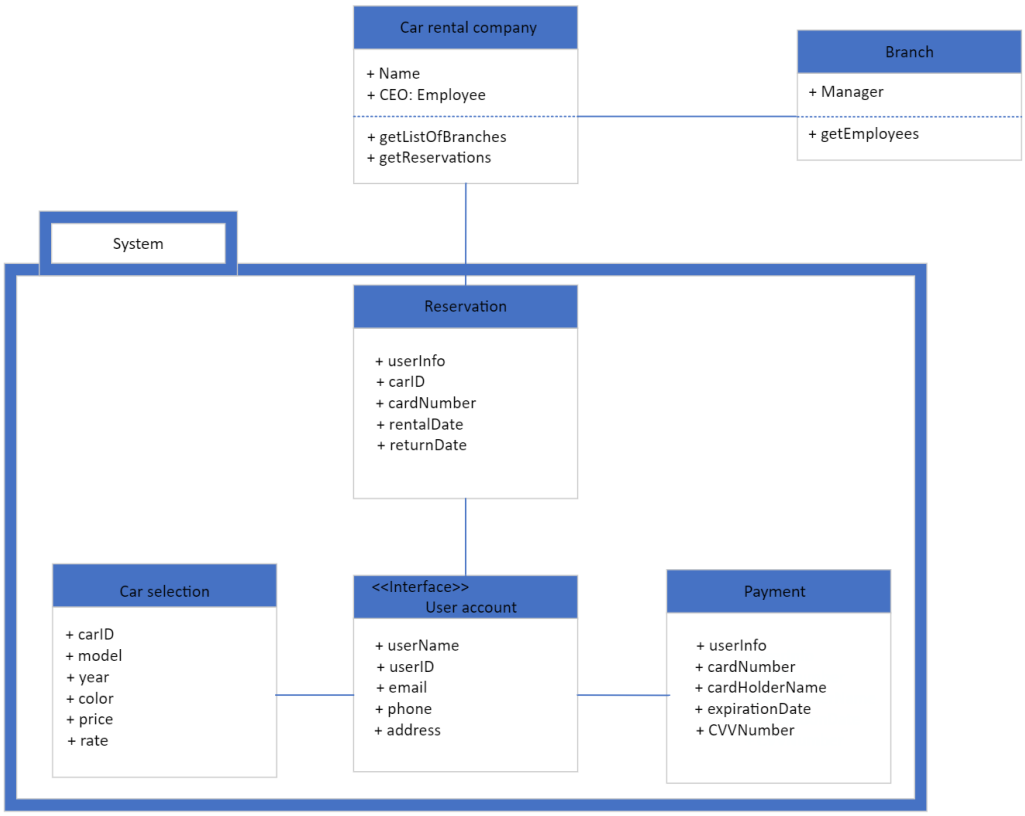
1. Contains information that should be retained or remembered
2. Provides needed services
3. Contains multiple attributes.
4. Has common set of attributes that apply to all class instances.
5. Has common set of operations that apply to all object instances.
6. Represents external entity that produces or consumes information.

Potential Classes	Characteristic Number That Applies
Customer	Apply All
Car	Rejected: 1, 2
Rental Reservation	Apply All
Order	Apply All
Payment Method	Apply All
Maintenance Record	Rejected: 1, 2
Review	Apply All
Location	Apply All
Employees	Apply All

Step 4:

Identifying the attribute for the selected classes





Deliverable #5 (in charge of Seon Woo Lee)

Class: Car	
Responsibility	Collaborator
Store car information Track car availability Calculate rental fees Handle maintenance and servicing of cars	Rental Agency Customer Maintenance Service

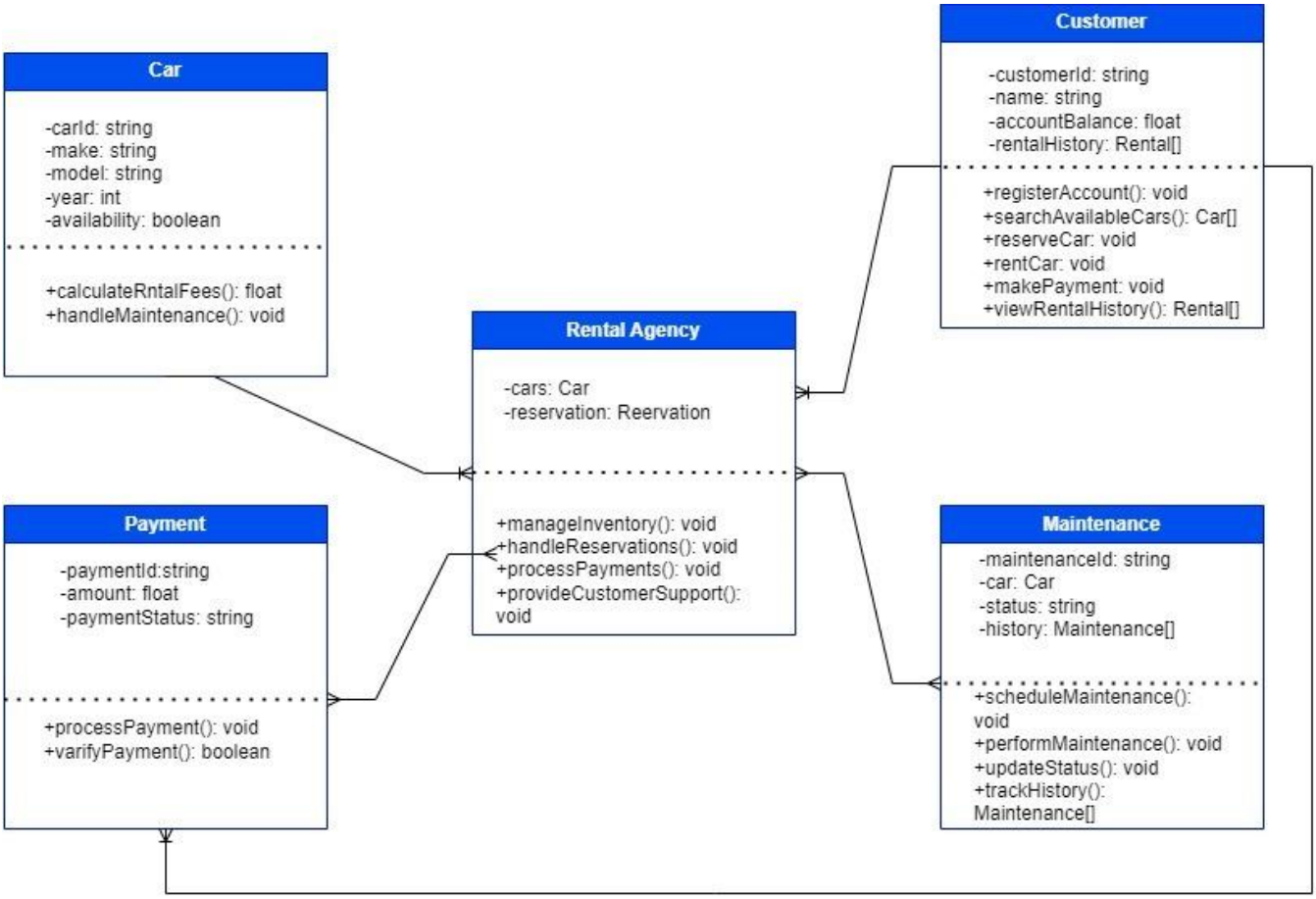
Class: Rental Agency	
Responsibility	Collaborator
Manage the inventory of available cars Handle car reservations and rentals Process rental payments Provide customer support	Car Customer

Class: Customer	
Responsibility	Collaborator
Register an account Search and browse available cars Reserve and rent Make payments View rental history	Car Rental Agency Payment Gateway

Class: Payment	
Responsibility	Collaborator
Process rental payments securely Handle payment transactions Verify payment details	Customer Rental Agency

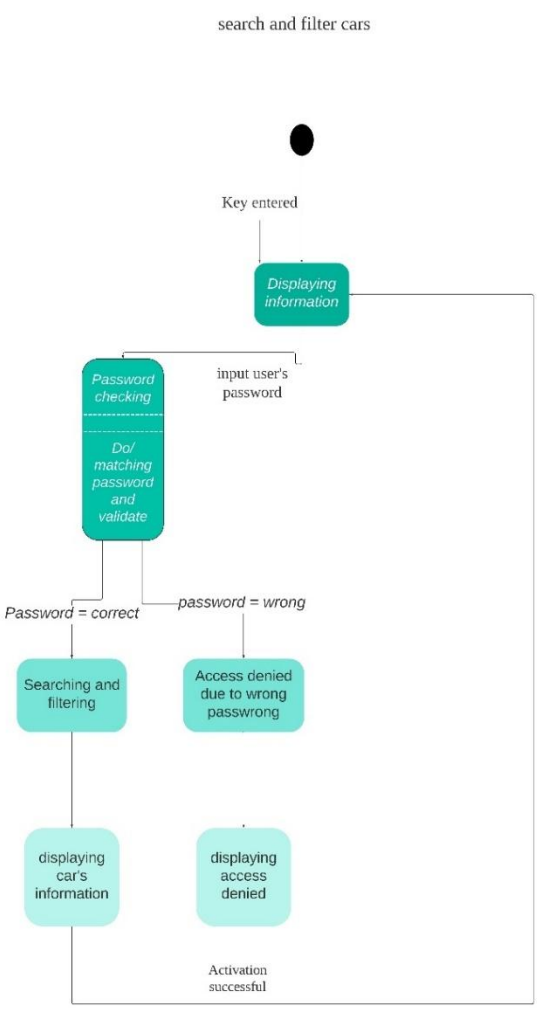
Class: Maintenance	
Responsibility	Collaborator
Schedule and perform car maintenance and repairs Update car status after maintenance Track maintenance history	Car

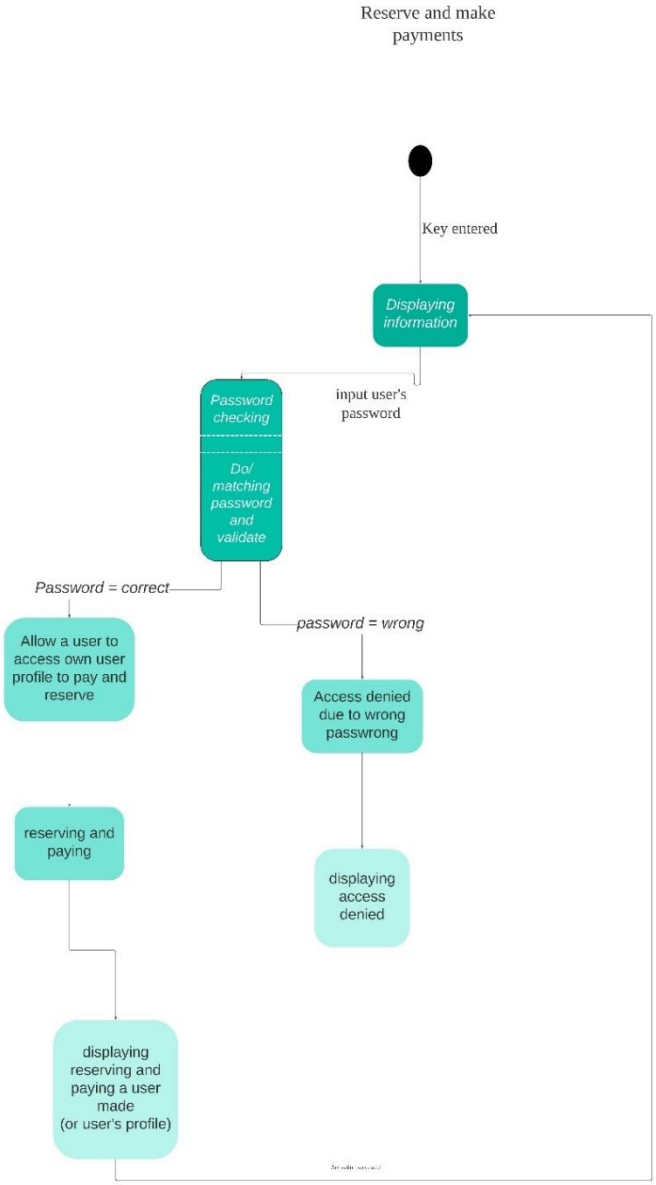
Deliverable #6 (in charge of MD Rifat Khan)



Part C

Deliverable #1 (in charge on Jin Hoi Lee)





Deliverable #2 (in charge of Adilet Masalbekov)