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# REQUIREMENT GATHERING OF A MOBILE APP FOR A CAR FAULT DIAGNOSIS

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## 1. INTRODUCTION

The primary objective of this mobile app is to assist car owners in understanding the meaning of dashboard warning lights and identify engine-related issues through AI-powered sound analysis.

To develop a reliable and user-friendly mobile application for car fault diagnosis, it is essential to gather comprehensive requirements from both functional and non-functional perspectives. This section outlines the methods used for requirements collection and the categorized requirements identified.

## 2. STAKEHOLDERS

The following stakeholders were identified as relevant to the success of the project:

- **Primary Users:** Car owners and drivers
- **Secondary Users:** Mechanics, technicians
- **Data Providers:** Automotive experts, car manufacturers
- **Project Team:** Developers and UI/UX designers
- **Academic Supervisor:** Lecturer evaluating the app

## 3. METHODS OF REQUIRMENT GATHERING

To effectively collect user needs and expectations, the following methods were employed:

- **Interviews:** We conducted informal interviews with mechanics and car owners. These conversations focused on common car problems, reactions to warning lights, and feedback on a mobile-based diagnostic tool.
- **Online Survey:** A Google Form was created and shared with car owners and drivers. The survey consisted of 9 questions

designed to understand their familiarity with dashboard lights and interest in a diagnostic app.
- **Observation:** Team members took note of real-life situations involving dashboard alerts and how drivers responded to them.

## 4. TOOLS USED

- **Google Forms:** For creating the survey and data collection
- **WhatsApp**: For sharing the survey links and getting feedback from car owners and mechanics
- **Microsoft Word:** For documenting the requirements and results
- **Google Sheets:** For organizing and analyzing survey responses

## 5. RESULTS

### a. Survey Findings

**1. Respondent Overview**

- **Total Responses:** 21
- **Age Distribution:**
    - 18–25 years: 10 respondents (37.5%)
    - 26–35 years: 2 respondents (12.5%)
    - 36–50 years: 3 respondents (18.8%)
    - 51+ years: 6 respondents (31.3%)

**2. Car Ownership**

- **Own/Regularly Drive a Car:**
    - Yes: 18 (81.3%)
    - No: 3 (18.8%)

3. **Dashboard Warning Light Experience**

- **Frequency Noticing Warning Lights:**
  - Frequently: 8 (12.5%)
  - Occasionally: 7 (25%)
  - Rarely: 4 (25%)
  - Never: 2 (37.5%)
- **Have Seen a Warning Light Without Knowing Its Meaning:**
  - Yes: 18 (81.3%)
  - No: 3 (18.8%)

4. **Typical Reactions to Warning Lights**

- Search online: 4 (12.5%)
- Ask a friend or mechanic: 7 (31.3%)
- Ignore it: 3 (18.8%)
- Visit a mechanic: 6 (31.3%)
- Don’t know: 1 (6.3%)

5. **Interest in a Diagnostic Mobile App**

- **Would find it useful:**
  - Yes: 20 (93.8%)
  - No: 1 (6.3%)
  - Maybe: 0 (0%)

6. **Desired Features (multiple selections allowed):**

- Explanations of faults and possible causes: 16 (68.8%)
- Step-by-step repair guides or videos: 14 (56.3%)
- Offline access: 12 (56.3%)

- Sound analysis of engine noise: 11 (56.3%)
- Camera-based recognition of dashboard warning lights: 8 (50%)
- Urgency level of the fault: 7 (43.8%)

## 7. Challenges Faced When a Warning Light Appears

Key recurring themes:

- **Uncertainty or lack of knowledge** (e.g., “don’t know what it means,” “can’t recognize the symbol”)
- **Financial constraints** (e.g., “no money to repair,” “cost is a burden”)
- **Distrust in mechanics** (especially when lacking car knowledge)
- **Inconvenience and stress** (e.g., “disrupts my day,” “car won’t start”)

## 8. Suggestions & Expectations

Most notable ideas:

- Develop an app that **automatically detects faults** and **suggests solutions**
- Include **visual dashboard representations**
- Add **engine sound diagnosis**
- Consider **integrating the app into the car system**
- Suggest **car maintenance education** as part of driving lessons

*Survey Summary*

A total of 21 participants responded to the survey. The majority were aged 18–25 and 51+, with over 80% owning or regularly driving a car. Many users often ignore or are unsure about

dashboard warning lights and expressed interest in a mobile solution.

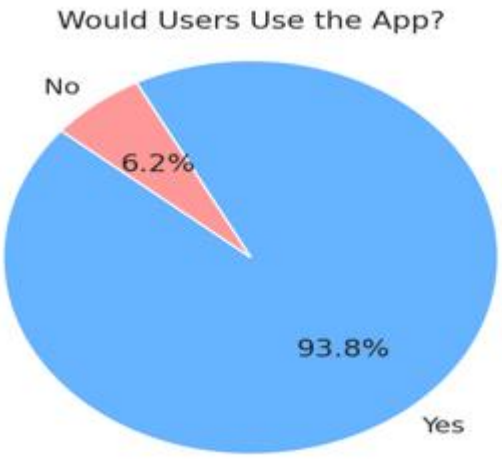


*Figure 1: Users' interest in a Car diagnostic app*

*This pie chart shows that 93.8% of survey respondents would find a mobile app useful for diagnosing dashboard warning lights and engine sounds.*


*Figure 2: Common Challenges faced by Car owners*

*Based on open-ended survey responses, this bar chart visualizes common challenges such as difficulty understanding warning lights, high repair costs, and lack of trust in mechanics.*

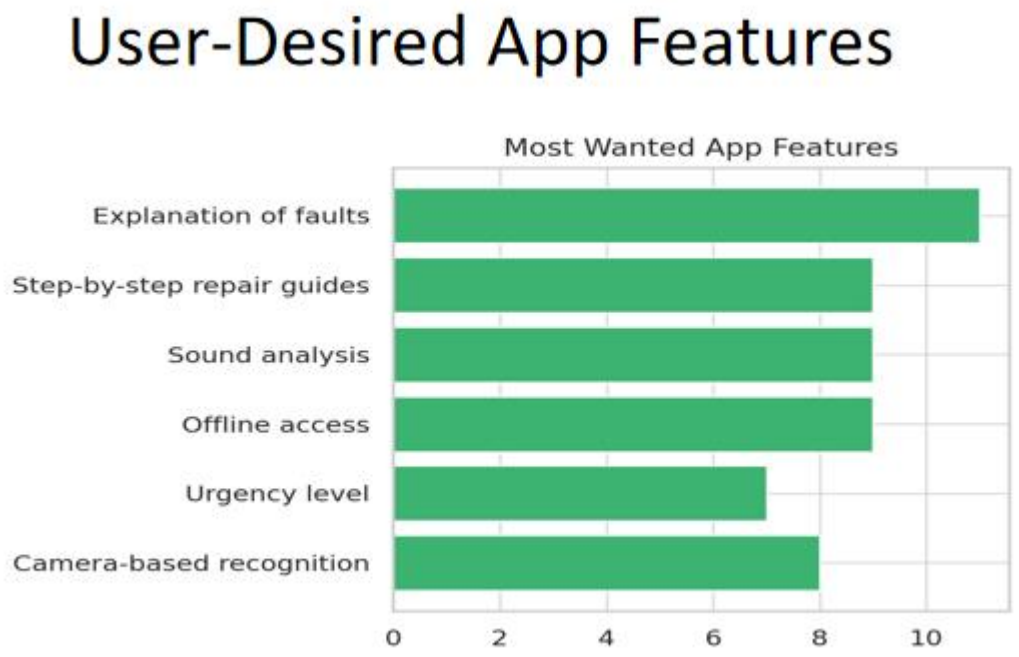


*Figure 3: Most desired features in the proposed app*

*This bar chart highlights the top features users want in the app, including explanations of faults, sound analysis, offline access, and repair guides.*

### b. Interview Findings

Participants

- Total interviews conducted: 9

**Key Themes from Interviews**

**1. Awareness and Experience with Dashboard Warning Lights**

- Most participants admitted to **not recognizing certain dashboard symbols**.
- A few said they had **ignored a warning light** because they didn't feel it was urgent or didn’t understand it.
- Some interviewees said warning lights create **anxiety or confusion**, especially when it’s unclear how serious the issue is.

**2. Current Actions Taken**

- Responses varied:
    - **Visiting a mechanic** was a common solution.
    - Others preferred to **consult friends or Google** the issue.
    - Some said they **ignore** lights they perceive as minor or non-urgent.

**3. Challenges Faced**

- **Lack of understanding** of warning lights was the most common challenge.
- **Fear of being overcharged** or misled by mechanics was raised.
- **Delays in fixing the issue due to cost or availability of help**.
- A few mentioned **breakdowns or being stranded** as a result of ignoring warning lights.

**4. Features on the Proposed App**

- Make the app simple and beginner-friendly.
- Allow saving of diagnosis history.
- Provide estimated repair costs or nearby mechanic recommendations.

To conclude,

Interviewees provided in-depth confirmation of survey insights: they face frequent uncertainty with warning lights, desire an easier way to understand car issues, and strongly support the idea of a smart diagnostic app. Their feedback gives clear guidance on which features to prioritize and how to improve usability.

## 6. FUNCTIONAL REQUIREMENTS

These describe what the system **should do**:

1. **User Registration (Sign-Up)**
    - The system shall allow users (car owners and mechanics) to register using their name and password.
    - The system shall display appropriate error messages for invalid inputs.

2. **User Authentication (Login)**
    - The system shall allow registered users to log in using their credentials.

3. **Dashboard Indicator Scanner**
    - Allow users to scan dashboard lights using their phone camera.
    - Use computer vision to recognize and classify the lights.

4. **Engine Sound Analysis**
    - Record engine sounds through the phone's microphone.
    - Analyze sounds using AI to detect patterns linked to faults (e.g., knocking, squealing).

5. **Fault Detection and Interpretation**
    - Display the meaning of each detected symbol/sound
    - Include possible causes and the urgency of the issue.

6. **Multiple Fault Detection**
    - Recognize multiple warning lights in a single scan.
    - Analyze overlapping or combined engine sounds

7. **Recommendations and Repairs**
    - Offer suggested repairs or next steps.
    - Provide maintenance tips.

8. **Video Tutorials Integration**

- Display embedded or linked YouTube videos from certified experts.

9. **Offline and Online Modes**
    - Basic features (e.g., recognition of common lights/sounds) should work offline.
    - Online mode should allow access to updated fault databases and videos.

10. **User Interface**
    - Simple and intuitive UI.
    - Allow users to navigate diagnostics and solutions easily.

11. **Repair Notifications**
    - The system shall notify the user of regular car maintenance and pending car repairs.

12. **Mechanic Contact Retrieval**
    - The system shall retrieve a list of the nearest available mechanics based on the car's current location.

## 7. NON-FUNCTIONAL REQUIREMENTS

These describe **how** the system should perform:

1. **Performance**
    - Fast image and sound processing with minimal lag.
    - Quick diagnosis within seconds.

2. **Accuracy**
    - High accuracy in recognition of warning lights and sound anomalies.
    - Continuous model training to improve predictions.

3. **Scalability**
    - Ability to expand the database of sounds, lights, and issues.

4. **Security**
    - Protect user data such as recordings and vehicle history.
    - Adhere to privacy policies and permissions.

5. **Reliability and Availability**
    - Ensure the app works under varying phone conditions (e.g., low battery, poor lighting).
    - Minimal crashes or bugs.

6. **Portability**
    - Compatible with a wide range of Android and iOS devices.

7. **Maintainability**
    - Code should be modular and easily updatable.
    - AI models should be upgradable.

8. **Usability**
    - Interface designed for non-technical users.
    - Language support or visual aids for better understanding.

## 8. CONCLUSION

Through surveys, interviews and observations, we have gathered valuable insights into the needs of car owners and professionals. By leveraging AI technologies and incorporating user feedback, the tool empowers users to maintain their vehicles proactively, potentially reducing repair costs and extending vehicle lifespan.