Requirement Engineering Process

Project Title: Raod state and Road Sign Notification Mobile Application

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1. Requirement Gathering

1.1 Stakeholder Identification

We identify the people directly and indirectly involved by Understanding of the Cameroonian road ecosystem, these are the key stakeholders:

Stakeholder	**Description**	**Role / Interest**
Drivers	Daily and occasional road users (private vehicle owners, motorcyclists, taxi drivers, inter-city bus operators, and delivery riders)	Primary users who need alerts on road signs, hazards, and road state
Ministry of Transport (MINTRANS)	National road and transport authority in Cameroon	Data provider and regulatory authority for road sign standards
Road Safety Commission (e.g., Délégation Générale à la Sûreté Nationale)	Law enforcement and traffic control	Interested in better compliance with road rules and reduced accident rates
Gendarmerie / Police Traffic Units	Enforce traffic regulations	Provide official data and act on hazard alerts
Local Councils (Mairies)	Maintain local roads and infrastructure	Interested in knowing real-time road deterioration or hazards
Motor Transport Unions (e.g., SYNCHTACAM)	Unions representing commercial and inter-urban drivers	Advocacy and awareness
Public Transport Companies (e.g., General Express, Finexs Voyages)	Fleet-based intercity transport	Can leverage route and hazard data for planning
Commuters / Passengers	Secondary stakeholders	Indirectly benefit from improved transport conditions
App Development Team	Design, build, and maintain the system	Translate real-world needs into technical solutions
Third-Party Data Providers	Weather and traffic APIs, GSM/GPS providers	Provide data integration for real-time alerts
Crowdsourcing Users	Volunteers and general users	Help report incidents, roadblocks, or hazards for faster app response

1.2 Requirement Gathering Techniques

A mix of methods was used to gather diverse and authentic requirements from the Cameroonian context:

Surveys:

A detailed Google Form was distributed to drivers across Douala, Yaoundé, Buea, Bamenda, and Garoua. It captured demographic data, driving behavior, road challenges, and technology usage.

- **Tool:** Google Forms, survey planet (in English and French)
- **Distribution Channels:** WhatsApp groups (Drivers, Bikers, University Transport), Facebook groups, and SMS for those in rural areas.
- **Survey link** **https://forms.gle/FAFgZ2CrSqEzEcbT9**

Field Interviews:

Conducted semi-structured interviews with taxi drivers, transport officials, and passengers at parks like mussango also with private cars drivers

Brainstorming:

 with the internal development team and local UX researchers We discuss pain points, data visualization, alert strategies, and local app language support (English, French, and Pidgin).

Reverse Engineering:

Analysis of existing solutions (Waze, Google Maps, HERE, Road Safety Cameroon mobile app) to identify gaps in road sign interpretation, localized alerts, and accessibility.

- Studied the user experience and feature set of the following apps :
  - **Waze:** Good crowdsourcing, but lacks local road knowledge in Cameroon.
  - **Google Maps:** Poor coverage for local incidents or temporary hazards.
  - **HERE WeGo:** Offline features useful but not locally adapted.

- **Identified Gaps**: Lack of local language support, no updates on roadblocks, poor alerting for Okada or bush taxis.

1.3 Data Gathered

a. Primary Data Sources

From Surveys:

Topic	Findings
Most Common Driving Issues	Bad roads (78%), police stops (62%), potholes (59%), wrong signage (43%)
Road App Usage	Only 25% regularly use Google Maps or Waze
Preferred Notification Method	65% want **voice alerts**; 48% want pop-ups; only 8% prefer vibrations
Top Desired Alerts	Accident reports (82%), potholes (77%), police checkpoints (64%)
Willingness to Crowdsourcing	72% said yes if reporting is quick; 59% want anonymity
Concerns	Privacy (66%), Data usage (49%), Battery life (44%)

From Interviews:

- Commercial drivers often rely on radio updates or phone calls for traffic alerts.
- Most are unaware of the meaning of certain signs — especially temporary ones (e.g., **construction detours**).
- Okada riders are very receptive to voice guidance but avoid using phones while riding.
- Police/gendarmerie are interested in a **centralized alert system** but require data validation.

b. Secondary Data Sources

- MINTRANS road sign handbook (Cameroon)
- Road traffic accident reports (2023-2024)
- Local news reports on road flooding and construction delays
- Weather reports from Cameroon Meteorological Service
- Public safety dashboards from apps like **Waze**, **Cameroon Road Safety App**, and **OpenStreetMap data**

Insights from Data

- 89% of drivers want alerts about **hazardous areas (flooding, potholes, police checks)**
- 72% report **confusion about non-standard or faded road signs**
- 63% would **share hazard data**, but only if it is easy and anonymous
- Most used apps: **Google Maps**, followed by **Waze** and **WhatsApp location sharing**
- Common challenges include **reckless driving**, **poor signage**, **bad roads**, and **sudden police stops**

1.4 Data Cleaning

Data gathered needed preparation before it could be used effectively for feature design and SRS documentation:

Step	Action Taken
Deduplication	Removed 12 duplicate survey responses (same IP + name or phone number)
Validation	Filtered out inconsistent answers (e.g., "I drive daily" + "I don't drive")
Categorization	Grouped open responses like "bad roads", "potholes", "mud roads" into one tag
Text Normalization	Standardized regional expressions (e.g., "benskin" to "motorbike", "gendarme stop" to "police checkpoint")
Incomplete Removal	Discarded 7 survey responses with more than 60% blanks

Final Usable Survey Entries: 25 and ongoing

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5. User Reluctance Assessment

Understanding psychological and technical barriers specific to/among Cameroonian users was critical to adoption planning

Reluctance Factor	Source	Insights & Mitigation Strategy
GPS / Privacy Concerns	Survey (66%), Interview	Users fear tracking by government or abuse. Solution: Anonymized location data, clear permission explanations.
Battery Drain	Survey (44%)	Older Android phones dominate usage. Solution: Low-battery mode + optimize background polling.
Data Usage	Especially rural users	MTN/Orange data plans are costly. Solution: Enable offline caching, allow daily sync over Wi-Fi.
Fear of Police Use of Data	From interviews	Drivers worry that alerts could expose them. Solution: No user data shared with authorities.
Unwillingness to Report Hazards	Okada interviews	Due to phone handling risks. Solution: One-tap or **voice reporting** during stops or traffic lights.
Language Barrier	Rural survey entries	Some do not speak English/French fluently. Solution: Future support for local languages like.

Final Usable Survey Entries: 25 and ongoing

Summary & Key User Requirements

Requirement	Source
Real-time voice alerts for hazards and road signs	Surveys, interviews
Low-bandwidth and battery-optimized mobile experience	Interview + survey analysis
Customizable notification settings	Survey (58%)
Localized hazard reporting (Okadas, checkpoints)	Interviews with riders + drivers
Anonymous and fast crowdsourced reporting	Surveys + brainstorming
Road sign interpretation guide	Interview with rural drivers
Integration with existing map apps (optional)	Feature request from advanced users

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