FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING

Group 18

Task 2: Requirement Gathering Report

CEF440: Internet Programming and Mobile Programming

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14/04/2025

1. Stakeholder Identification

Stakeholders are individuals, groups, or organizations that can affect or be affected by the project. Identifying and understanding their roles, expectations, and influence on the project is critical to the success of the mobile application for car fault diagnosis.

Primary Stakeholders:

- Car Owners/Drivers: They are the primary users of the app. Their needs drive the functionality of the application. Most are not automotive experts and rely on the app to provide accurate, easy-to-understand diagnostics.
- Mobile App Developers: Responsible for turning user requirements into a working application, including designing the interface, implementing features, and ensuring app security and performance.
- UI/UX Designers (Group members) : Ensure the application is user-friendly, accessible to non-technical users, and visually intuitive. Their role is vital to maximize adoption and usability.
- Project Supervisors/Academic Advisors: Oversee the academic aspect of the project, ensuring methodology is sound, objectives are met, and quality is maintained.
- Automobile Mechanics/Technicians: Provide ground-truth knowledge for system validation and help define the types of faults and their symptoms. They act as subject matter experts.

Secondary Stakeholders:

- Cloud Service Providers: Host backend services such as updated databases, analytics, and heavy ML models that can’t be run offline.

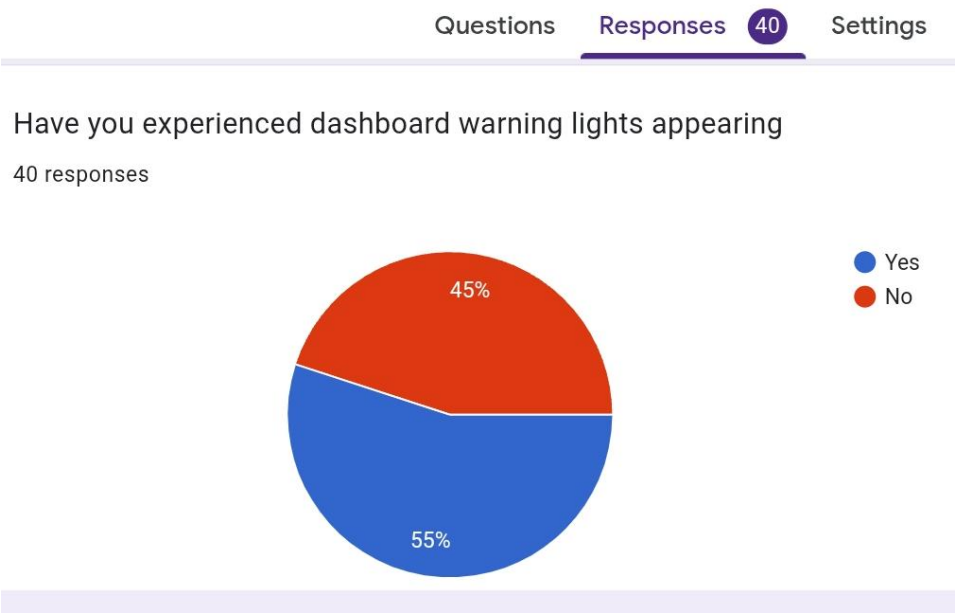
2. Requirement Gathering Techniques

A robust requirement gathering process combines various methods to ensure both functional and non-functional needs are comprehensively captured. This project used both user-centric and expert-centric approaches.

2.1 Surveys

Surveys were conducted using Google Forms distributed through social media groups and car owners. The aim was to assess car users' knowledge of car diagnostics, usage of existing solutions, and interest in mobile-based fault detection. The survey was mainly carried out on taxi drivers and private car owners.

The questions included are shown below:

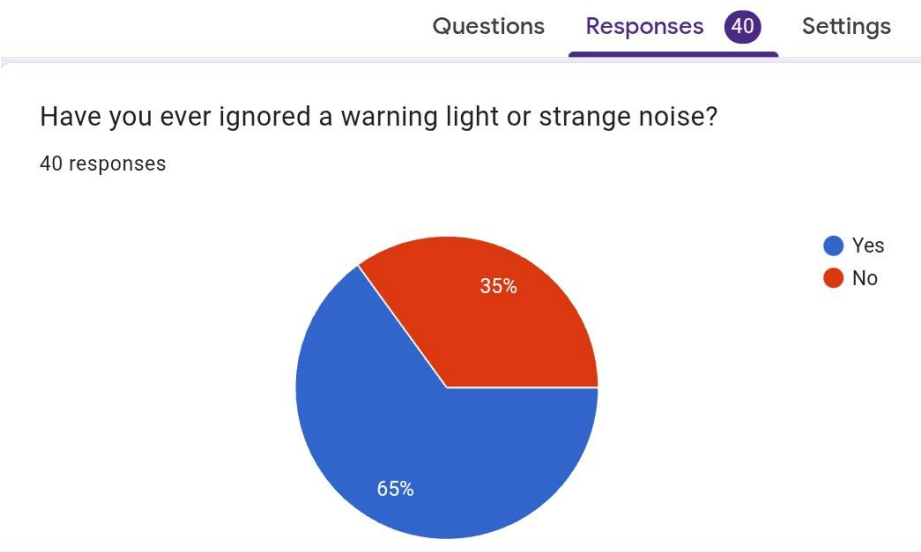


From the above, we can see that most people have experienced dashboard lights appearing.

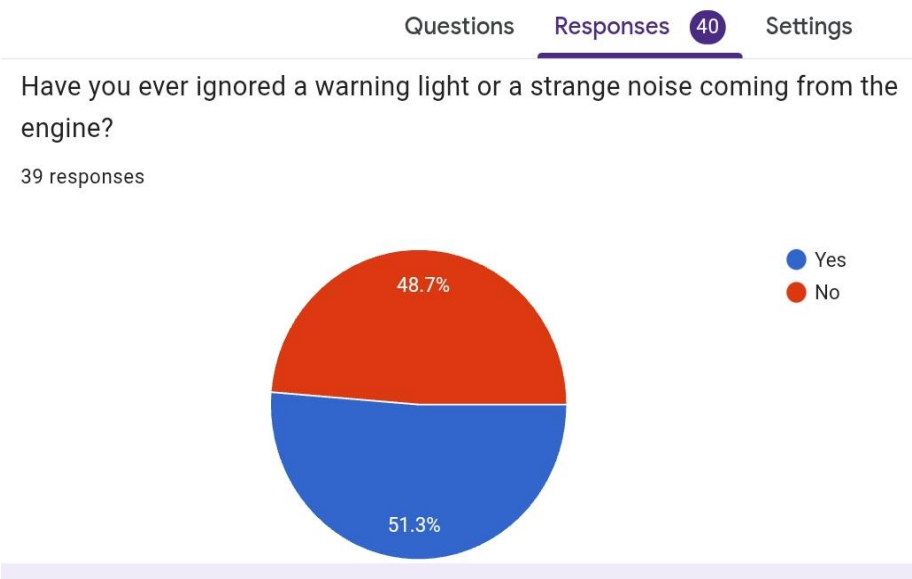
Major feedback we got from people after experiencing a dashboard warning was:

- Car engine seized
- Car stopped because the signal was red
- I didn't know what the light signifies
- I went to the mechanic
- Car broke down

From the above, we see that most people don't understand dashboard warning.



We can clearly see that majority of people who answered the questionnaires ignore warning lights or strange noises from their cars



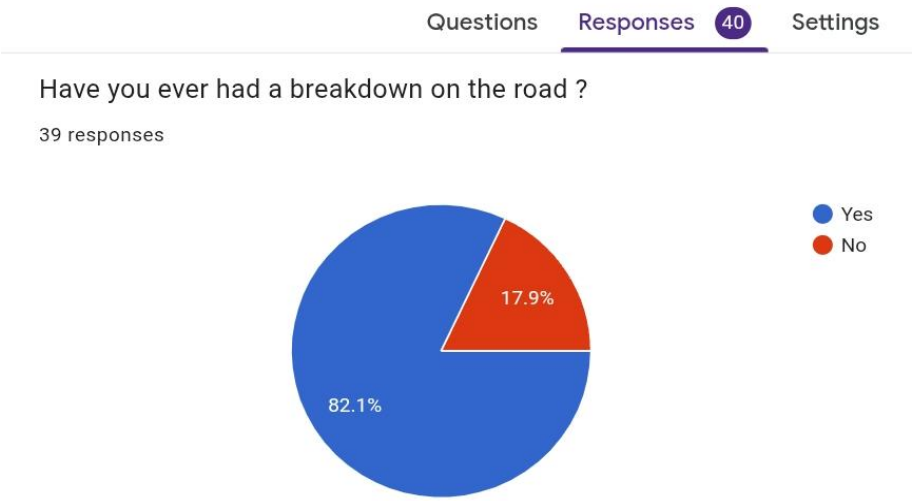
From the above, we see that most people ignore warning lights and strange noises coming from their engine.

Major feedback we got from people after ignoring warning lights and strange noises coming from their engine was:

- Car broke down
- Went to mechanic
- The engine knocked and stopped working

- The car wouldn't start
- Cost me a lot to fix it

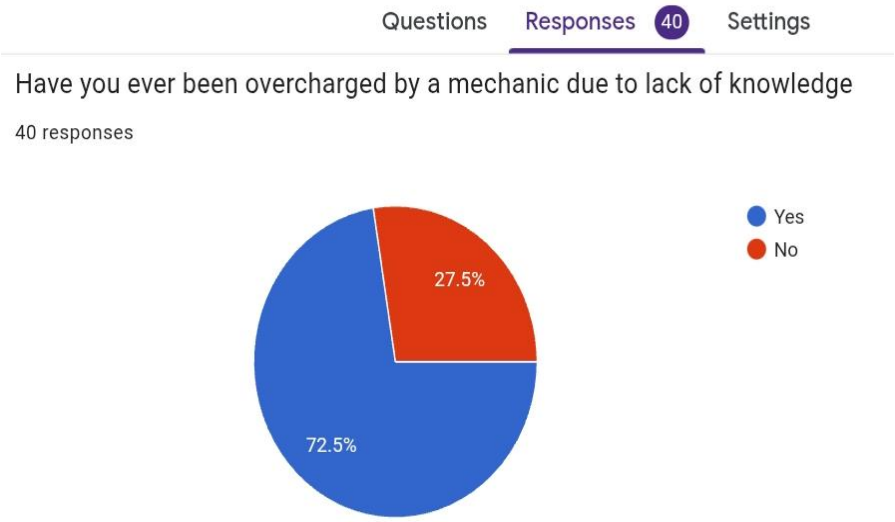
From the above, we see that everyone had a negative after effect after ignoring warning lights and strange noises coming from their engine.



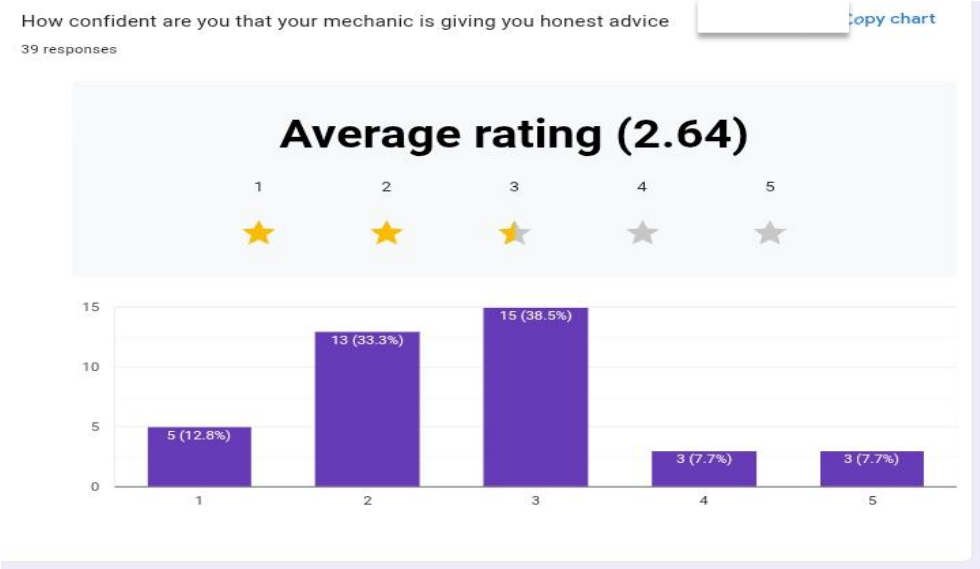
From the above, we see that most people have had a breakdown on the road.

Major feedback we got from people after having a breakdown from the road was:

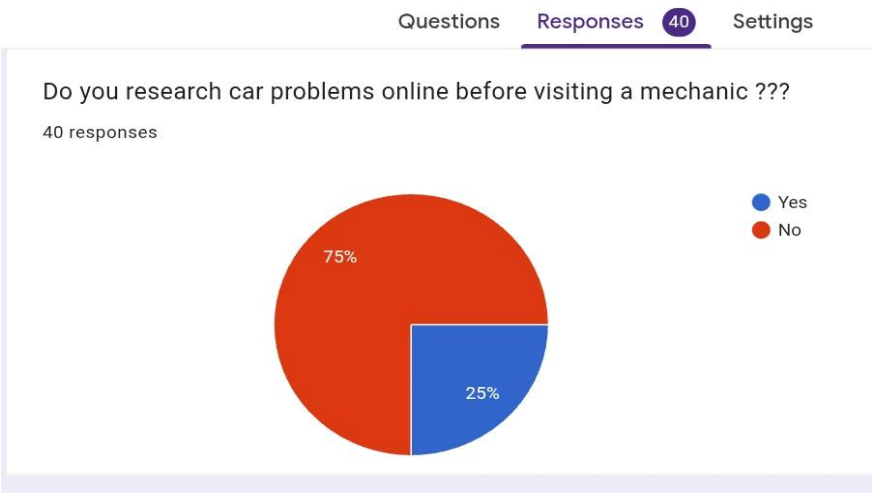
- Called a mechanic
- Ask help from passer-by
- Called a technician
- Left the car there for days
- Tire puncture
- I added water to the car and let the car cool down



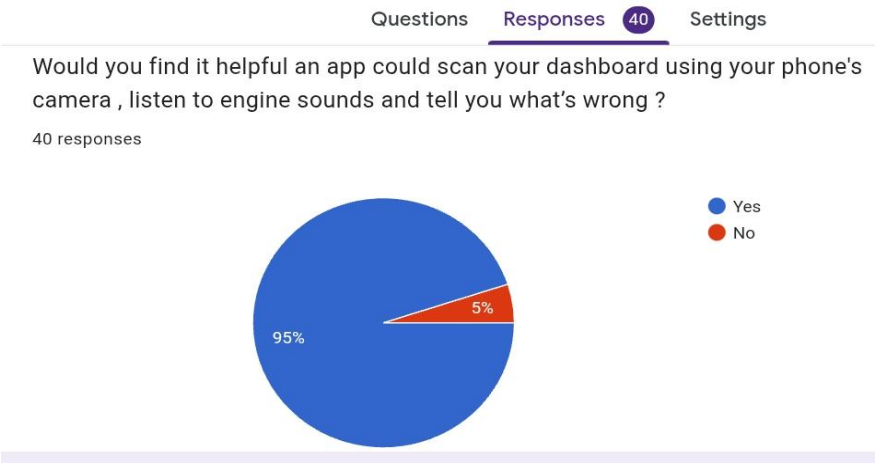
From the above, we see that most people are being over charged by a mechanic due to lack of knowledge



From the above, we see that most drivers are not confident with their mechanics advice.



From the above, we see that most drivers do nor research their car problems



From the above, we see that majority drivers would find a car fault diagnosis app that could help them predict car problems very useful.

Major feedback we got from people concerning what features they would like in a car diagnostic app include:

- Provide accurate troubleshooting skills
- Estimate the cost of fixing about fault in their car
- Educate people on the issues with their car
- Detect anomalies and propose solution to solve them
- Provide numbers trustworthy mechanics and electricians in case of emergency
- App should be able to connect to cars OBD-II Port so it can read diagnostic trouble codes

- Predict the fault of the car before the user can reach the machanic
- Assist in fixing minor car issues
- Send notifications concerning car

From 40 responses, 65% have ignored warning on dashboard, 72.5% admitted they were overcharged by their mechanic and 95% showed interest in using a smartphone-based diagnostic tool, confirming a strong user need.

2.2 Interviews

Semi-structured interviews were held with certified mechanics, experienced car owners and lecturers. This helped identify common mechanical problems that produce audible indicators and how they are usually diagnosed. Below are the feedback we got from the interview.

We visited 5 mechanic work shop (Moki garage, Mbako garage, BOCOM garage, Solo & Sons garage, Bius garage) Feedback gotten from them were:

- Mechanics emphasized that while expert diagnosis is best, apps could triage issues and guide users on what requires urgent attention.
- People come with vague complaints. A feature that guides users through symptom reporting would be helpful.

We interviewed 3 lecturers (Dr Nkemeni Valery, Dr Marshall, Dr Ines Djouela) and the feedback gotten was:

- The app should generate revenue
- The app should be able to minimize as much as possible the level of extortion from mechanics
- The app should provide a possibility for an on-site car fault detection
- The app should educate users cars on their cars

We interviewed 10 car owners and major Feedback gotten were:

- The app should add diagnose car problems using OBD-II data
- The app should add a car maintainance history

2.3 Brainstorming Sessions

We had 2 group sessions to ideate the app's design. Ideas were grouped into core (must-have), important (nice-to-have), and future (scalable) features. Topics included:

- Image detection architecture (CNN-based model, offline capability)
- Audio classification framework (Mel spectrograms + CNN or LSTM)
- Simplified UI with icons, one-click scan, and optional voice narration for accessibility
- Generate income either by using adds or by upgrading to the premium (without adds)

2.4 Reverse Engineering

Popular tools like apps like OBD2 Ccar scanner, OBB Auto doctor and OBD docker were analyzed to evaluate their functionality and gaps. These apps often required external OBD-II devices and were not affordable or intuitive for average users. This project's competitive edge will be:

- Just OBD-II Bluetooth Adapter required (relatively cheaper)
- AI-driven with real-time feedback
- Educational resources linked to each diagnosis
- We also studied pre-existing apps like "car problems and repairs"

3. Data Gathering

Quality data is essential to train machine learning models and develop a reliable diagnostic tool. We used 5 main ways to gather data that is:

- Survey: By using Google forms
- Interviews: By having talks with lecturers, mechanics and car owners
- Observation: This was done in a taxi where we observed how the driver reacts to dashboard warnings.
- Brainstorming: We had 2 brainstorming sessions
- Reverse engineering: This was done by studying existing applications

4. Data Cleaning

Collected data underwent several preprocessing stages to ensure accuracy and uniformity. We mainly used manual review to clean our data

4.1 Validation

Each data type was cross-checked manually and validated against expert inputs. Data that was mislabelled or corrupted was discarded or re-annotated.

5. User Reluctance Assessment

5.1 Identified Concerns:

- Some users were not in their good mood so they shunt us off
- Some were not confident about what they were saying so they prefer not to answer
- Some were just rude and sent us away
- Some never trusted us enough to share their thoughts with us
- Some were actually interested in answering but were busy so they declined
- Others never even gave us a listening ear

5.2 Mitigation Strategies:

- Provide disclaimer and confidence level with each diagnosis.
- Being more patient and understanding with them helped a lot

Conclusion

The requirement gathering stage revealed a clear user need for a mobile, AI-powered car diagnostic tool. Diverse techniques—surveys, interviews, and expert reviews—ensured a deep understanding of user pain points and technical feasibility. The resulting insights guide the application's design, data requirements, model development, and user engagement strategy. With a strong foundation of validated data and stakeholder alignment, the project is well-prepared for the system design and implementation phases.