

## ***Car Rental System Management System***

### ***1. Introduction:***

The management of vehicle inventory, reservations, interaction with customers, billing, maintenance, insurance, and support is all intended to be streamlined by the car rental system. By putting in place a strong database management system, the business intends to optimize operations and give clients a hassle-free rental car experience.

### ***2. Business Problems Addressed:***

- **Ineffective management of the vehicle inventory** makes it difficult to keep track of the available vehicles, their condition, and their maintenance history.
- **Lack of centralized customer profiles**, resulting in fragmented customer data and suboptimal personalized services.
- **An inefficient process for returns and inspections** makes it difficult to record damages and upkeep needs.
- **Absence of transparent billing processes** causing disorder and disputes with customers.
- **Inadequate customer service/support** procedures cause delays in resolving issues, which has a detrimental effect on client loyalty and satisfaction. The lack of a centralized mechanism for handling support interactions worsens the situation.

### ***3. Entity-Relationship Model:***

#### **Relationship establishment:**

- **Reservation to Car:** One-to-many relationship, as each reservation corresponds to one vehicle, but a vehicle can be reserved multiple times.
- **Reservation to Customer:** Many-to-one relationship, as multiple reservations can be made by one customer, but each reservation is made by only one customer.
- **Return and Inspection to Reservation:** One-to-one relationship, as each return and inspection is associated with one reservation, and each reservation corresponds to one or no return and inspection as reservation can be cancelled.
- **Billing to Reservation:** One-to-one relationship, as each billing record is tied to one reservation, ensuring accurate invoicing and payment tracking. Because Reservation can be cancelled, Reservation can be tied to no Billing.
- **Car to Maintenance:** One-to-many relationship, as one car can have multiple maintenance records, but each maintenance record corresponds to one car.
- **Car to Car Category:** Many-to-one relationship, as multiple cars can belong to the same category, but each car belongs to only one category.
- **Car to Location:** Many-to-one relationship, as multiple cars can be located at the same rental location, but each car is located at only one location.
- **Employee to Support:** One-to-many relationship, as one employee can handle multiple or no support request, but each support request is handled by one employee.
- **Employee to Return & Inspection:** One-to-many relationship, as one employee can do inspection for multiple or no car, but every inspection is done by one employee on return.
- **Support to Customer:** One-to-many relationship, as one customer can have multiple support interactions, but each support interaction corresponds to one customer.
- **Insurance to Car:** One-to-many relationship, as one insurance policy covers multiple cars, but each car is covered by only one insurance policy.

### ***4. Entity Inclusion Justifications:***

- **Car (Primary Key: CarID):** Stores information about rental cars, including make,

model, year, condition, and rental rates.

- **Reservation (Primary Key: ReservationID, Foreign Key: CustomerID, CarID):** Makes reservations easier by connecting clients with the cars they have reserved.
- **Customer (Primary Key: CustomerID):** Maintains customer profiles with personal information and contact details.
- **Employee (Primary Key: EmployeeID):** Maintains employee profiles with personal information, rental history, and contact details.
- **Return and Inspection (Primary Key: ReturnID, Foreign Key: ReservationID):** Manages the return process, documenting inspections, damages, and maintenance requirements.
- **Billing (Primary Key: BillingID, Foreign Key: ReservationID):** Generates invoices for customers based on rental activity, tracking total cost, payment status, and payment date.
- **Car Category (Primary Key: CategoryID):** Categorizes vehicles based on rental rates and attributes.
- **Maintenance (Primary Key: MaintenanceID, Foreign Key: CarID):** Tracks maintenance activities for each vehicle, including maintenance date and description. [Weak Entity]
- **Location (Primary Key: LocationID):** Stores information about rental locations, including city, state, and address.
- **Insurance (Primary Key: InsuranceID):** Manages insurance coverage for rental vehicles, including coverage type and amount.
- **Support (Primary Key: SupportID):** Records support requests and interactions with customers, including issue description and resolution. [Associate Entity]