San Francisco State University

CSC675

Database System

Product Description and Database Requirements

Milestone One

Project Name: Car Rental Database System

Fahim Amiri

921205685

famiri1@mail.sfsu.edu

Github repository link→

https://github.com/sfsu-joseo/csc675-775-database-systems-sp24-fahimamiri

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I. Product Summary

In today's business landscape, database systems serve as essential tools for the retention and storage of data across various industries. Similarly, within the realm of car rental services, databases play a pivotal role in enhancing operational efficiency and functionality.

The car rental database system empowers rental companies to effectively manage their vehicle inventory. This includes comprehensive tracking of the fleet, encompassing vehicle details, roadworthiness, and legal compliance prior to customer rental. Customers value a seamless reservation and booking process when utilizing car rental services. Therefore, the integration of a robust database system proves instrumental in efficiently storing essential customer information, including rental dates, vehicle preferences, pickup locations, and payment details. The utilization of a rental database system offers rental companies numerous advantages, including the ability to maintain comprehensive records of customer information. Moreover, it enables efficient tracking of vehicle maintenance and repair activities, encompassing maintenance schedules, service records, repair histories, and alerts for ensuring vehicle reliability and safety. Additionally, through the analytical and reporting capabilities of the database system, companies can stay abreast of rental trends, customer preferences, and operational performance, facilitating informed decision-making and fostering potential growth opportunities.

II. Motivations

As a software engineer, my passion lies in problem-solving and enhancing the human experience. Engaging with this project presents an opportunity to craft a seamless system that benefits both car rental companies and their valued customers. While existing car rental database systems may fall short of user expectations, I am committed to delivering a solution that prioritizes ease of use, safety, and reliability. Customers value simplicity and accessibility in service delivery, and I am dedicated to fulfilling these expectations through innovative database system design.

In this project, my aim is to introduce a rental car database system that prioritizes efficiency and user-friendliness. It is imperative that car rental companies can navigate the system with ease. Addressing the limitations of existing car rental databases, my objective is to streamline processes and mitigate any concerns that may arise for rental companies. By developing a solution that is intuitive and robust, I aim to enhance operational efficiency and provide a seamless experience for both rental companies and their customers.

III. Use Cases of The Car Rental Database

1. **Use case :** Reservation and booking management

Actor: Renal company employee (Sara)

Description : A customer, seeking to rent a vehicle from X Rental Company, selects and books a car for a specific date. The customer arrives at the designated location of X Rental Company, situated at 123 H&H Street, to pick up the reserved car. Sara, the rental company employee, assists the customer upon arrival.

Upon verifying the booking confirmation in the system, Sara locates the car reserved under the customer's name. However, upon reaching the parking area, Sara discovers that the selected car is unavailable as it is undergoing servicing. Recognizing the issue, Sara promptly conducts further investigation and identifies the unavailability of the car due to maintenance reasons.

In response, Sara offers alternative options to the customer, ensuring that their rental needs are adequately met despite the unforeseen circumstance. This incident underscores the importance of effective vehicle availability management within the car rental service.

The integration of a robust car rental database system empowers X Rental

Company to promptly update vehicle statuses, such as maintenance schedules, ensuring accurate availability information for customers. By streamlining this process, both customers and X Rental Company benefit from enhanced efficiency, minimized conflicts, and a smoother rental experience.

Functional Requirements

Vehicle Management

- ☐ 1.1 Users shall be able to log in in the DB system.Ty
- ☐ 1.2 Users shall be able to see many of the reservations .
- ☐ 1.3 Users shall be able to see all vehicle inventory.
- ☐ 1.4 Authenticate users with unique login credentials,
- ☐ 1.5 Users shall be able to add new cars to the database including make model , year and registration info.
- ☐ 1.6 Users shall be able to Update the status of existing vehicles.
- ☐ 1.7 Users shall be able to remove sold , or damaged vehicles
- ☐ 1.8 Users shall be able to truck the vehicle by their VAN numbers
- ☐ 1.9 Users shall be able to categorize vehicles based on their type sedan , SUV, truck.
- ☐ 1.10 The system shall allow Users to check reservations for customers , including selecting the desired vehicle , specifying the rental dates , and record customer details.

☐ **2. Booking management**

☐ 2.1 The booking confirmation shall be stored in the database

☐ 2.2 Confirmation should be visible for the user when a customer reserved .

☐ 2.3 Users shall be able to record customer information, name ,phone , email.

☐ 2.4 Users shall be able to search customer information.

☐ 2.5 Users shall be able to send booking confirmation through email.

☐ 2.6 Users shall be able to handle customer deposit and payment securely.

☐ 2.7 User shall be able to rent only one vehicle to a customer

☐ **3. Customer management.**

☐ 3.1 users hall be able to create profile for new customer

☐ 3.2 user shall be able to maintain the rental history of the customer including previous reservation information.

☐ 3.3 user shall be able to recognize loyal customers, to provide discounts and points.

☐ 3.4 System shall allow customers to add or update their information on their profile.

☐ 3.5 System shall be able to generate customer feedback for analytics and improvement purposes.

☐ **4. Billing and Invoice**

☐ 4.1 Users shall be able Calculate rental fees based on factors such as vehicle type, rental duration, and additional services.

☐ 4.2 Users shall support a real time zone based on customer or employee location.

☐ 4.3 User shall to support different billing methods

☐ 4.4 User shall be able to calculate taxes and other misalliance charges on each locations

☐ 4.5 Users shall be able to download customer invoices form their account.

☐ 4.6 User shall be able to converts other foreign currencies

☐ 4.7 Users shall be able to generate revenue and lost reports on a monthly , yearly basis.

☐ 4.8 Users shall be able to secure customers payment information such as bank info.

☐

- [ ] **5. Vehicles maintenance and repair**

- [ ] 5.1 User shall not be able to rent vehicle that are listed for maintenance
- [ ] 5.2 users shall be able set alerts which vehicle needs to schedule for maintenance.
- [ ] 5.3 users shall track service history and maintenance records for each vehicle.
- [ ] 5.4 users shall be able to set maintenance for each vehicle.
- [ ] 5.5
- [ ]
- [ ] **6. Inspection and reporting**

- [ ] 6.1 users shall be able to check the record each vehicle inspections
- [ ] 6.2 users shall be able to record and add new damages to each vehicle.
- [ ] 6.3 users shall be able to provide access to vehicle inspection reports to customers.
- [ ] 6.4 user shall be able to flag down new repair for each vehicle after receiving the car from the customers
- [ ] 6.5 User should be able to analyze inspection of each vehicle and schedule repairs
- [ ] **7. Insurance**

- [ ] 7.1 **user shall be able to add at least one insurance for each vehicles**
- [ ]
- [ ] 7.2 sara should be able to give preference insurance for customer.(optional or spacial insurance)
- [ ] 7.3 user should be to verify converges to customers at time of booking
- [ ] 7.4 users should be able to handle insurance claims for vehicle accidents or damages during the rentals.
- [ ]
- [ ] 7.5 user shall not be able to rent vehicle without insurance
- [ ] 7.6 User shall accept insurance from different companies
- [ ] 7.8 user shall not accept expired insurance
- [ ] 7.9 user shall be able to verify insurance
- [ ]

☐ **8. Vehicle Inventory**

☐ 8.1 user should be able to check the see vehicle ready for rent

☐ 8.2 user should be remove vehicle

☐ 8.3 user should be able add vehicle

☐ 8.4 users shall update the vehicle inventory automatically as each car rent out.

☐ 8.5 user shall be to obtain vehicle information by its VIN

☐ 8.6 user shall be able to access the value of each var in to days$ value

☐ 8.7 user shall check categorization of each type of vehicles.

Non Functional Requirements

1- The system shall be able to respond to user requests , such obtaining transections.

2- system shall be able to increase the number of users , vehicles , and transactions without significantly impacting performance.

3- system should have a back up data automatically and avoid data loss .

4- system shall be able to protect the internal data of both the customer and the rental company.

5- system shall be compatible with a wide range of devices, browsers and operating systems.

6- system shall be to maintain and update with well organized code.

IV. Entities And Attributes

1. Vehicle Entity:

Attributes:

1. Vehicle ID
2. Make
3. Model
4. Year

5. Color
6. Mileage
7. Registration
8. Number VIN (Vehicle Identification Number)
9. Transmission
10. Type
11. Fuel
12. Type
13. Rental Rate

2. Customer Entity:

Attributes

1. Customer ID
2. First Name
3. Last Name
4. Email Address
5. Phone number
6. Address
7. DL number
8. Loyalty points

3. Reservations Entity:

Attributes

1. Reservation ID
2. Customer ID
3. Vehicle ID
4. Rental Start Date
5. Rental End Date
6. Rental Locations
7. Drop off Location
8. Total Rental price
9. Reservation status (confirmed, pending , canceled, hold)

4. Booking Entity:

Attributes

1. Booking ID
2. reservation ID
3. Booking date
4. Payment Type
5. Payment status(confirmed, pending , canceled, hold)

5. Locations Entity:

Attributes

1. Locations ID
2. Location name
3. Address
4. Contact Info
5. POC Name

6. Maintenance Entity:

Attributes

1. Maintenance ID
2. Vehicle ID
3. Maintenance date
4. Maintenance type (regular or repair
5. Descriptions
6. Total cost

7. Insurance Entity:

Attributes

1. Insurance ID
2. Vehicle ID
3. Insurance company name

4. Policy number
5. Policy Start date
6. Policy end date
7. Premium amount

8. Feedback Entity:

Attributes

1. Feedback ID
2. Reservation ID
3. Customer ID
4. Rating
5. Comments
6. Date

9 **DB User(employee)**

Attributes

1. Login
2. USer ID
3. Password
4. Email
5. Name

10 **Inspections**

Attributes

10.1 Inspection ID
10.2 Vehicle ID
10.3 Ins Date
10.4 User ID

11 Vehicle Inventory

Attributes

11.1 Vehicle ID
11.2 Make

11.3 Model

11.4 Year

11.5 VIN

11.6 Color

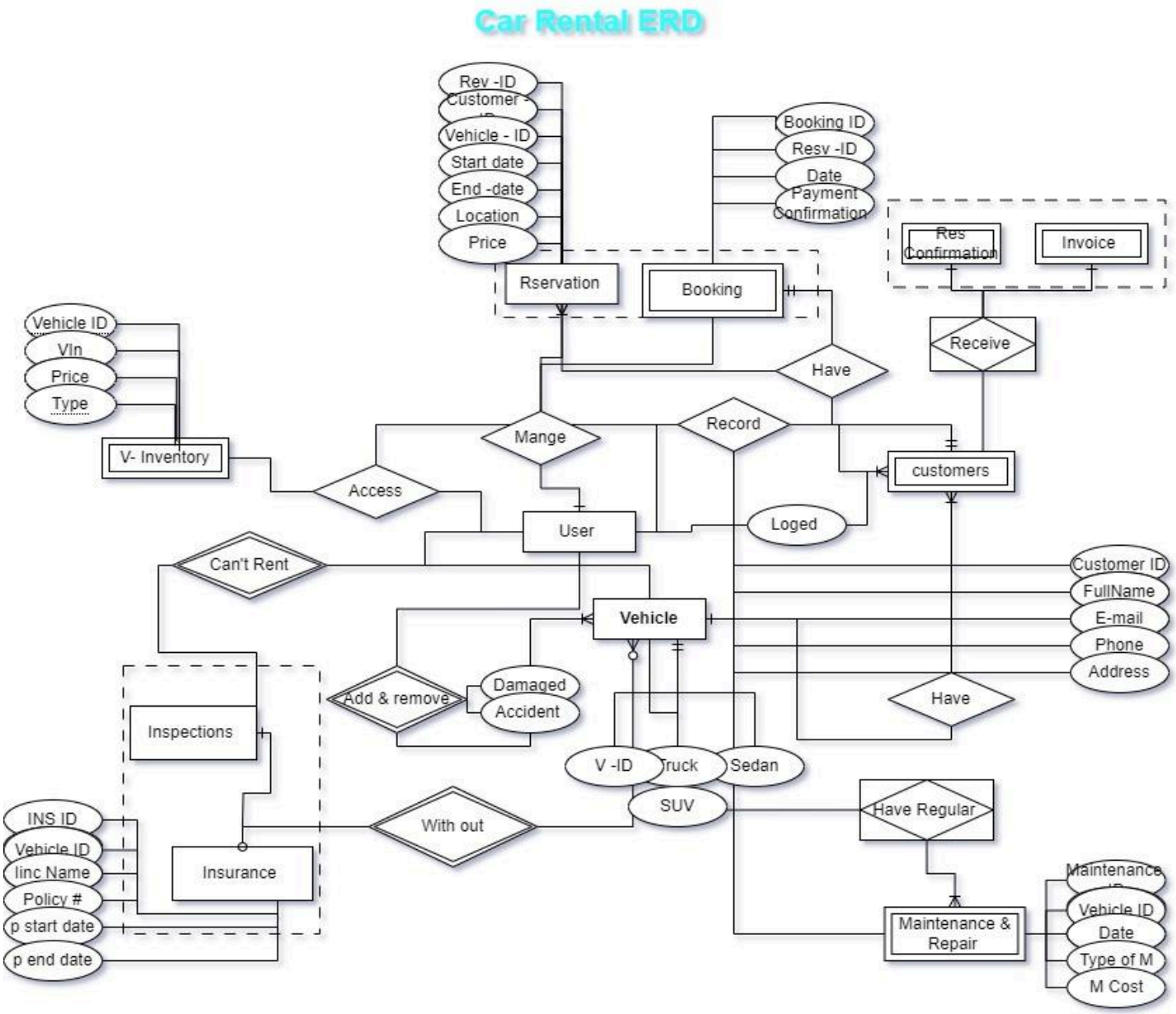
11.7 Price

11.8 Fuel Type

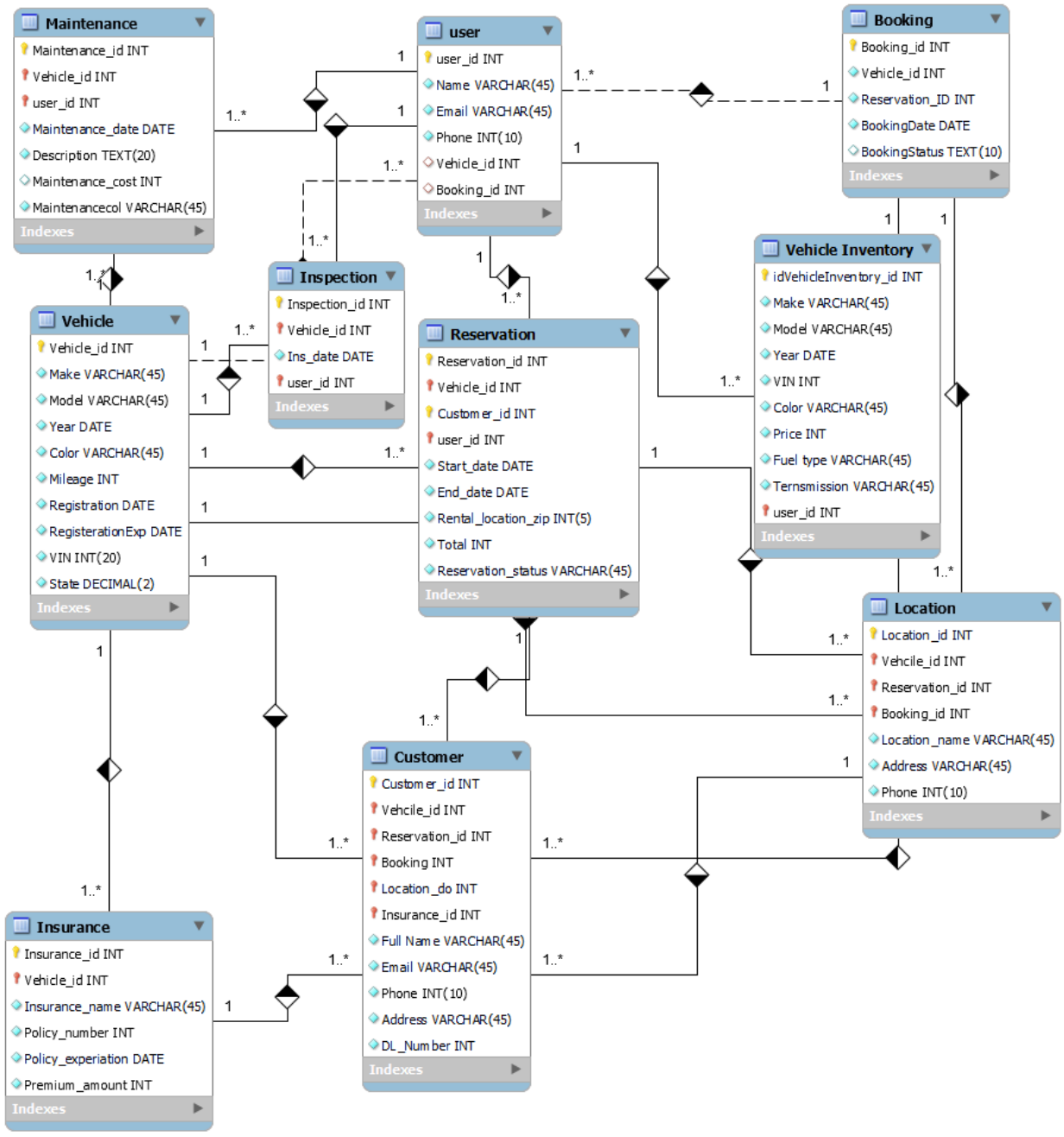
11.9 Transmission

11.10 Vehicle Type

Entity Relationship Diagram (ER)



EER Diagram


Maintenance
Maintenance_id INT
Vehicle_id INT
user_id INT
Maintenance_date DATE
Description TEXT(20)
Maintenance_cost INT
Maintenancecol VARCHAR(45)
Indexes
user
user_id INT
Name VARCHAR(45)
Email VARCHAR(45)
Phone INT(10)
Vehicle_id INT
Booking_id INT
Indexes
Booking
Booking_id INT
Vehicle_id INT
Reservation_ID INT
BookingDate DATE
BookingStatus TEXT(10)
Indexes
Vehicle Inventory
idVehicleInventory_id INT
Make VARCHAR(45)
Model VARCHAR(45)
Year DATE
VIN INT
Color VARCHAR(45)
Price INT
Fuel type VARCHAR(45)
Ternsmission VARCHAR(45)
user_id INT
Indexes
Inspection
Inspection_id INT
Vehicle_id INT
Ins_date DATE
user_id INT
Indexes
Vehicle
Vehicle_id INT
Make VARCHAR(45)
Model VARCHAR(45)
Year DATE
Color VARCHAR(45)
Mileage INT
Registration DATE
RegisterationExp DATE
VIN INT(20)
State DECIMAL(2)
Indexes
Reservation
Reservation_id INT
Vehicle_id INT
Customer_id INT
user_id INT
Start_date DATE
End_date DATE
Rental_location_zip INT(5)
Total INT
Reservation_status VARCHAR(45)
Indexes
Location
Location_id INT
Vehcile_id INT
Reservation_id INT
Booking_id INT
Location_name VARCHAR(45)
Address VARCHAR(45)
Phone INT(10)
Indexes
Customer
Customer_id INT
Vehcile_id INT
Reservation_id INT
Booking INT
Location_do INT
Insurance_id INT
Full Name VARCHAR(45)
Email VARCHAR(45)
Phone INT(10)
Address VARCHAR(45)
DL_Number INT
Indexes
Insurance
Insurance_id INT
Vehicle_id INT
Insurance_name VARCHAR(45)
Policy_number INT
Policy_experiation DATE
Premium_amount INT
Indexes

Constraint descriptions

Constraint name: Vehicle_id
Descriptions:
Action :

Car Rental Business Requirements

Vehicle management business requirement (implemented)

1. The system shall allow retrieval of detailed vehicle information, including make, model, year, and license plate, based on a unique identifier.
2. it should provide insights into the vehicle's maintenance history, displaying maintenance dates and descriptions, inspection records with dates and comments, and any feedback from customers.
3. Ensuring data integrity and optimizing query performance are essential for accurate and efficient retrieval of vehicle profiles.

Location Business requirement. (implemented)

4. The system should facilitate the retrieval of vehicle details, including the vehicle's make, model, build year, and current location based on a unique identifier.
5. Integration with the inventory management module enables tracking of each vehicle's current location stored in the inventories table, ensuring accurate and up-to-date information for fleet management.
6. Ensuring data consistency and reliability is crucial for providing real-time insights into vehicle availability and location for efficient rental operations.
7. The system should calculate the total revenue generated from reservations for each location during the year 2024.(current year)

Reservation And booking business requirement

8. Allow customers to make reservations for specific vehicles specifying the pickup and return dates.
9. Access booking system to customer to confirm reservation, make payment and receive booking confirmation
10. Manage booking schedules like overbooking , cancellation and modifications made by both users and customers.

Customer management Business requirement (implemented)

11. The system should be able to obtain customer details, including the customer's full name, associated booking and reservation IDs, as well as vehicle make, model, and the end date of the reservation.
12. Incorporating a parameter for the vehicle makes filtering of results based on specific vehicle manufacturers, enhancing flexibility in querying customer data.
13. Ordering the results by customer full name in descending order provides a structured view for analysis or presentation purposes.
14. The system should retrieve customer details including their name, email, phone number, and address, along with the make and model of the vehicle associated with their booking.
15. The system should retrieve rental details for a customer based on their phone number, including the vehicle make, model, rental start date, rental end date, rental location, total cost, and rental status.

Insurance Business requirements(implemented)

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16. Provide a display of insurance details , policy and the premiums amount for the customer during the reservation or booking and get their consigns.
17. The system shall retrieve details about vehicles and their associated insurance information.

Maintenance Business requirements(implemented)

18. Store and record the maintenance activities along the routine inspection of each car in the rental database.
19. System should alert when it's time for a car routine maintenance as it is recommended by the manufacturer of the vehicle.
20. The system should retrieve details of vehicles requiring maintenance, including their ID, make, model, and the date of the last maintenance.
21. System should enables proactive maintenance scheduling by identifying vehicles that have not undergone maintenance in the last 90 days

Rental Payment and invoice requirements. (implemented)

22. The system shall aims to determine the vehicle with the lowest or highest revenue by computing the total sum of invoice amounts for each vehicle
23. It concatenates the make and model of each vehicle to enhance presentation. By ordering the results in ascending order based on the total sum and limiting the output to one record, users can easily identify the vehicle with the lowest or highest revenue.
24. The system should compute the total revenue generated by each vehicle make, enabling analysis of revenue contribution by different vehicle brands
25. The system should calculate the average rental duration in days for each vehicle make, providing insights into the typical rental period for vehicles of different brands.
26. The system should retrieve overdue booking details, including customer name, email, phone number, address, booking start date, booking end date, and payment status

Inventory Management Business requirement.(implemented)

27. The system shall aim to provide insights into rental demand for each vehicle made by counting the number of times each vehicle made has been rented.
28. Retrieve details about vehicles rented out to customers within the current date range, including the vehicle make, model, and year, along with the customer's full name and the rental start and end dates.

Analytical and reporting Business requirements . (implemented)

1. The system should provide a comprehensive view of revenue generation by calculating the total sum of invoice amounts for each vehicle.
2. To enhance readability and understanding, it should concatenate the make and model of each vehicle. By organizing the results based on vehicle ID and ordering them in descending order according to the total sum, the system enables users to identify the vehicle contributing the most to revenue.
3. Limiting the output to one record ensures focus on the vehicle with the highest revenue.
4. The system should compute the total revenue generated by each vehicle make, enabling analysis of revenue contribution by different vehicle brands