# Phase 3: Data Modelling & Relationships

## 1. Introduction & Overview

This document details the successful completion of **Phase 3: Data Modeling & Relationships** for the AutoService Manager capstone project. This phase was the core of the project's development, as it involved building the foundational data model that supports all business processes. The primary goal was to create a robust and scalable data structure that accurately represents the business operations of "AutoFix Garage."

The work completed in this phase was crucial for unlocking the remaining administrative and security configurations from Phase 2, which were dependent on the existence of these new objects. As a result, this document also includes a summary of the Phase 2 tasks that were finalized concurrently with this work.

This phase has provided the project with the following:

- A clear and interconnected data model.
- The necessary custom objects to store key business information.
- Validation rules to ensure data integrity and quality.
- Automation fields to streamline reporting and analysis.
- The completion of the security model that grants the right users access to the right data.

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## 2. Custom Object Implementation

The data model was implemented by creating four custom objects. Each object was carefully designed with fields and relationships that align with the business requirements identified in Phase 1.

### 2.1. Vehicle (Vehicle__c)

This object is the central repository for all vehicle-related information. It is crucial for maintaining a detailed history of every car serviced by the garage.

- **Primary Purpose:** To track a vehicle’s details, ownership, and service history.
- **Key Fields & Justification:**
    - VIN__c (External ID, Text): This field uniquely identifies each vehicle. It is marked as an External ID to ensure uniqueness and to allow for potential integration with external systems in the future.
    - Make__c (Picklist): A controlled picklist of values for the vehicle's make ensures data consistency and simplifies reporting.
    - Model__c (Text): Captures the specific model name.
    - Year__c (Number): A number field with a length of 4 digits to store the vehicle's manufacturing year.
    - Mileage__c (Number): Tracks the vehicle’s mileage, which is a key factor in service recommendations.
    - Owner__c (Lookup to Contact): This relationship links a vehicle to its owner, a standard Contact record, providing a complete view of the customer.
    - Last_Service_Date__c (Date): This field tracks the date of the most recent service, which is essential for proactive customer outreach and scheduling.
    - Service_Status__c (Picklist): This picklist indicates whether the vehicle is currently active or inactive for service at the garage.

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**2.2. Parts Inventory (Parts_Inventory__c)**

This object is the backbone of the garage's supply chain management. It provides real-time visibility into the parts available in stock.

- **Primary Purpose:** To manage and track the inventory of parts, components, and supplies.
- **Key Fields & Justification:**

- Part_Number__c (External ID, Text): A unique identifier for each part, crucial for inventory management and supplier communication.
- Part_Name__c (Text): A descriptive name for each part.
- Current_Stock__c (Number): The current quantity of the part in the garage.
- Minimum_Stock__c (Number): A defined threshold that will be used for future automation to alert managers when stock is low and needs to be reordered.
- Unit_Cost__c (Currency): The cost of a single unit of the part.
- Supplier__c (Text): The name of the supplier for the part.
- Location__c (Text): The physical location of the part within the garage, aiding technicians in quickly finding items.

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### 2.3. Service History (Service_History__c)

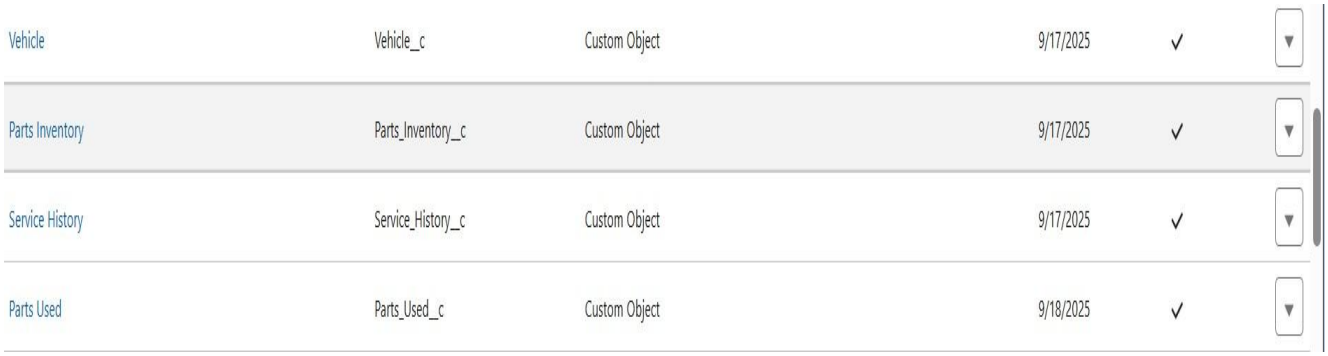
This object is a critical part of the data model as it captures a detailed record of every service event. It is a child object to the Vehicle object, forming a crucial Master-Detail relationship.

- **Primary Purpose:** To store a historical record of all services performed on a vehicle.
- **Key Fields & Justification:**
  - Vehicle__c (Master-Detail to Vehicle): This is a required field that links every service record to a specific vehicle. The Master-Detail relationship ensures that a service record cannot exist without a parent vehicle record, reinforcing data integrity.
  - Service_Date__c (Date): The date on which the service was performed.
  - Service_Description__c (Text Area): A detailed description of the work that was done.
  - Total_Cost__c (Currency): The total cost of the service for billing and financial reporting purposes.

### 2.4. Parts Used (Parts_Used__c)

As a junction object, Parts Used plays a unique role in connecting two separate parent objects: the standard Work Order object and the custom **Parts Inventory** object. This enables the system to track exactly which parts were consumed for a specific job.

- **Primary Purpose:** To act as a junction between Work Order and Parts Inventory, tracking the consumption of parts per job.
- **Key Relationships:**
    - Master-Detail to Work Order: Links a parts-used record to a specific work order.
    - Master-Detail to Parts Inventory: Links a parts-used record to a specific part in the inventory.



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|---|---|---|---|---|---|
| Vehicle | Vehicle_c | Custom Object | 9/17/2025 | ✓ | |
| Parts Inventory | Parts_Inventory_c | Custom Object | 9/17/2025 | ✓ | |
| Service History | Service_History_c | Custom Object | 9/17/2025 | ✓ | |
| Parts Used | Parts_Used_c | Custom Object | 9/18/2025 | ✓ | |

## 3. Data Integrity & Automated Calculations

To improve data accuracy and reporting, several key features were implemented.

### 3.1. Data Validation

A validation rule was created to prevent erroneous data from entering the system, which is a key requirement for the project.

- **Rule Name:** VIN_must_be_17_characters
- **Formula:** LEN(VIN__c) <> 17
- **Error Message:** "VIN must be exactly 17 characters."

- **Function:** This formula checks the length of the VIN field. If the length is not 17, it displays an error message, ensuring all vehicle records conform to the industry-standard VIN format.

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### 3.2. Roll-up Summary Fields

A roll-up summary field was implemented to provide a real-time, calculated value from a related list of records.

- **Field Name:** Total_Cost_of_Services__c
- **Location:** On the **Vehicle** object.
- **Function:** This field automatically sums the Total Cost from all related Service History records. This provides a running total of the money spent on a vehicle, which is valuable for both the customer and the garage manager.

### 3.3. Multi-select Picklists

A multi-select picklist field was added to the Work Order object to streamline the process of selecting multiple items.

- **Field Name:** Required_Tools__c
- **Function:** This field allows a user to select multiple tools needed for a job from a predefined list. This prevents the need for multiple text fields or complex picklists, making data entry faster and more accurate.

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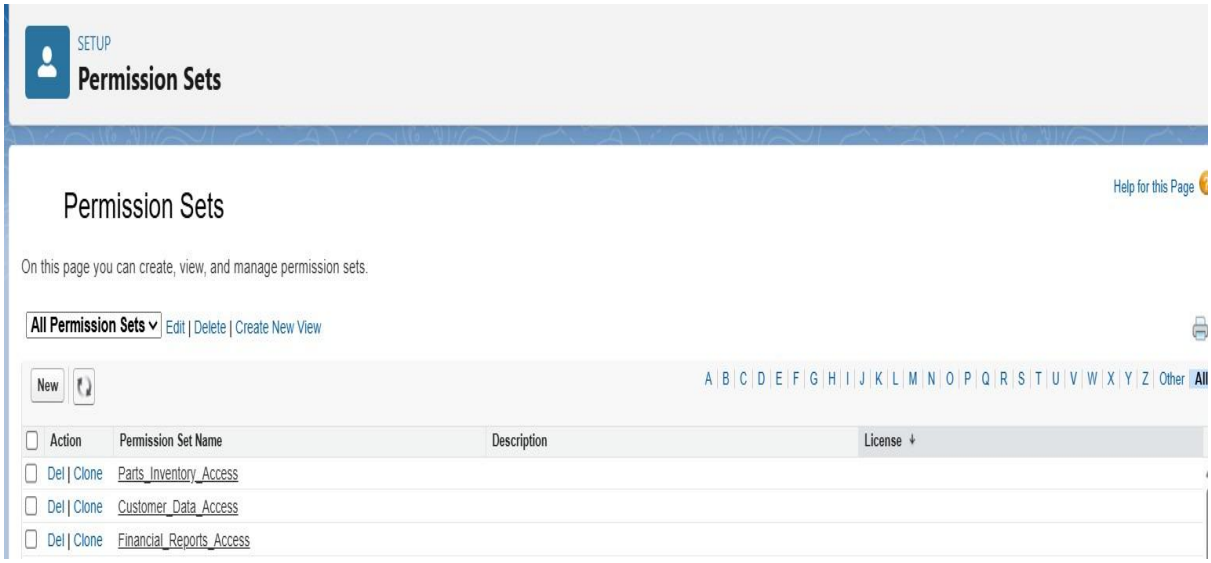
## 4. Concurrently Completed Phase 2 Tasks

The completion of the custom objects in Phase 3 was a prerequisite for finalizing several key administrative and security configurations from **Phase 2**. These tasks were completed simultaneously to fully enable the new data model.

### 4.1. Permission Sets

Three permission sets were created to grant fine-grained access to the new custom objects, without modifying existing user profiles.

- **Parts_Inventory_Access**: Grants **Read**, **Create**, **Edit**, and **Delete** permissions on the **Parts Inventory** and **Parts Used** objects for users who handle inventory.
- **Customer_Data_Access**: Grants **Read**, **Create**, **Edit**, and **Delete** permissions on the **Vehicle** and **Service History** objects for service advisors and managers.
- **Financial_Reports_Access**: Grants **Read** access on the **Total Cost** field of the Service History object, ensuring only managers can view sensitive financial data.

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### 4.2. Organization-Wide Defaults (OWD) & Sharing Rules

The sharing model was finalized to ensure the right users have the right level of access to data.

- **OWD Settings:** The OWDs for key objects were set as follows:
    - Work Order: Public Read Only
    - Case: Private
    - Vehicle: Public Read/Write
    - Parts Inventory: Public Read Only
    - Service History & Parts Used: Controlled by Parent (Set automatically)

- **Sharing Rules:** Two sharing rules were created to expand access where needed, overriding the OWDs.
    - **Technician Work Order Sharing**: A rule to grant **Read/Write** access on Work Order records to the assigned technicians, allowing them to update the status of their jobs.

**Service Advisor Case Sharing**: A rule to grant **Read/Write** access on Case records to the assigned service advisors, allowing them to manage all customer issues.