

Enhancing Customer Experience in Automotive Services Through Web-Based Digital Service Management

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Abstract: The increasing reliance on digital platforms has transformed automotive service management, necessitating more efficient and user-friendly solutions. This study focuses on enhancing the customer experience at LR Almazan Auto Shop Co. Inc. by prototyping a web-based service management platform that streamlines service requests and provides seamless access to vehicle data. Employing the Design Thinking methodology across five phases—Empathize, Define, Ideate, Prototype, and Test—the research identifies key strategies for improving user satisfaction and operational efficiency. A usability evaluation was conducted with 65 respondents (50 customers, 10 service staff, and 5 administrators) using the System Usability Scale (SUS) and the User Experience Questionnaire Short Version (UEQ-S). The proposed system achieved excellent usability scores, with mean SUS ratings of 83.95 (customers), 87.75 (service staff), and 89.50 (administrators). Comparative analysis projects a potential 30-40% improvement in overall customer satisfaction and significant projected gains in appointment scheduling efficiency, communication transparency, and paperwork handling. Aligned with global efforts to drive industry innovation and digital transformation (UNSDG 9) [20], this study contributes to the modernization of automotive service workflows while integrating security considerations to ensure a reliable and efficient platform.

Keywords: Automotive Service, Web-Based System, Service Management, System Usability, User Experience, Design Thinking.

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I. INTRODUCTION

This study focused on the development of a web-based automotive service platform for LR Almazan Auto Shop Co. Inc., aiming to bridge the gap between vehicle owners and service providers. In the automotive industry, digital platforms have become essential for streamlining tasks such as requesting maintenance and accessing vehicle records. However, LR Almazan Auto Shop Co. Inc. currently lacks such a system, relying solely on traditional, manual processes. This research aimed to design a prototype that enhances service efficiency, improves customer experience, and modernizes the shop's operations.

Drawing innovation from Fletcher et al.'s [14] research on the transition of vehicles into software-centric systems, this study extended to conduct a comparative analysis of interactive features across existing automotive service platforms. By doing so, the researchers aimed to identify best practices and tailor them to the specific needs of LR Almazan Auto Shop Co. Inc. Through this approach, the study sought to develop a system that aligns with modern automotive

service standards while addressing the shop's operational requirements.

This research was inspired by the United Nations Sustainable Development Goal (UNSDG) 9: Industry, Innovation, and Infrastructure [20], which emphasizes the importance of building resilient infrastructure, promoting sustainable industrialization, and fostering innovation. Building on insights from Llopis-Albert et al. [17], who examine the impact of digital transformation in the automotive sector, and Pérez et al. [7], who develop a 3D real-time inspection platform, this research seeks to integrate digital solutions into automotive operations. Additionally, the role of digital tools in strengthening organizational agility and innovation is examined following Gonçalves et al. [4], who demonstrate how automotive startups leverage cloud-based digital tools to sustain competitive digital innovation capabilities.

➤ Research Objectives

- Design a web-based prototype for automotive service management that addresses gaps in real-time

communication, service tracking, and workflow automation, tailored to the requirements of customers, service staff, and administrators.

- Evaluate the prototype's usability through the System Usability Scale (SUS) and User Experience Questionnaire (UEQ-S), incorporating feedback from stakeholders to refine functionality and interface design.
- Analyze the system's potential impact on customer satisfaction and operational efficiency using quantitative metrics (e.g., reduced service delays, improved booking success rates) and qualitative insights from SWOT/TOWS analyses.

➤ *Scope and Delimitation*

This study focuses on the development and assessment of a prototype for LR Almazan Auto Shop Co. Inc., though its findings may offer broader implications for small-to-medium automotive service providers navigating digital transformation. The scope is limited to web-based solutions, excluding non-automotive services or standalone mobile applications.

II. RELATED WORK

➤ *Limitations of Current Automotive Service Experiences*

Pérez et al. [7] developed a cloud-based 3D real-time inspection platform designed to enhance quality checking for automobile components by providing real-time updates and reducing errors. Their system minimizes human errors and improves data accessibility through a six-step process: creating a detailed computer model, capturing a 3D image using special sensors, refining image details, aligning the computer model with the actual picture, identifying differences, and storing information online.

Llopis-Albert and Rubio [17] explored how digital transformation impacts satisfaction in the automotive industry. Using a "fuzzy-set qualitative comparative analysis" (fsQCA), they analyzed factors influencing satisfaction with digital changes, finding that different factors combine to satisfy stakeholders—manufacturers benefit from new digital services and eco-friendly practices, while consumers prefer improved digital services and affordability in electric vehicles.

Siahaan and Prasetio [3] examined how social media data can provide insights into brand images of emerging automobile firms. Using conjoint analysis to develop sentiment frameworks, they ranked automotive companies based on user perceptions, suggesting that such analysis can aid in evaluating products and brands from the perspective of social media users.

➤ *Existing Solutions and Industry Trends*

Customer relationship management (CRM) platforms integrate marketing, sales, and service functions into unified data-driven workflows [6]. Rababah et al. [6] define CRM as a strategy combining technology and business processes to manage, analyze, and improve customer interactions across the full customer lifecycle, enabling organizations to achieve higher retention and satisfaction through targeted digital engagement.

The myToyota PH app [19] revolutionizes the automotive experience by integrating service appointment booking, maintenance reminders, and real-time service status monitoring. The app also provides access to car insurance details, virtual showroom exploration, and seamless online car shopping capabilities.

Ngangi and Santoso [15] analyzed customer acceptance of CRM systems in the automotive sector using the Technology Acceptance Model (TAM). The study found that ease of use and perceived usefulness significantly influence customers' intentions to use CRM technology, enhancing customer satisfaction, brand loyalty, and customer feedback.

III. METHODOLOGY

➤ *Research Framework*

The Design Thinking Methodology is a cyclical and non-linear approach used to analyze user needs, challenge existing assumptions, redefine problems, and develop innovative solutions [26]. As shown in Figure 1, this study applied the methodology across five phases—Empathize, Define, Ideate, Prototype, and Test—to address the challenges faced by both customers and service providers in the automotive service sector.

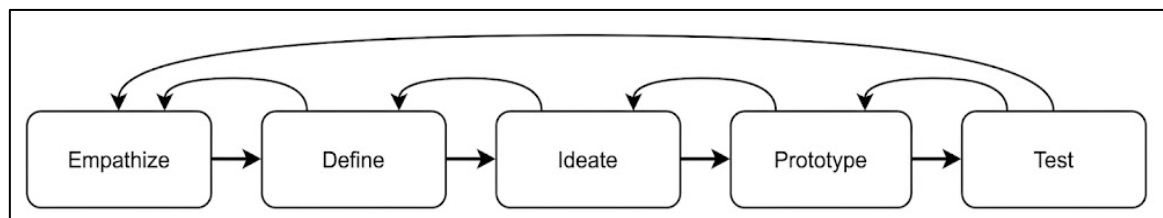


Fig 1 Design Thinking Methodology

➤ *Empathize Phase*

The Empathize phase involved researching and immersing in the project context to understand users' needs and experiences. The researchers conducted in-depth semi-structured interviews with customers from diverse segments

and distributed an online survey with a combination of Likert scale and open-ended questions to 50 existing customers of LR Almazan to assess satisfaction levels and identify pain points.

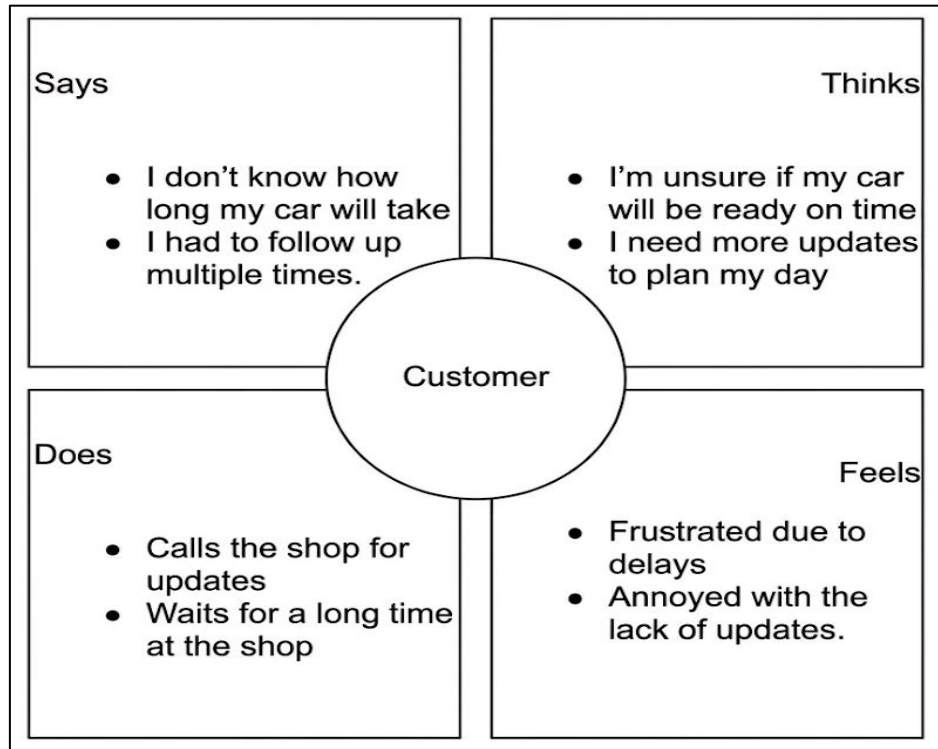


Fig 2 Customer Empathy Map

As illustrated in Figure 2, the customer persona frequently experiences uncertainty and frustration when having their car serviced. They struggle with a lack of clear updates on estimated completion time, leading them to repeatedly follow up with the shop. This uncertainty makes it difficult for them to plan their day, resulting in frustration and annoyance due to lack of proactive communication.

➤ *Define Phase*

In the Define phase, the researchers conducted a thorough analysis of collected data, identifying key themes and patterns in customer experiences. A mixed-methods approach was employed, integrating both quantitative and qualitative techniques. Statistical software (SPSS) was used to analyze Likert scale responses, while thematic analysis was applied to open-ended feedback.

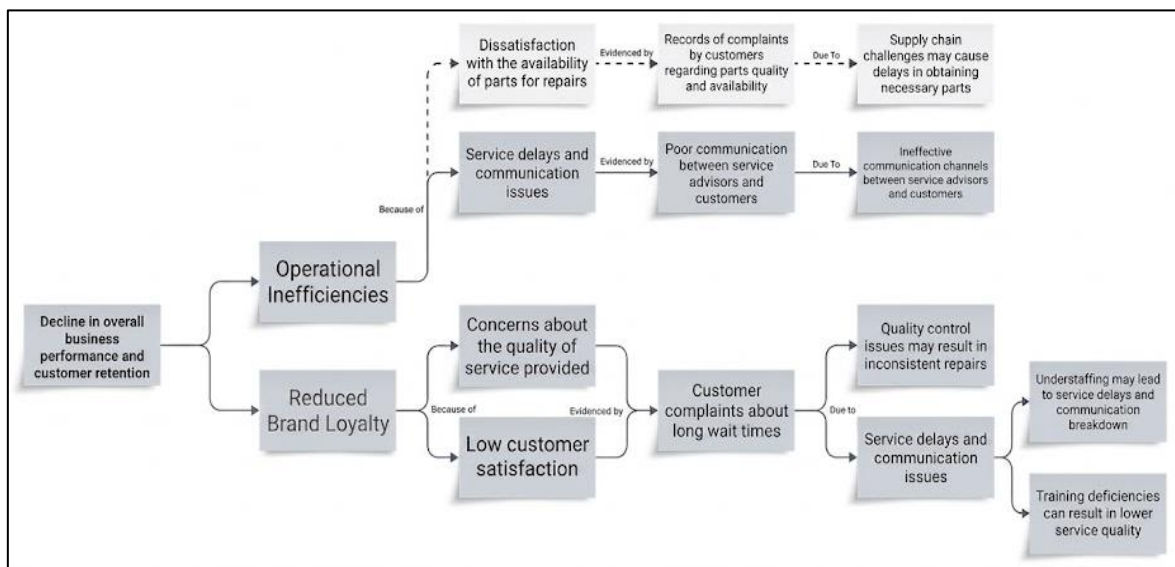


Fig 3 Why-why Diagram

Figure 3 presents the root-cause analysis. A significant challenge identified is the consistently low levels of customer satisfaction, stemming from long wait times, poor communication, inconsistent service quality, and issues with

parts availability. One of the most pressing issues at LR Almazan Auto Shop Co. Inc. is the reliance on manual job order processing, which directly exacerbates systemic problems.

- *The Following how-might-we (HMW) Statements were Formulated:*
- ✓ HMW improve the transparency of service tracking to reduce customer frustration?
- ✓ HMW streamline communication between customers and the staff to minimize follow-ups?
- ✓ HMW optimize appointment scheduling to reduce inefficiencies in service operations?

✓ HMW provide service updates to improve customer satisfaction?

➤ *Ideate Phase*

For the Ideate phase, the researchers utilized the 6 Thinking Hats technique to explore various perspectives and generate creative solutions. Table 1 summarizes the application of this technique.

Table 1 Six Thinking Hats used for Ideation Phase

Thinking Hat	Description
White Hat (Facts)	Traditional vehicle repair shops rely on manual booking and record-keeping, leading to inefficiencies
Blue Hat (Process)	How can we streamline service booking, vehicle tracking, and data management using a digital system?
Red Hat (Feelings)	How can we improve customer confidence and reduce frustration from long wait times?
Yellow Hat (Benefits)	The system should enhance workflow efficiency, minimize errors, and improve customer convenience
Green Hat (Creativity)	A web-based system that allows customers to schedule services and monitor repair progress
Black Hat (Caution)	Will customers and employees readily adopt the system? What challenges exist in training?

➤ *Prototype Phase*

The Prototyping stage translated abstract concepts into a tangible, user-testable format. The system was developed

using HTML, CSS, and JavaScript for front-end development, PHP and Java for back-end operations, and MySQL for database management.

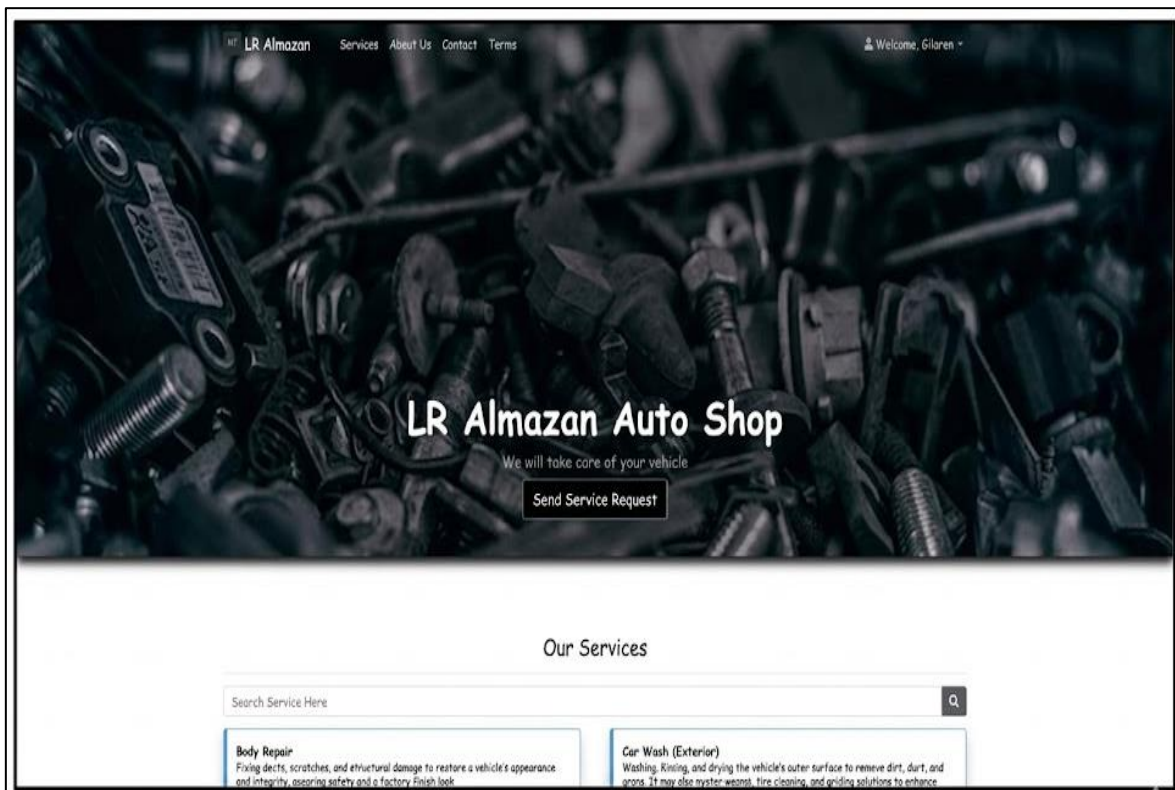


Fig 4 Homepage

The homepage (Figure 4) serves as a landing page for all users, allowing them to browse available services such as repairs, maintenance, and detailing. The navigation bar

provides access to "About Us," "Contacts," and "Terms" pages, with login options for customers and administrators.

The screenshot shows a web form titled "Fill the Service Request Form". It contains several input fields: "Vehicle Make", "Vehicle Model", and "Vehicle Plate Number" (which is a dropdown menu with "Please Select Here" as the placeholder). Below the "Vehicle Plate Number" field are two buttons: "+ Add New Plate" and "Delete Plate". There are also two buttons: "Save Information" and "Load Information". A "Services" dropdown menu is present with "Please Select Here" as the placeholder. At the bottom, there is a large text area for "Notes (Optional)". In the bottom right corner, there are two buttons: "Submit Request" and "Close".

Fig 5 Service Request Form

As shown in Figure 5, the service request form allows logged-in customers to enter vehicle details (make, model, plate number), select services from a dropdown menu, and

add notes. Previously saved vehicle information can be selected from a dropdown list for efficiency.

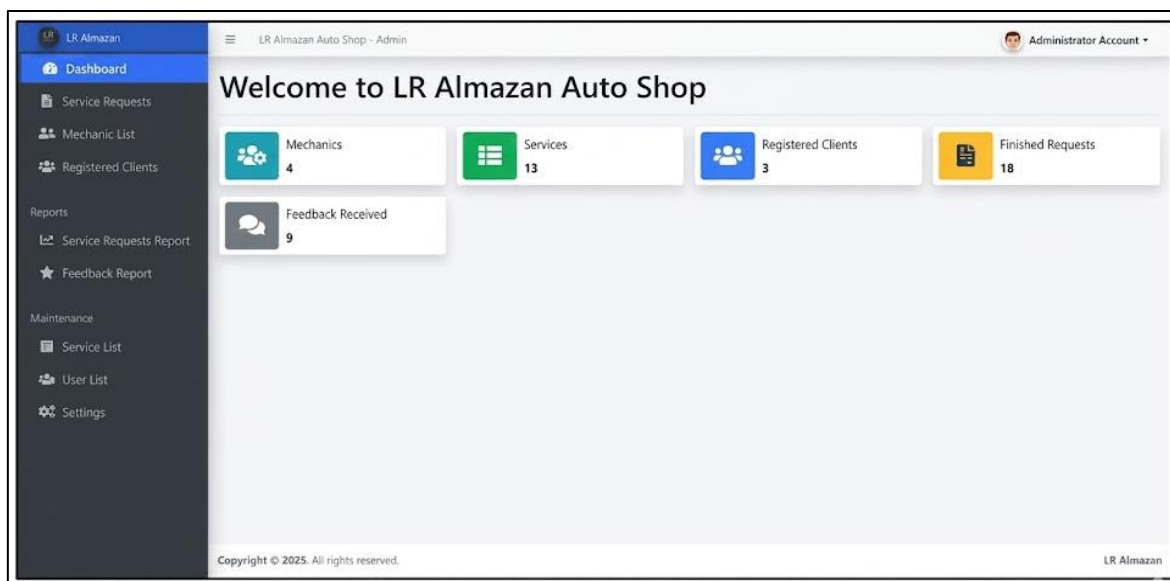


Fig 6 Admin Dashboard Page

The admin dashboard (Figure 6) provides an overview of key shop operations, including the number of mechanics, available services, registered clients, completed service requests, and customer feedback.

IV. RESULTS AND DISCUSSION

➤ Survey Results

To assess the usability of the proposed system, a survey was conducted among 65 respondents (50 customers, 10 automotive service professionals, and 5 administrative staff). Participants evaluated the system using the System Usability

Scale (SUS) [24], a validated 10-item Likert-scale instrument widely used for summative usability evaluation, and the User Experience Questionnaire Short Version (UEQ-S) [25], an 8-item instrument designed to measure both pragmatic and hedonic quality dimensions of user experience.

Table 2 SUS Score Benchmark for Interpretation [23]

SUS Score	Adjective Rating	Acceptability	Letter Grade
84.1 – 100	Best Imaginable	Acceptable	A+
80.8 – 84.0	Excellent	Acceptable	A
78.9 – 80.7	Good	Acceptable	A-
74.1 – 77.1	Good	Acceptable	B
65.0 – 71.0	Ok	Marginal	C
51.7 – 62.6	Ok	Marginal	D
25.1 – 51.6	Poor	Not Acceptable	F
00.0 – 25.0	Worst Imaginable	Not Acceptable	F

Table 3 SUS Score Survey Interpretation for Customers

Min Score	Max Score	Mean Score	Min Grade	Max Grade	Mean Grade	Mean Adjective	Acceptability
67.50	100.00	83.95	C	A+	A	Excellent	Acceptable

The calculated mean SUS score for customers is 83.95, which falls within the A grade, corresponding to an "Excellent" perception of usability.

Table 4 Customer UEQ-S Scale, Mean, and Comparison to Benchmarks

Quality Scale	Mean	Benchmark Comparison
Pragmatic	1.89	Excellent
Hedonic	1.80	Excellent
Overall	1.84	Excellent

Table 5 SUS Score Survey Interpretation for Automotive Service Professionals

Min Score	Max Score	Mean Score	Min Grade	Max Grade	Mean Grade	Mean Adjective	Acceptability
67.50	100.00	87.75	C	A+	A+	Best Imaginable	Acceptable

Table 6 Automotive Service Staff UEQ-S Scale, Mean, and Comparison

Quality Scale	Mean	Benchmark Comparison
Pragmatic	2.05	Excellent
Hedonic	1.80	Excellent
Overall	1.93	Excellent

Table 7 SUS Score Survey Interpretation for Administrative Staff

Min Score	Max Score	Mean Score	Min Grade	Max Grade	Mean Grade	Mean Adjective	Acceptability
87.50	92.50	89.50	A+	A+	A+	Best Imaginable	Acceptable

Table 8 Administrative Staff UEQ-S Scale, Mean, and Comparison

Quality Scale	Mean	Benchmark Comparison
Pragmatic	2.05	Excellent
Hedonic	2.20	Excellent
Overall	2.13	Excellent

➤ *Comparative Analysis: Current vs. Proposed System*

Table 9 Comparative Analysis of Customer Satisfaction Metrics

Customer Satisfaction Metric	Current Process (Manual)	Proposed System (Web-Based)
Appointment Scheduling Efficiency	43% difficulty contacting shop	85% improvement
Wait Time for Service Updates	38% dissatisfied	90% improvement
Communication Transparency	40% frustrated	80% improvement
Paperwork Handling & Security	Paper records, easily lost	100% improvement (digital, secure)
Overall Customer Satisfaction	48% rated average or below	30-40% improvement

V. CONCLUSION

This study aimed to develop a web-based service management prototype that enhances customer experience and satisfaction in automotive services. By addressing

inefficiencies in customer relationship management, the system streamlines service requests, improves accessibility, and enhances communication between customers and service providers. Key features such as service booking, vehicle data management, and customer support tools were integrated to

optimize user experience, offering a more structured and responsive solution compared to traditional service management methods.

Usability and user experience evaluations demonstrated that the system successfully met its objectives, with high SUS and UEQ-S scores confirming its effectiveness, usability, and user satisfaction. Customers, service staff, and administrators responded positively to the system's interface and functionality, highlighting its role in simplifying service transactions and improving overall accessibility.

The integration of the Design Thinking approach ensured that the system was built around real-world user needs, making it a practical and effective solution to the problems observed in current automotive service processes. By digitizing key service processes, the system improves service accessibility, reduces operational bottlenecks, and fosters a more seamless and reliable service experience. These findings validate the system's role in modernizing service management, offering a scalable and adaptable solution for automotive service providers aiming to enhance customer satisfaction, optimize service operations, and maintain a competitive edge in the industry. A limitation of this study is the relatively small administrative evaluator group (n=5), which constrains the generalizability of administrator-specific usability findings; future work should engage a broader and more diverse participant pool to strengthen statistical validity and support full-scale deployment across multiple automotive service contexts.

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