

Operational Business Process Model of a Car Repair Shop System Using BPMN 2.0

1. Introduction

This report presents an operational business process model of a car repair shop system using Business Process Model and Notation (BPMN 2.0). The model includes user interfaces for capturing data inputs and precise task specifications that map directly to executable workflows.

BPMN 2.0 is particularly suitable for operational modelling as it provides a standardized notation that bridges the gap between business process design and technical implementation (OMG, 2011). This allows for the automation of processes through business process management systems like Camunda while maintaining readability for business stakeholders.

2. Model Overview

Our operational BPMN model expands on the strategic model by detailing the specific tasks, data objects, and system interactions across four primary participants (pools):

- Customer
- Receptionist
- Mechanics
- Towing Service

The model incorporates user task forms for data capture, service tasks for automated processing, and detailed process flow that can be directly executed in a process engine. Figure 1 shows the complete operational BPMN model.

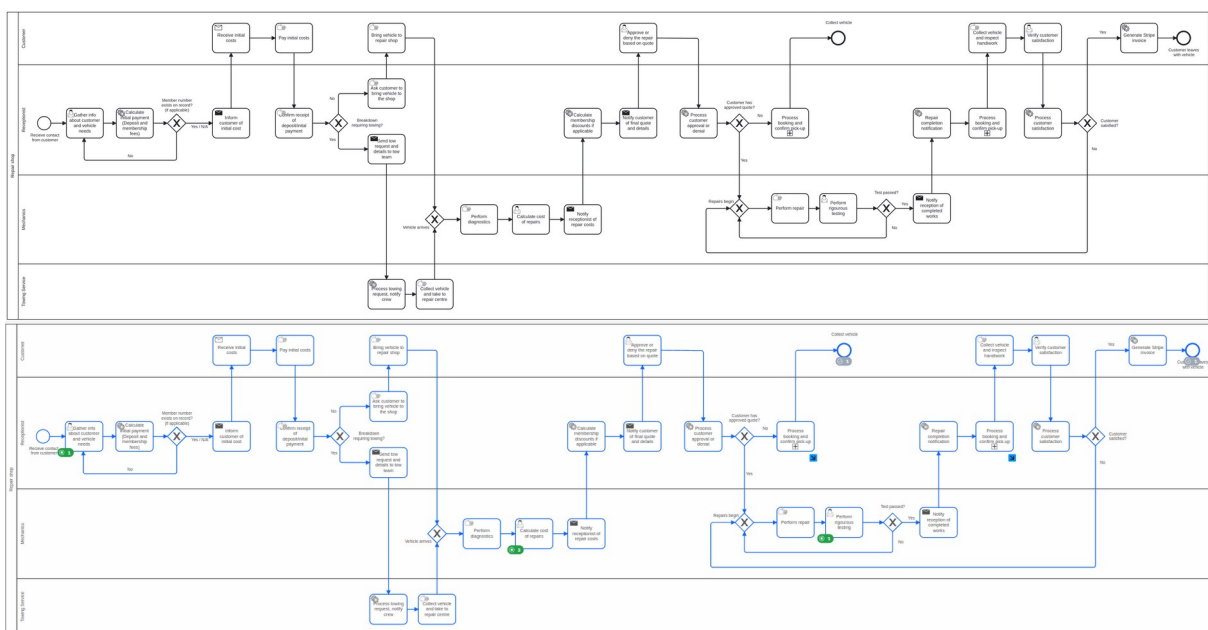


FIGURE 1: Operational BPMN Model of the Car Repair Shop System

3. Detailed Process Analysis

3.1 Customer Process

The customer journey has been enhanced with specific operational details and user interface interactions.

Key Operational Elements:

- **Start Event:** Customer initiates the repair request process
- **User Task:** "Pay initial costs" - Interface for submitting payment information
- **User Task:** "Bring vehicle to repair shop" - Scheduling interface for drop-off
- **User Task:** "Approve or deny the repair quote" - Decision interface with cost breakdown
- **User Task:** "Receive and examine quote" - Detailed quote review interface
- **User Task:** "Receive and review invoice" - Final invoice review interface
- **User Task:** "Collect vehicle and process payment" - Checkout and final payment interface
- **End Event:** "Customer leaves with vehicle" - Process completion

User Form: Vehicle Issue Submission

The process begins with a customer form for submitting vehicle issue details:

This form captures essential information including:

- Vehicle make and model
- Description of the issue
- Customer contact information
- Preferred service date

The form incorporates input validation to ensure all required fields are completed properly before submission, enhancing data quality and process efficiency (Freund and Rücker, 2019).

3.2 Receptionist Process

The receptionist process has been enhanced with specific operational tasks and system integrations.

Key Operational Elements:

- **Service Task:** "Calculate membership discounts if applicable" - Automated calculation based on customer database
- **User Task:** "Gather info about customer and vehicle needs" - Customer intake interface
- **Service Task:** "Inform customer of initial cost" - Automated notification system
- **User Task:** "Ask customer if towing is needed to the shop" - Decision capture interface
- **Service Task:** "Send car details to the team" - Automated work order generation
- **User Task:** "Receive customer payment and finalize work" - Payment processing interface

User Form: Towing Request

When towing is needed, the receptionist uses a specialized form

This form captures:

- Vehicle location details
- Customer availability for vehicle handover
- Special handling instructions
- Towing priority (standard/urgent)

The system automatically routes this information to the towing service through an integrated API, eliminating manual communication delays (Freund and Rücker, 2019).

3.3 Mechanics Process

The mechanics' process has been enhanced with detailed operational tasks and quality control gates.

Key Operational Elements:

- **User Task:** "Perform initial diagnostics" - Diagnostic findings capture interface
- **User Task:** "Identify exact cost of repairs" - Cost estimation interface with parts database integration
- **User Task:** "Perform repairs" - Repair documentation interface
- **Gateway:** "Tests passed?" - Quality control decision point
- **User Task:** "Apply quality assurance completed sticker" - Final approval interface

User Form: Diagnostic Findings

The mechanics use a comprehensive diagnostics form

This form includes:

- Diagnostic test results (with attachable images)
- Parts needed for repair (with automated inventory checking)
- Estimated labor hours
- Repair priority classification

The system automatically calculates cost estimates based on parts prices from the inventory database and standard labor rates, ensuring accuracy and consistency (Camunda, 2021).

3.4 Towing Service Process

Key Operational Elements:

- **Service Task:** "Arrange towing transport" - Automated dispatch and routing
- **User Task:** "Collect vehicle and take to repair service" - Collection confirmation interface with GPS integration

User Form: Towing Confirmation

The towing service uses a mobile-optimized form

This form includes:

- GPS location capture
- Vehicle condition documentation (with photo attachments)
- Estimated arrival time at repair shop
- Digital customer signature for vehicle release

The form automatically updates the repair shop's system with real-time vehicle transit information, enabling better resource planning (Silver, 2011).

4. System Integration Points

The operational model incorporates several system integration points that enable automation:

4.1 Customer Database Integration

The receptionist's "Calculate membership discounts if applicable" service task queries the customer database to verify membership status and automatically applies relevant discounts. This integration eliminates manual lookup and calculation errors.

4.2 Inventory Management System

The mechanics' "Identify exact cost of repairs" task integrates with the parts inventory system to:

- Check part availability
- Retrieve current pricing
- Reserve parts for the repair
- Trigger reordering for low-stock items

This integration ensures accurate quotations and prevents delays due to parts availability issues (Camunda, 2021).

4.3 Payment Processing System

The customer's "Pay initial costs" and "Collect vehicle and process payment" tasks integrate with a secure payment processing system that:

- Validates payment methods
- Processes transactions
- Issues digital receipts
- Updates the accounting system

This integration streamlines the financial aspects of the repair process, reducing administrative overhead and improving cash flow management (von Rosing et al., 2014).

4.4 Notification System

Automated notifications are triggered at key points in the process:

- When the initial quote is ready for customer review
- When repair work begins
- When repairs are completed
- When the vehicle is ready for collection

These notifications can be delivered via email, SMS, or mobile app notifications based on customer preferences, enhancing the customer experience through proactive communication (Freund and Rücker, 2019).

5. Data Validation and Reusability Features

5.1 Data Validation

All user input forms incorporate comprehensive validation to ensure data integrity:

- Required field validation prevents form submission with missing information
- Format validation ensures phone numbers, email addresses, and vehicle identification numbers conform to expected patterns
- Logical validation checks for inconsistencies (e.g., appointment dates in the past)
- Cross-field validation ensures related information is consistent (e.g., vehicle make and model compatibility)

These validation mechanisms prevent process errors and exceptions due to bad data, improving overall process reliability (Silver, 2011).

5.2 Reusability Features

Several components of the process have been designed for reusability:

5.2.1 Form Templates

Standardized form templates are used for common data capture scenarios, ensuring consistent user experience and data collection. These templates can be reused across different service types while maintaining branding and usability standards.

5.2.2 Sub-processes

Common activities have been encapsulated as reusable sub-processes:

- Payment processing
- Customer notification
- Diagnostic procedures
- Quality assurance checks

These sub-processes can be maintained centrally and reused across multiple business processes, ensuring consistency and reducing maintenance overhead (Camunda, 2021).

6. Process Efficiency Improvements

The operational model introduces several efficiency improvements over the strategic model:

6.1 Parallel Processing

Where the strategic model showed primarily sequential activities, the operational model introduces parallel processing opportunities:

- Vehicle diagnostics can begin while customer information is being processed
- Parts ordering can occur concurrent with repair authorization
- Quality checks can be performed while invoicing is prepared

This parallel processing reduces overall process time and improves resource utilization (Dumas et al., 2018).

6.2 Automated Decision Points

Several decision points have been automated based on business rules:

- Discount application based on membership status
- Towing requirement assessment based on vehicle condition
- Quality assurance routing based on test results

These automated decisions reduce manual intervention, speed up processing, and ensure consistent application of business policies (von Rosing et al., 2014).

7. Conclusion

The operational BPMN model provides a detailed, implementation-ready representation of the car repair shop process. By incorporating user interface designs, system integration points, and automated components, the model bridges the gap between business process design and technical implementation.

Key benefits of this operational model include:

- Reduced manual data entry through integrated forms

- Improved accuracy through automated calculations and validations
- Enhanced customer experience through timely notifications
- Increased efficiency through parallel processing
- Consistent application of business rules through automated decisions

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