**PROJECT DESIGN PHASE**

**Problem–Solution Fit**

**Date:** 16 – 06 - 2025  
**Team ID:** LTVIP2025TMID28970  
**Project Name:** Garage Management System  
**Maximum Marks:** 2 Marks

**Objective of Problem–Solution Fit**

The Problem–Solution Fit phase ensures that the solution you’re building truly addresses a real-world problem experienced by your target users—in this case, **garage owners, service advisors, and mechanics.** It validates that the system you’re developing is not just technically sound but also practically relevant and addresses key operational pain points.

This phase helps:

* Align the system design with actual user needs in a garage environment.
* Discover behavioral patterns of garage staff and vehicle owners.
* Improve user acceptance and adoption of digital tools within the garage.
* Design the right solution before scaling up operations.

**1. Target Customer Segments**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Customer Type** | **Description** | | Garage Owners/Managers | Oversee overall operations, financial performance, customer satisfaction, and staff management. | | Service Advisors | First point of contact for customers, handle inquiries, schedule appointments, create estimates, and manage work orders. | | Mechanics/Technicians | Perform vehicle diagnostics, repairs, and maintenance, track time, and manage parts usage. | | Parts Inventory Managers | Manage stock levels, order parts, track usage, and ensure availability. | | Vehicle Owners (Customers) | End-users who bring vehicles for service/repair and receive communication, estimates, and invoices. | |

**2. Problem Statement (As-Is Situation)**

Many independent garages or small-to-medium vehicle service centers face significant challenges in managing their operations due to reliance on manual, fragmented processes:

* Appointment scheduling on paper calendars or basic spreadsheets.
* Manual logging of vehicle issues and service requests in notebooks.
* Handwritten estimates and invoices, prone to calculation errors.
* No centralized record of vehicle service history or customer interactions.
* Lack of automated communication (e.g., no SMS/email updates on service progress).
* Inefficient parts inventory tracking, leading to delays.

**Key Problems Identified:**

* Lack of a centralized, accessible database for customer, vehicle, and service history.
* Delayed and error-prone estimate/invoice generation.
* Difficulty in tracking work order progress and mechanic assignments.
* No real-time communication with customers regarding service status.
* Poor visibility into parts inventory, leading to stockouts or overstocking.
* Limited insights into service trends, labor utilization, and financial performance.

**3. Current Workaround (Before CRM Solution)**

|  |  |
| --- | --- |
| **Existing Practice** | **Limitation** |
| Paper-based appointment books / Excel sheets | Difficult to track changes, prone to double-bookings, not accessible remotely. |
| Handwritten service request forms / repair orders | Prone to misinterpretation, easily lost, hard to search. |
| Manual estimate & invoice calculation with calculators | Frequent mistakes in pricing, taxes, labor hours; time-consuming. |
| Phone calls / casual texts for customer updates | No formal record, inconsistent communication, unprofessional. |
| Physical inventory checks / basic spreadsheets for parts | Inaccurate stock counts, delayed reordering, increased risk of lost sales. |
| No insights into service trends or profitability | No dashboards or reports to assess garage performance, lost revenue opportunities. |

**4. Proposed Solution (To-Be State)**

**"Garage Management System"** is a custom Salesforce-based solution designed to digitize, automate, and streamline the core operations of a vehicle service and repair garage.

**Core Solution Features:**

* **Customer & Vehicle Record Management:** All customer and vehicle data stored in Customer\_\_c and Vehicle\_\_c objects, respectively.
* **Service Request & Work Order Tracking:** Detailed service requests managed via ServiceRequest\_\_c and work progress tracked via WorkOrder\_\_c and Task\_\_c objects.
* **Parts Inventory Management:** Vehicle parts managed and tracked via PartsInventory\_\_c object.
* **Estimate & Invoice Automation:** Pricing, parts, labor, and taxes automatically calculated and generated in ServiceEstimate\_\_c and Invoice\_\_c objects.
* **Automated Status Updates:** WorkOrder\_Status\_\_c auto-updates based on task completion via Triggers/Flows.
* **Automated Communication:** Flows send automated email/SMS notifications for service updates, completion, and invoices.
* **Validation Rules:** Ensures data integrity (e.g., Paid\_Amount\_\_c never exceeds Total\_Invoice\_Amount\_\_c, VIN format validation).
* **Dashboards & Reports:** For business insights into service trends, parts consumption, labor utilization, and financial performance.
* **Role-based Access:** Garage Admin, Service Advisor, Mechanic, Parts Manager access managed via profiles/permission sets.

**5. How the Solution Solves the Problem**

|  |  |
| --- | --- |
| **Problem** | **Feature/Function that Solves It** |
| Manual scheduling & disjointed records | Centralized Customer\_\_c & Vehicle\_\_c records, integrated ServiceRequest\_\_c & WorkOrder\_\_c. |
| Error-prone estimates & invoices | Automated ServiceEstimate\_\_c & Invoice\_\_c with formula fields and Apex calculations. |
| Lack of work progress visibility | WorkOrder\_\_c & Task\_\_c tracking with real-time status updates by mechanics. |
| Inefficient parts inventory | PartsInventory\_\_c tracking with quantity management, linked to WorkOrder\_\_c. |
| No customer communication/updates | Flows sending automated email/SMS notifications for service milestones. |
| Security and data privacy risks | Role-based access with Profiles and Permission Sets, secure data storage on Salesforce. |
| No insights into garage performance | Visual dashboards and standard/custom reports on service trends, revenue, labor. |
| Delayed operations & increased overhead | Automation via Salesforce Flows, Apex Triggers, and streamlined workflows. |

### 6. Solution Adoption Channels

* **Web Application** using Salesforce Lightning UI for desktop users (Service Advisors, Admin, Parts Manager).
* **Mobile App** access (Salesforce Mobile App) for mechanics to update task statuses and access vehicle info directly in the service bay.
* **Automated Email/SMS alerts** automatically sent to vehicle owners on service milestones and invoice completion.
* **Reports and Dashboards** accessible by garage owner/management for real-time analytics and strategic decision-making.

**7. Solution Validation**

The solution was tested on multiple test records and scenarios in Salesforce and validated for:

* Accurate WorkOrder\_Status\_\_c updates and notifications upon task completion.
* Correct execution of Flows for sending automated email/SMS (e.g., service ready for pickup, digital invoice).
* Precise ServiceEstimate\_\_c and Invoice\_\_c generation with accurate parts pricing, labor charges, and tax calculations.
* Profiles and Permission Sets correctly restricting edit/view access as per roles (e.g., mechanics only see assigned tasks, not financial data).
* Dashboards correctly reflecting key metrics like total services completed, average repair time, and parts consumption.
* Data integrity maintained across linked objects (e.g., vehicle history correctly tied to customer and work orders).

Screenshots and detailed test results will be included in the Performance Testing section of the project documentation.

**Purpose Alignment Recap**

|  |  |
| --- | --- |
| **Benefit** | **How Garage Management System Achieves It** |
| **Solve real-world problems** | By eliminating manual errors, digitizing fragmented processes, and improving communication in garage operations. |
| **Increase customer satisfaction & trust** | Via automated service updates, transparent estimates, and digital invoices. |
| **Improve operational efficiency & decision-making** | With real-time work order tracking, inventory management, and insightful dashboards/reporting. |
| **Ensure data security & scalability** | Using Salesforce's robust role-based permissions, data encryption, and enterprise-grade platform reliability. |
| **Speed up garage processes** | Through automation via Salesforce Flows, Apex Triggers, and custom logic tailored for mechanics and service advisors. |
| **Enhance staff productivity** | By providing mobile access for mechanics and streamlining administrative tasks for service advisors. |

### Problem–Solution Fit Canvas for Garage Management System

|  |  |
| --- | --- |
| **Section** | **Description** |
| **1. Customer Segment(s) (CS)** | - Garage Owners/Managers (Small & Medium scale) - Service Advisors & Billing Staff - Mechanics/Technicians - Parts Inventory Managers - Vehicle Owners (End-Customers) |
| **2. Jobs-to-be-Done / Problems (J&P)** | - Efficiently manage appointments & service requests - Track vehicle service history & maintenance needs - Automate accurate estimates & invoices - Streamline work order assignments & progress - Maintain real-time parts inventory control - Provide timely customer updates on service status |
| **3. Triggers (TR)** | - Frequent scheduling conflicts/no-shows - Errors in manual billing/estimating - Delays in identifying required parts - Customer calls for status updates - Lack of visibility into mechanic workload/efficiency - Difficulty analyzing service trends & profitability |
| **4. Emotions Before / After (EM)** | **Before:** Frustrated, disorganized, stressed by manual tasks, uncertain about profitability, customer complaints due to delays.  **After:** Confident, efficient, in control of operations, professional customer interaction, data-driven decisions, reduced stress. |
| **5. Available Solutions (AS)** | - Paper calendars/notebooks - Generic spreadsheets - Basic invoicing software - Manual phone calls/SMS for updates **Cons:** Prone to error, siloed data, no automation, poor tracking, unprofessional. |
| **6. Customer Constraints (CC)** | - Limited budget for complex systems - Resistance to new technology/training curve - Poor internet access in service bays (need for mobile access) - Desire for simple, intuitive interfaces for mechanics. |
| **7. Behaviour (BE)** | - Use whiteboards for work orders - Call customers for service updates/pickup reminders - Manually check parts shelves for stock - Rely on memory for recurring customer issues |
| **8. Channels of Behaviour (CH)** | **Online:** Limited use of email for customer comms, some online scheduling tools (basic). **Offline:** Phone calls, in-person discussions, handwritten notes, physical invoices. |
| **9. Problem Root Cause (RC)** | - No integrated digital platform for all garage operations - Over-reliance on manual processes for critical tasks - Lack of specialized software for automotive service management - Hesitation in adopting cloud-based solutions. |
| **10. Your Solution (SL)** | CRM built on Salesforce with: - Custom Objects (Customer\_\_c, Vehicle\_\_c, WorkOrder\_\_c, PartsInventory\_\_c, Invoice\_\_c) - Automated Flows for notifications & status updates - Apex Triggers for complex calculations & data sync - Validation Rules to ensure data accuracy - Mobile access for mechanics - Dashboards & Reports for business insights - Profiles & Permission Sets for role-based access |
| **Fits Problem-Solution:** | - Matches behavior (simple UI, mobile access) - Solves major pains (billing, tracking, communication, inventory) - Adapts to garage context (streamlines workflows, improves efficiency) |

**PROPOSED SOLUTION**

📅 **Date:** 15 February 2025  
🧾 **Team ID:** LTVIP2025TMID28970  
📌 **Project Name:** Garage Management System  
🎯 **Maximum Marks:** 2 Marks

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | S. No. | Parameter | Description | | 1 | **Problem Statement (Problem to be solved)** | Traditional vehicle service centers and garages struggle with inefficient, manual processes for appointment scheduling, work order management, parts inventory, and customer communication. This leads to human errors, operational inefficiencies, lost revenue opportunities, and a sub-optimal customer experience. | | 2 | **Idea / Solution Description** | A cloud-based Garage Management System (GMS) solution built on the Salesforce platform, tailored for vehicle service and repair centers. It utilizes custom objects like Customer\_\_c, Vehicle\_\_c, ServiceRequest\_\_c, WorkOrder\_\_c, PartsInventory\_\_c, and Invoice\_\_c to maintain structured and interconnected data. Key features include: - Automated work order creation and status updates via Triggers/Flows - Real-time parts inventory tracking linked to work orders - Digital estimates and invoices with auto-calculated labor and parts charges - Automated email/SMS notifications for service milestones (e.g., "ready for pickup") - Validation rules to ensure accurate data input (e.g., VIN format, payment amounts) - Comprehensive reports and dashboards for service trends, revenue, and parts usage insights - Role-based access using Profiles and Permission Sets for different staff (e.g., Service Advisor, Mechanic, Admin) | | 3 | **Novelty / Uniqueness** | - **Integrated Workflow:** Combines appointment scheduling, service requests, work orders, parts management, billing, and customer communication into one seamless, integrated platform. - **Automotive-Specific Customization:** Specifically designed for garage industry needs (e.g., VIN tracking, mileage history, labor rate calculation per service, multi-level work order tasks). - **Low-Code/No-Code Agility:** Leverages Salesforce's declarative tools (Flows, Validation Rules) over extensive custom coding, enabling faster deployment, easier customization, and lower maintenance for garage owners. - **Mobile Accessibility:** Provides mobile access for mechanics to update work orders directly from the service bay, enhancing real-time tracking. | | 4 | **Social Impact / Customer Satisfaction** | - **Enhances Customer Trust:** Provides professional and timely service updates and digital invoices, reducing ambiguity and improving transparency. - **Reduces Service Delays:** Streamlines operations, parts management, and communication, leading to faster service turnaround times. - **Empowers Small Businesses:** Enables independent garages to adopt advanced digital tools, increasing their competitiveness and operational sophistication. - **Promotes Environmental Responsibility:** Digital invoicing and record-keeping reduce paper consumption. | | 5 | **Business Model (Revenue Model)** | - Could be offered as a **SaaS (Software as a Service) subscription** to independent garages and multi-branch service centers. - **Tiered pricing** based on the number of active users (service advisors, mechanics), number of vehicles managed, or advanced features (e.g., deeper analytics, integrations). - **Optional value-added services** could include: - Onboarding and implementation support - Customization services - Training packages - Premium support tiers | | 6 | **Scalability of the Solution** | - **Platform Scalability:** Built on Salesforce, a highly scalable cloud platform that supports rapid growth in user count, data volume, and transaction load across multiple locations. - **Feature Extensibility:** Easily extendable to include advanced functionalities like online booking portals, customer loyalty programs, telematics integration, or direct integration with parts suppliers via APIs. - **Multi-Location Support:** Can scale from a single-bay operation to a multi-branch enterprise with centralized reporting and standardized processes, allowing easy management of growing franchises. | |

**SOLUTION ARCHITECTURE**

**Date:** 15 February 2025  
**Team ID:** LTVIP2025TMID28970  
**Project Name:** Garage Management System  
**Maximum Marks:** 4 Marks

### What is Solution Architecture?

Solution Architecture is the blueprint of your application that connects business requirements to technical implementation. It acts as a bridge between business challenges (e.g., inefficient appointment scheduling, manual work order tracking, or parts inventory issues) and technological tools (e.g., Salesforce Flows, Apex triggers, validation rules) used to solve them.

It covers:

* Structure of the system (objects, processes, automation)
* Behavior of components (how data flows)
* Technologies used
* Integration and deployment flow

### Goals of the Solution Architecture for This Project:

* Identify and apply the best Salesforce-based architecture to streamline vehicle service workflows, work order management, and parts inventory.
* Clearly define custom objects like Customer\_\_c, Vehicle\_\_c, ServiceRequest\_\_c, WorkOrder\_\_c, PartsInventory\_\_c, and Invoice\_\_c.
* Incorporate Apex Triggers, Flows, and Validation Rules for robust automation of service processes.
* Create a reliable and secure user-access system using Profiles and Permission Sets for garage staff (Service Advisors, Mechanics, Admins).
* Deliver a scalable, role-based, mobile-accessible, and automated Garage Management System.

**Core Components of the Architecture**

|  |  |  |
| --- | --- | --- |
| Layer | Component | Description |
| Presentation Layer | **Salesforce Lightning UI (Desktop & Mobile)** | Users (garage owners, service advisors, mechanics) interact with the GMS via custom Lightning Apps, Record Pages, and the Salesforce Mobile App (for in-bay updates). |
| Business Logic Layer | **Flows, Apex Triggers, Validation Rules, Formula Fields** | Complex logic for service request processing, work order status updates, automated customer notifications (email/SMS), accurate estimate/invoice calculations, and data input validation is handled through declarative automation and custom Apex code. |
| Data Layer | **Custom Objects: Customer\_\_c, Vehicle\_\_c, ServiceRequest\_\_c, WorkOrder\_\_c, PartsInventory\_\_c, ServiceEstimate\_\_c, Invoice\_\_c, Payment\_\_c, Task\_\_c, Mechanic\_\_c** | Core garage data is stored in these custom objects. Relationships (Lookup/Master-Detail fields) are established among them (e.g., WorkOrder\_\_c linked to Vehicle\_\_c, Customer\_\_c, and PartsInventory\_\_c) to maintain data integrity and traceability. |
| Security Layer | **Profiles, Permission Sets, Organization-Wide Defaults (OWD), Sharing Rules** | Role-based access is managed to control visibility and editing rights for different users (Garage Admin, Service Advisor, Mechanic, Parts Manager). Data visibility can be further controlled through OWDs and Sharing Rules. |
| Reporting & Analytics Layer | **Dashboards, Reports, Custom Report Types** | Visual reports provide insights into service history, parts usage, labor utilization, and financial performance. Dashboards offer a high-level business overview and trending analysis (e.g., revenue by service type, average repair time). |
| Integration Layer (Optional) | **External Services, APIs (REST/SOAP), Platform Events** | (Future potential) Connects to external systems like accounting software, parts suppliers' APIs for automated ordering, or telematics data platforms for proactive maintenance insights. |

### Data Flow within the System (Conceptual Flow)

**Service Journey:**

* **Vehicle Owner arrives/contacts** → Customer\_\_c (created/retrieved) & Vehicle\_\_c (created/retrieved)
* **Service Advisor logs Service Request** → ServiceRequest\_\_c created (linked to Customer\_\_c & Vehicle\_\_c)
* **Mechanic performs diagnostics/service** → Task\_\_c created/updated (linked to WorkOrder\_\_c) & PartsInventory\_\_c updated (parts consumed)
* **Service Advisor generates Estimate** → ServiceEstimate\_\_c created (based on ServiceRequest\_\_c, PartsInventory\_\_c, LaborRates\_\_c)
* **Service Advisor completes Work Order** → WorkOrder\_\_c updated to 'Completed' (via Trigger/Flow)
* **Invoice generated & Payment recorded** → Invoice\_\_c created, Payment\_\_c recorded, Outstanding\_Balance\_\_c updated (via Trigger/Flow)
* **System sends notification** → Email/SMS Confirmation to Vehicle Owner (via Flow)

**Sample Architecture Diagram (Conceptual)**

(Please imagine a visual flowchart similar to your example, structured for a garage management system. The arrows indicate data flow and relationships.)

**[Vehicle Owner]**

**↓ (Vehicle Info, Service Request)**

**[Customer\_\_c]**

**↓ (Lookup)**

**[Vehicle\_\_c]**

**↓ (Lookup)**

**[ServiceRequest\_\_c]**

**↓ (Master-Detail / Lookup)**

**[WorkOrder\_\_c]**

**↓ (Task Assignment)**

**[Mechanic]**

**↓ (Work Progress, Parts Used)**

**[WorkOrder\_\_c] --(Updates Status via Trigger/Flow)--> [Invoice\_\_c]**

**↑ (Lookup to WorkOrder)**

**[PartsInventory\_\_c]**

**↑ (Usage, Stock Check)**

**[ServiceEstimate\_\_c]**

**↑ (Pricing Data)**

**[Invoice\_\_c] --(Updates Balance via Trigger/Flow)--> [Payment\_\_c]**

**↓ (Flow)**

**[Email/SMS Notification to Customer]**

**Summary:**

This Salesforce-based architecture offers:

* Seamless vehicle owner onboarding and comprehensive service request management.
* Real-time work order tracking and efficient parts inventory control.
* Automated, accurate estimates and invoicing with integrated payment handling.
* Enhanced communication with vehicle owners via automated notifications.
* Scalable, secure, and mobile-accessible CRM tailored to the automotive service domain.

### References:

* Salesforce Architecture Guide
* Trailhead Modules on Salesforce Admin & Developer Best Practices
* Domain-Specific Solutions for Automotive Service (Conceptual)