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# Car Rental Management System

## Assessment -2

## Software Engineering Lab - BCSE301P

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## 1. Describe the System/Project

### What is the project about?

The **Car Rental Management System** is a software application designed to automate and streamline the process of renting vehicles to customers. It enables users to **book, rent, return, and pay for vehicles**, while allowing the system to **manage inventory, track reservations, and generate reports**.

### What are the main functionalities?

- **User Registration & Authentication:** Customers sign up, log in, and manage their accounts.
- **Vehicle Management:** Add, update, and maintain vehicle information.
- **Booking & Reservation System:** Customers can browse available cars, check availability, and reserve them.
- **Payment Processing:** Secure online transactions for rental payments.
- **Rental Tracking:** Tracks active rentals, return deadlines, and overdue rentals.
- **Invoice & Billing:** Generates rental invoices and processes payments.
- **Reports & Analytics:** Provides reports on revenue, vehicle usage, and customer trends.

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## 2. Define the States

A **state** represents a particular condition of the system at a given moment.

### Distinct States & Their Meanings:

1. **Idle State** – The system is running but awaiting user interaction.
2. **User Authentication State** – A user is registering, logging in, or being verified.
3. **Browsing State** – The customer is searching for a car to rent.
4. **Booking State** – The customer selects a car and confirms a rental request.
5. **Payment Processing State** – Payment details are entered, and the transaction is being verified.
6. **Rented State** – The car is successfully rented, and the system is tracking the rental period.

7. **Return State** – The customer returns the car, and the system verifies its condition.
8. **Invoice and Billing State** – The system generates an invoice and processes final charges.
9. **Maintenance State** – The car is flagged for maintenance if necessary, before the next rental.
10. **Terminated State** – The rental session is completed successfully.

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## 3. Identify the Events

Events **trigger transitions** between states.

**Key Events:**

- **User logs in/registers** → Moves from **Idle State** → **Authentication State**.
- **User browses available cars** → Moves from **Authentication State** → **Browsing State**.
- **User selects a car and confirms rental** → Moves from **Browsing State** → **Booking State**.
- **Payment is processed successfully** → Moves from **Booking State** → **Rented State**.
- **Car is returned** → Moves from **Rented State** → **Return State**.
- **Car needs maintenance** → Moves from **Return State** → **Maintenance State**.
- **Rental transaction is completed** → Moves from **Return State** → **Terminated State**.

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## 4. Specify the Actions

| State | Actions Performed |
|---|---|
| **Idle State** | Waits for user interaction. |
| **Authentication State** | Verifies user credentials, retrieves customer details. |
| **Browsing State** | Displays available cars, filters search results. |
| **Booking State** | Confirms car availability, reserves car. |
| **Payment Processing** | Processes payment, generates booking ID. |

| State | Actions Performed |
|---|---|
| **Rented State** | Assigns car to customer, updates vehicle status. |
| **Return State** | Checks vehicle condition, calculates final cost. |
| **Invoice & Billing** | Generates invoice, deducts payments if needed. |
| **Maintenance State** | Flags car for inspection and maintenance. |
| **Terminated State** | Completes transaction, updates rental history. |

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## 5. Define the Guards (Conditions)

**Guards** are conditions that must be met for a transition to occur.

- **User Authentication Guard:** The user must provide valid login credentials before accessing the system.
- **Booking Guard:** A car must be available before it can be rented.
- **Payment Guard:** The payment must be **successful** before the rental is confirmed.
- **Return Guard:** The car must be returned in acceptable condition to finalize the rental.
- **Maintenance Guard:** If the car has **damage or requires servicing**, it moves to **Maintenance State** before being available again.

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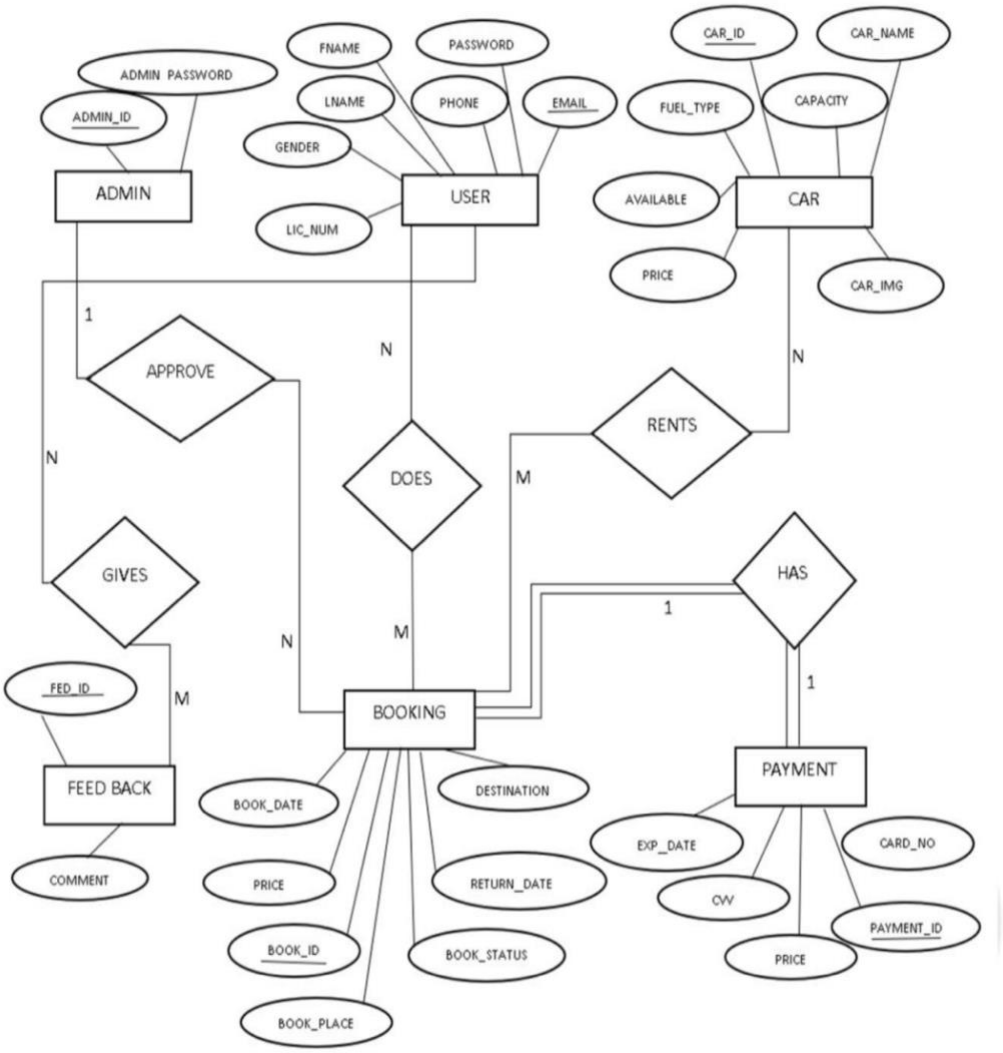
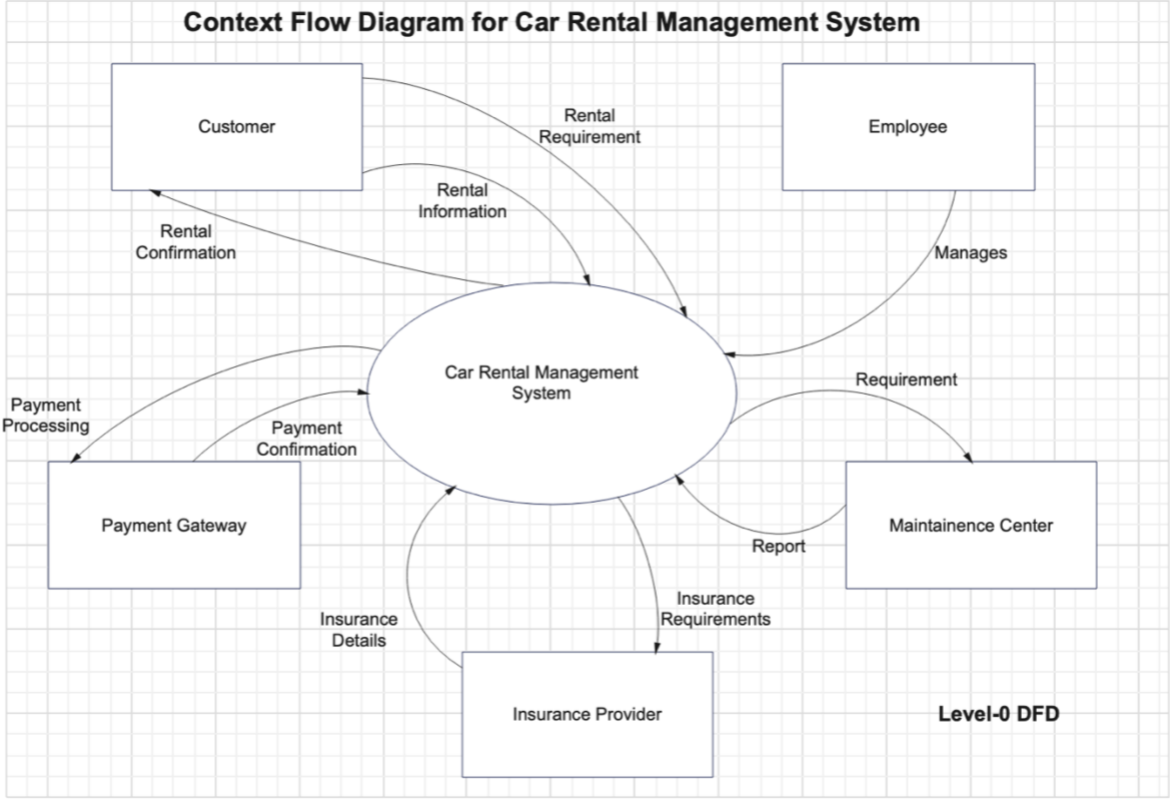
# Entity Relationship (ER) Diagram:



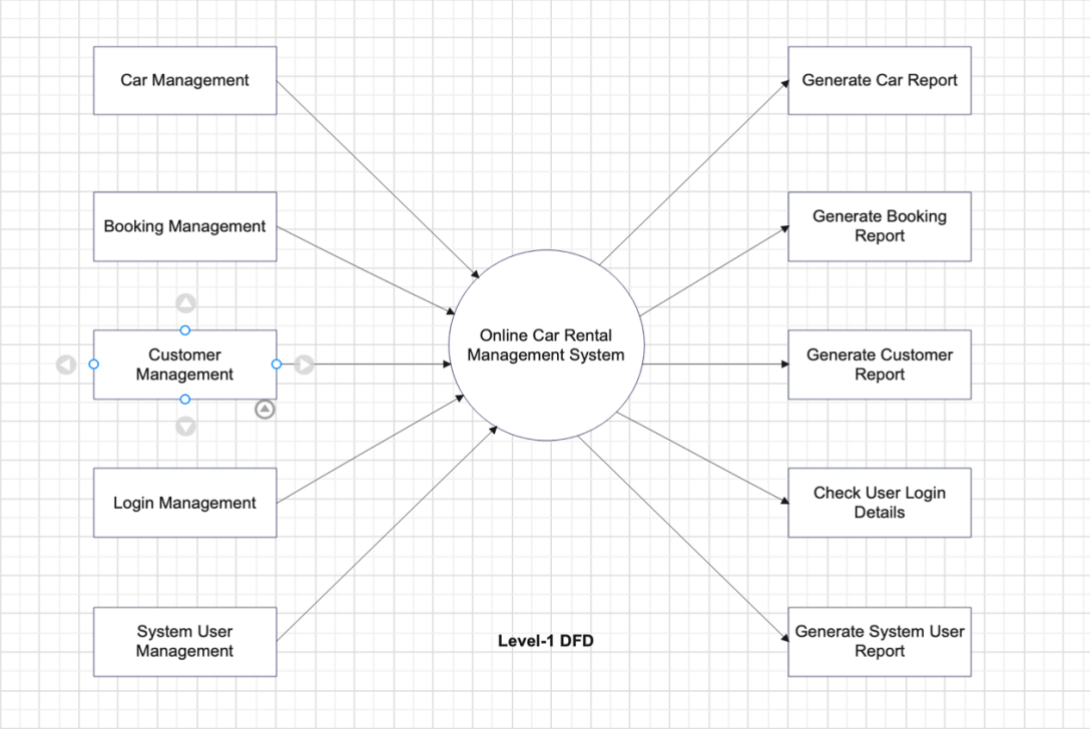
## Context flow diagram (Level-0 DFD):




Zero Level DFD of online car rental system, it elaborates high level process of online car rental system. It is overview of whole online car rental system there are some high-level entities for the process of car rental system.

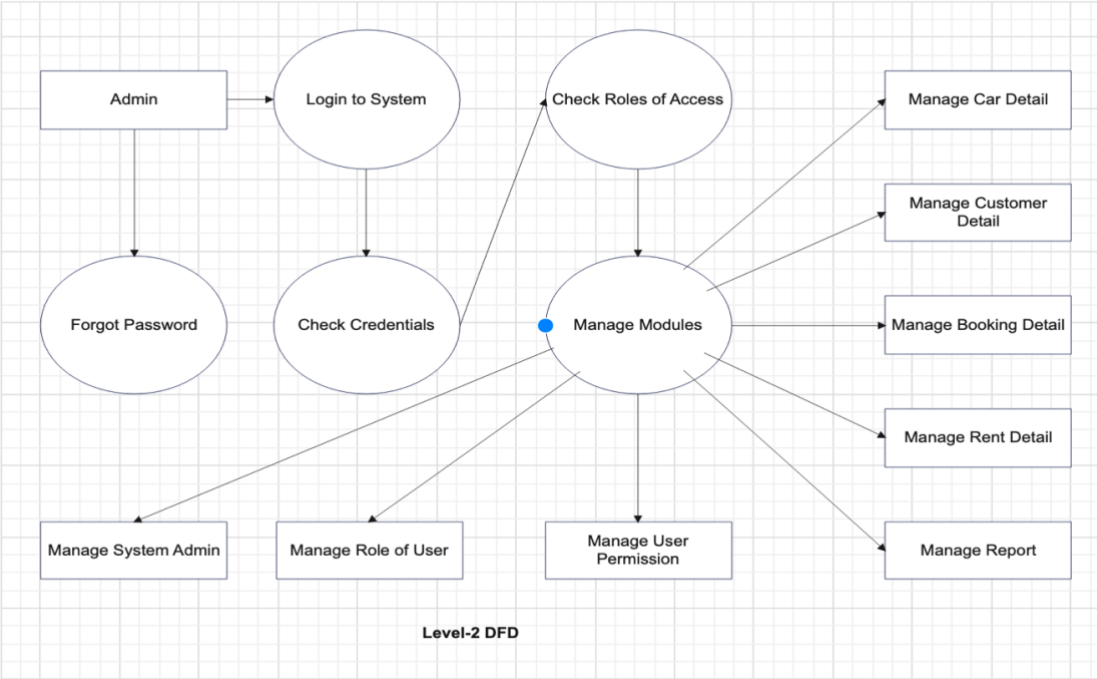
## Data Flow Diagram:

**Level-1 DFD:**



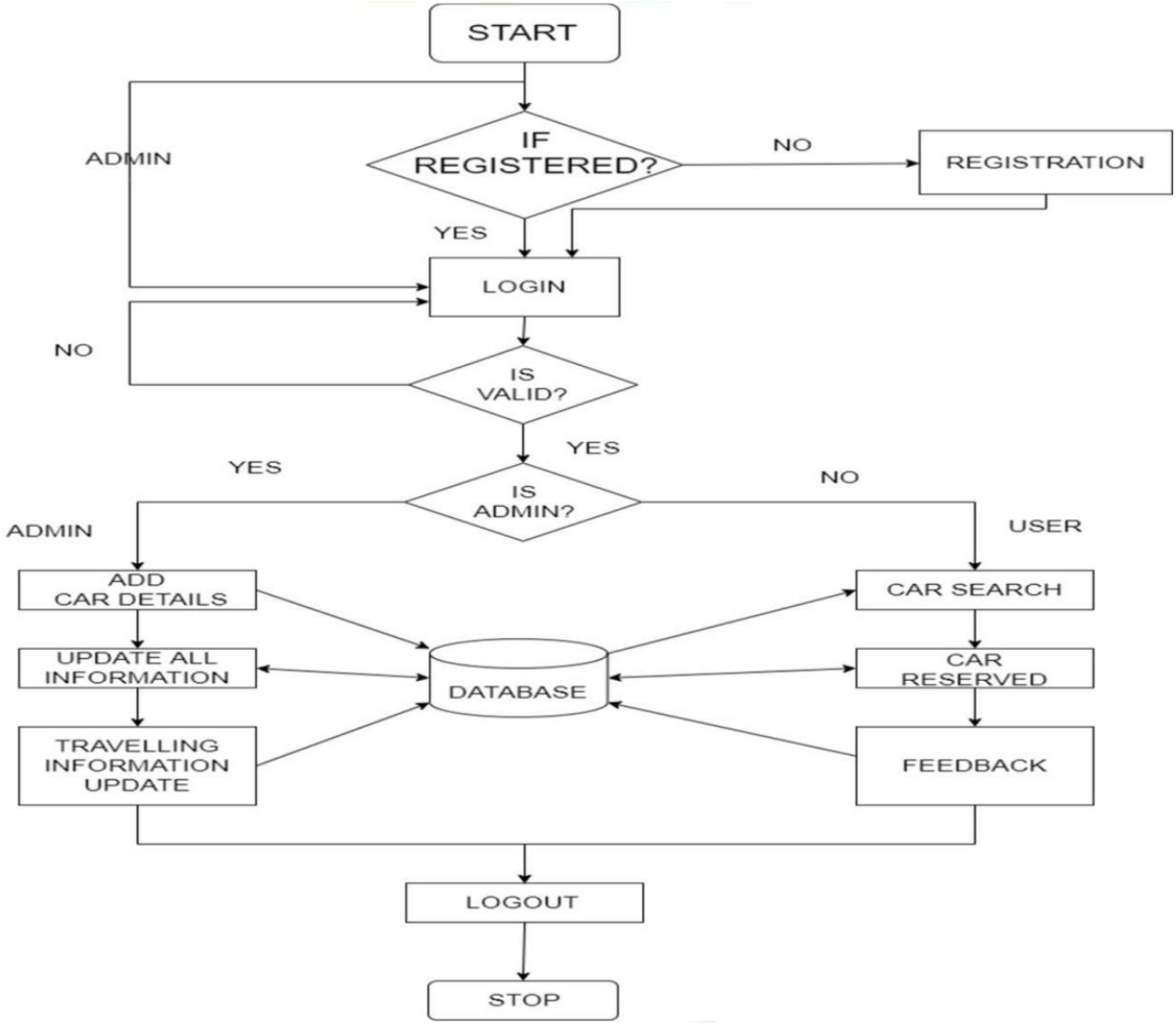

1st Level DFD of online car rental system shows how the system is divided into sub system, each of which deals with one or more of the data flows to or from an external agent which together provide all the functionality of online car rental system as whole, above are some given entities and output of 1st level.

**Level-2 DFD:**



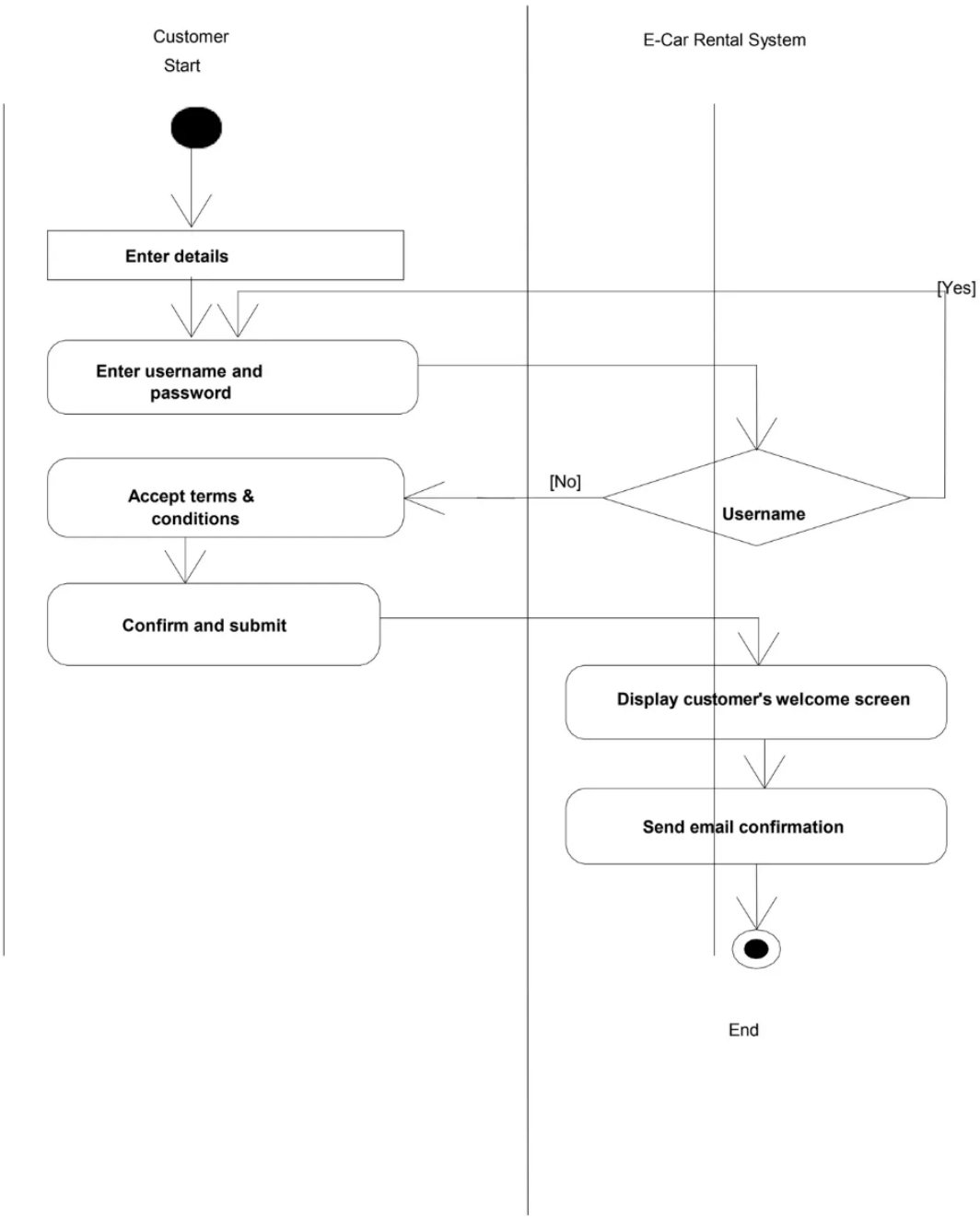

The Level-2 DFD further decomposes the Level-1 processes into more detailed sub-processes, illustrating how data flows within each major function of the system. At this level, the system is broken down into specific operational components, showing the interaction between users, data stores, and system processes. The primary subsystems in this Level-2 DFD include User Management, Vehicle Management, Booking & Reservation, Payment Processing, Rental Tracking, and Reporting & Analytics.

**Flow Chart:**

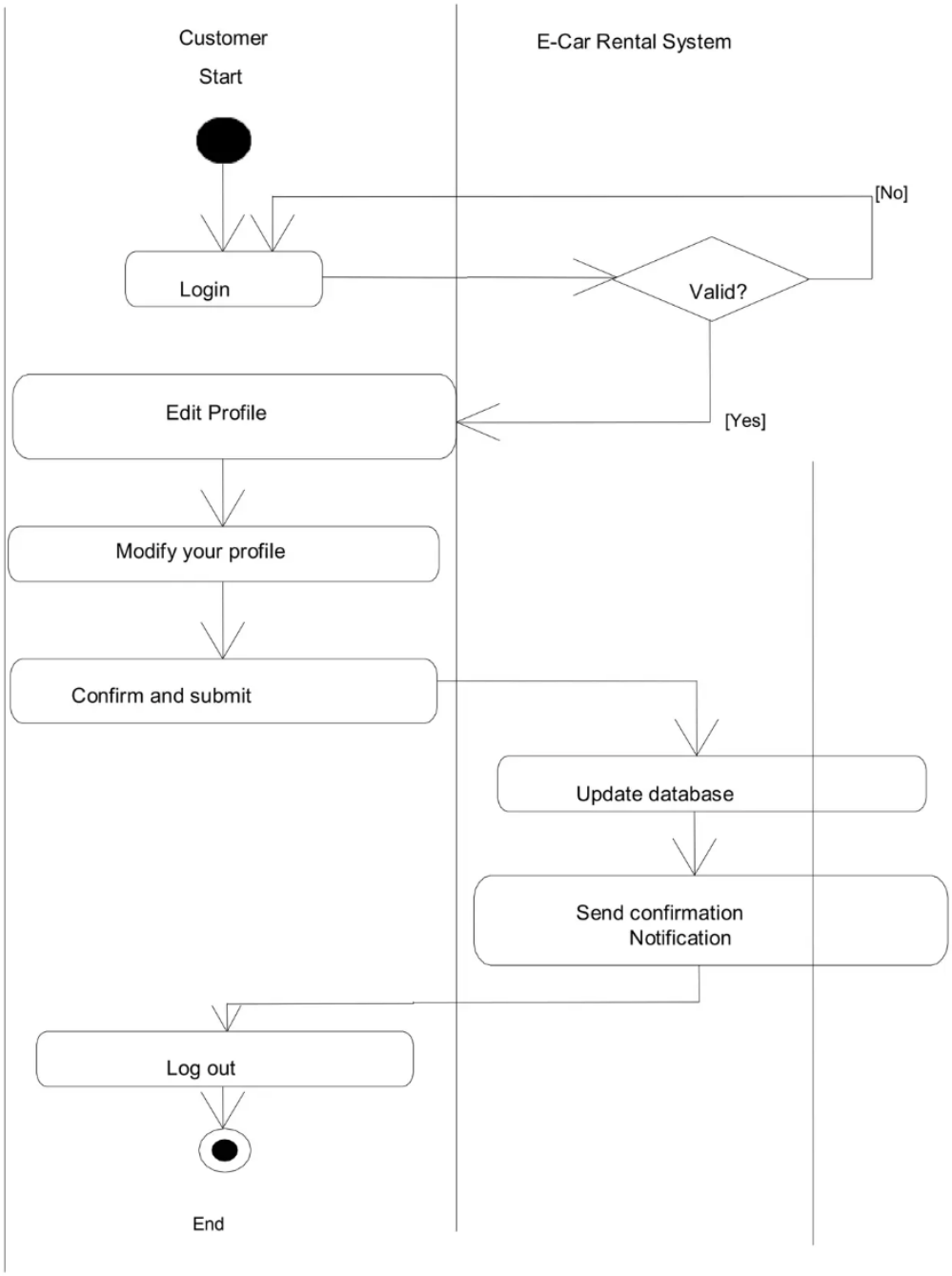



A flowchart provides a step-by-step visual representation of the processes in the Online Car Rental System, showcasing the decision-making steps and data flow.

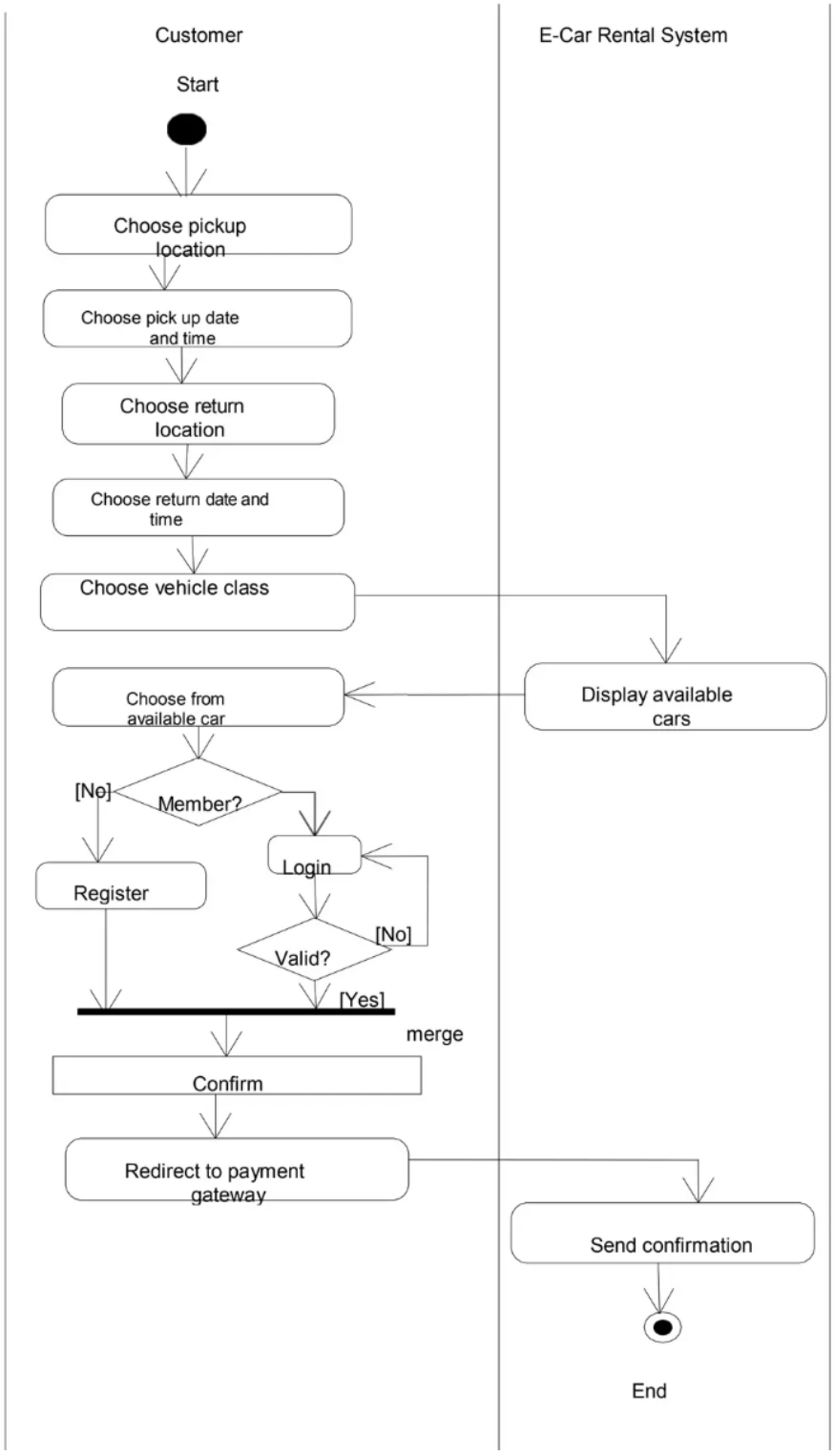
## Activity Diagram:



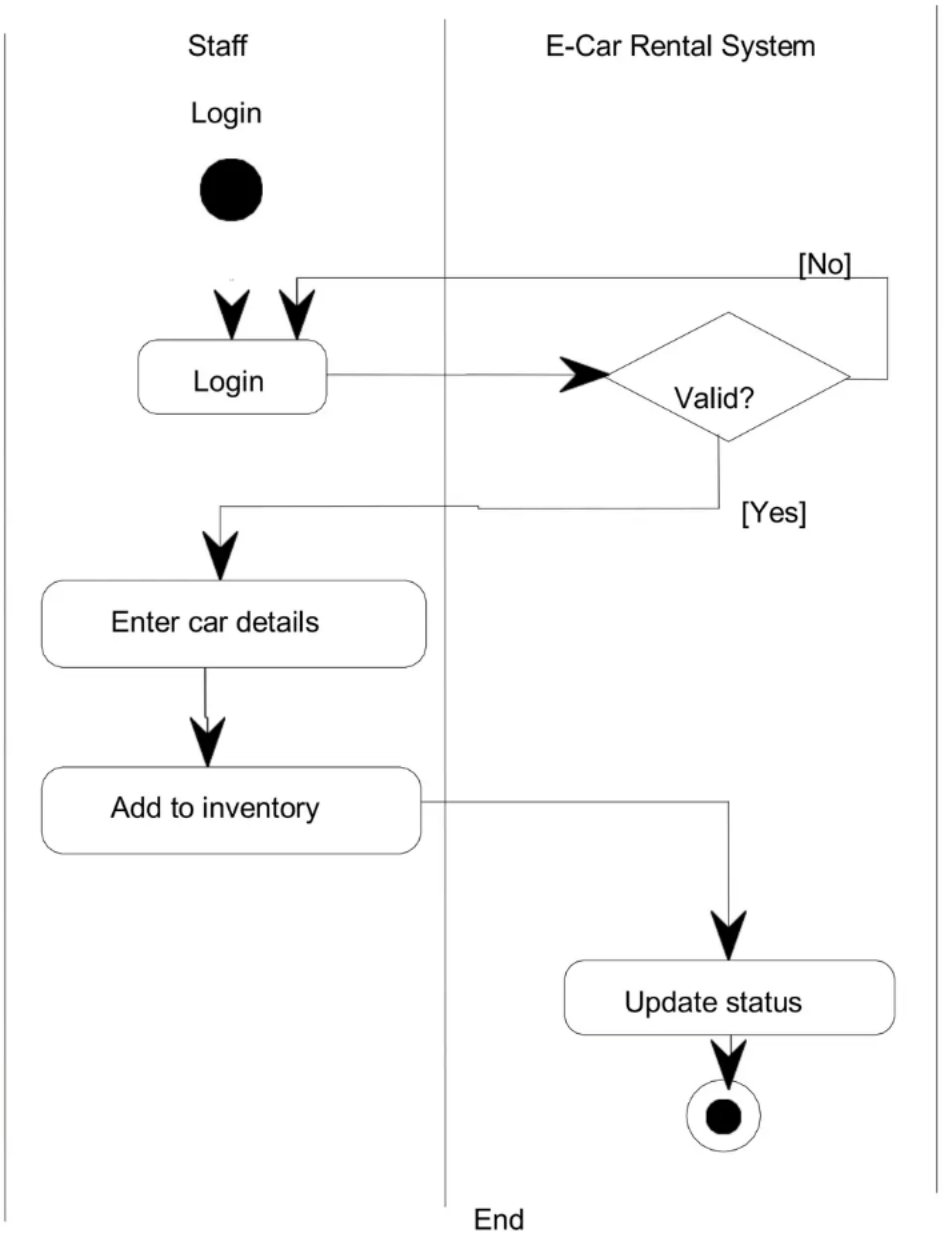

## Member Registration



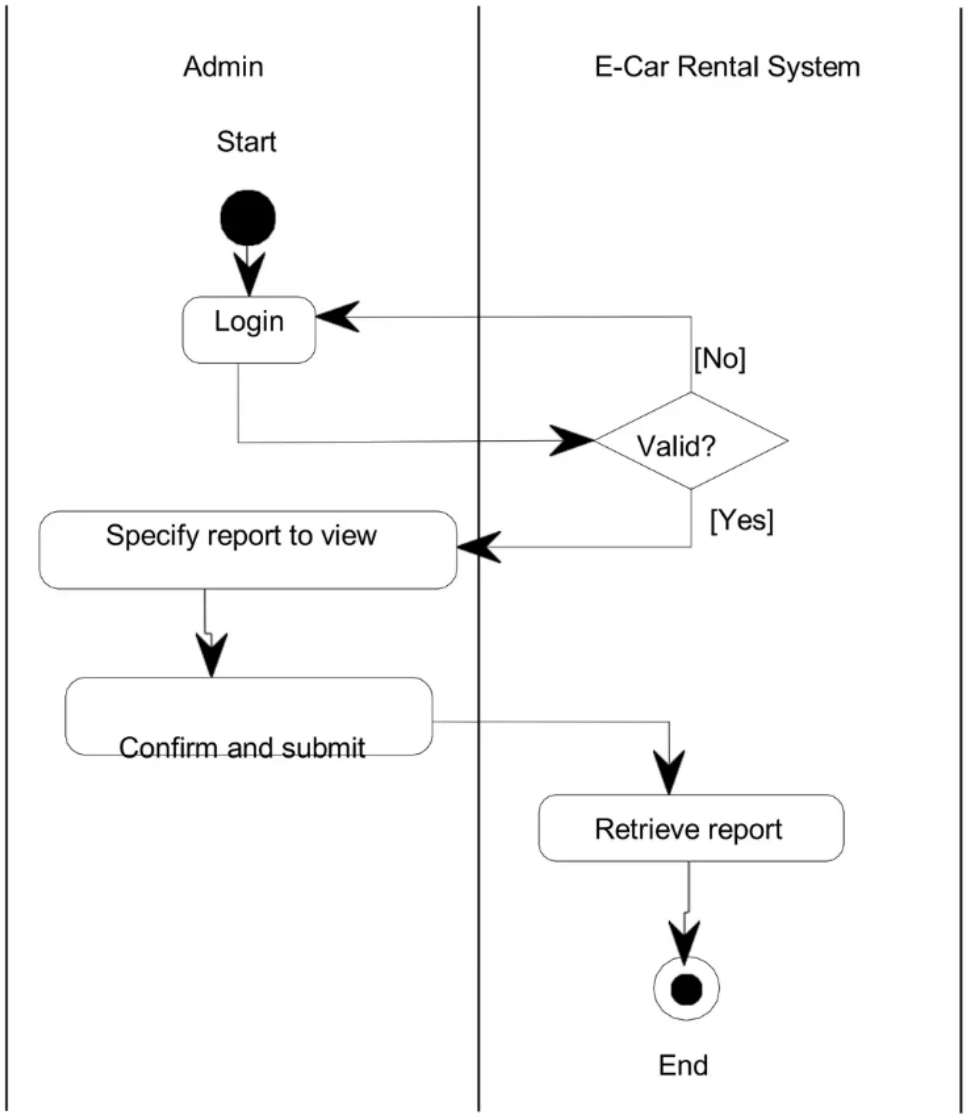

# Modify Profile



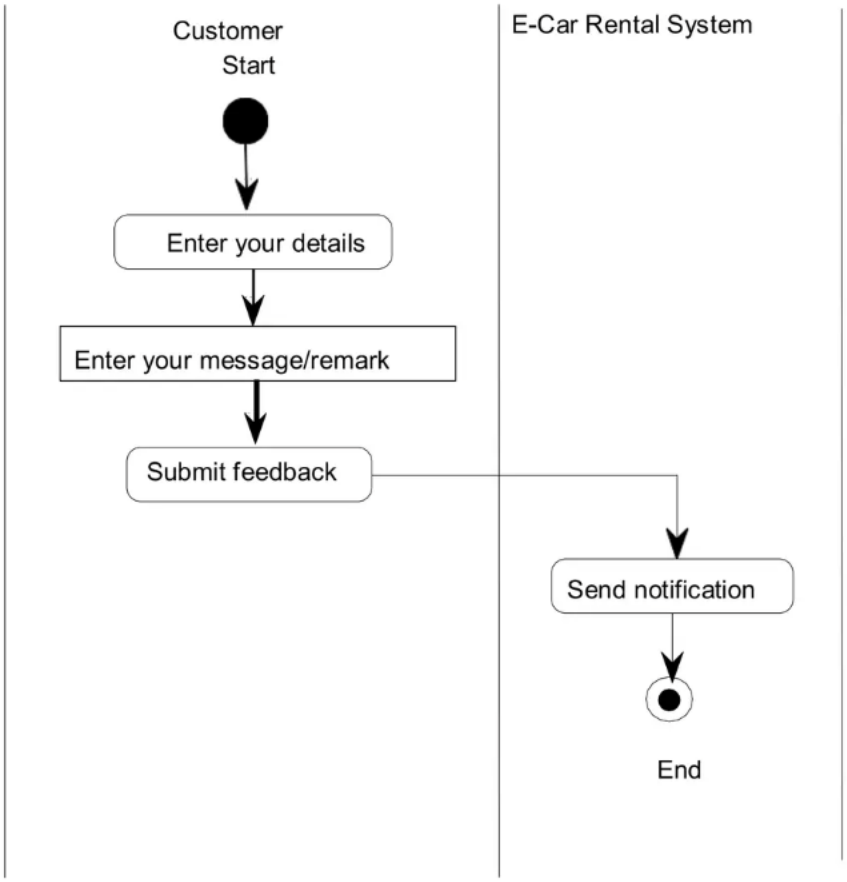

**Make Reservation**




**Adding a new Car**


Admin
E-Car Rental System
Start
Login
[No]
Valid?
[Yes]
Specify report to view
Confirm and submit
Retrieve report
End

**Report**


Customer
Start
E-Car Rental System
Enter your details
Enter your message/remark
Submit feedback
Send notification
End

# Feedback