Road Assessment and Hazards (RAAH)

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1. Introduction

This qualitative research was conducted to understand user needs, attitudes, and behaviors related to road maintenance and safety in urban areas. The objective was to explore how both citizens and authorities currently report, manage, and respond to road hazards, and how a digital platform can improve this process. Data was collected through questionnaire surveys and interviews from both end users and subject-matter experts including traffic wardens, indrivers and civil engineers. These insights will later guide persona creation and user-centered design for RAAH.

2. Problem Statement

In many urban areas of Pakistan, road maintenance and traffic management systems are deteriorating. Issues such as broken streetlights, garbage accumulation, clogged drains, and potholes pose constant risks to citizens' safety and disrupt daily life. Despite the severity of these problems, most reporting mechanisms are either unavailable, manual, or poorly designed, offering little user interaction or feedback. This lack of an accessible, digital communication channel between citizens and municipal authorities results in delayed or unresolved issues. Therefore, there is a pressing need for a reliable, user-friendly, and interactive reporting system that empowers citizens to report hazards easily and enables authorities to respond effectively in real time.

3. Literature Review

Application	Key Features	Strengths	Limitations
Road Surveyor	Video capture, GPS tracking and statistical analysis.	GPS tracking and data statistics.	No saving feature, weak CRUD implementation, inconsistent design.
Road Survey	Survey form submission and location tracking.	Simple and direct reporting.	No authentication, poor UI design.
SOR (Safety of Road)	Sign in system and GPS-based issue reporting.	GPS-enabled location accuracy.	No sign up option, poor error handling, non-iterative design.
SeeClickFix	User authentication, problem reporting and GPS tagging.	Effective issue reporting and tracking.	Only for the USA.

Summary

These applications have several limitations, such as weak data management, inconsistent interface design, limited authentication mechanism, poor error handling, and a lack of iterative user-centered development.

4. Competitive Review

Existing Systems Reviewed

The following existing systems have been reviewed:

- Road Surveyor
- Road Survey
- SOR (Safety of Road)
- SeeClickFix

Observed Issues

Several issues in existing systems have been observed, including:

- Absence of saving features
- Weak CRUD (Create, Read, Update, Delete) implementation
- Lack of authentication
- Poor error handling
- Inconsistent user interface design

RAAH's Improvement

RAAH introduces a more reliable and user-centered approach to road management. It allows users to report any road-related issues they encounter, ensures secure authentication, and helps authorities address and resolve problems efficiently.

5. Research Methodology

Type

Qualitative Research – focuses on understanding user experiences, attitudes, and behaviors rather than collecting numerical data.

Methods Used

- **Questionnaire Survey**

  Conducted with **end users** and **civil engineers** to gather insights about how they use or respond to road hazard reporting systems. Observed their level of awareness, ease of use, and common difficulties while interacting with such systems.

- **Interviews**

  Conducted with **SMEs, traffic wardens, security guards** and **end users** to explore their daily challenges in road maintenance and reporting. Participants highlighted issues such as lack of coordination, limited accessibility, and delayed responses.

Tools

Verbal interviews and online **Google Forms** were used for data collection.

Duration

Approximately **7 days** (1st–7th October 2025)

Focus

The study focused on participants' **aptitude**, **attitude**, and **behavior** toward technology adoption, ease of use, and their willingness to engage in road safety reporting.

6. Population

The population for this study includes all individuals and professionals who are directly or indirectly affected by road conditions in urban areas of Pakistan. This covers **citizens** such as daily commuters, drivers, and pedestrians, as well as subject-matter experts **(SMEs)** like traffic wardens, cargo drivers, and civil engineers.

The study targeted a diverse demographic group including participants ranging in age from **18 to 60+ years**, **both genders**, and **various educational and occupational backgrounds** such as students, private employees, public workers, and technical professionals. These demographics helped capture a wide range of perspectives regarding road hazards, reporting behavior, and digital solution preferences.

7. Sample

The research was conducted using a **sample** rather than the full population.
A total of **20 participants** were selected, including citizens, civil engineers, and municipal staff. Participants were chosen based on basic **demographics** such as location, occupation, and familiarity with road safety issues, ensuring a diverse yet focused group for qualitative insights.

8. Response Rate

A total of **80 questionnaires** were distributed among end users and civil engineers, out of which **67 were completed** and returned, representing a response rate of **84%**.

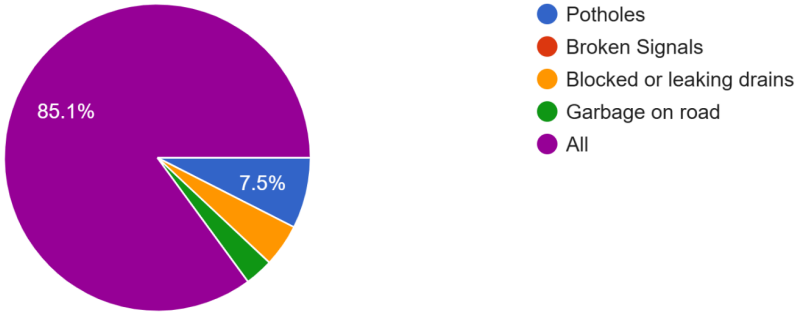
In addition, **35 interview invitations** were sent, and **20 participants** successfully took part in interviews, resulting in a **57%** participation rate.

9. Data Analysis

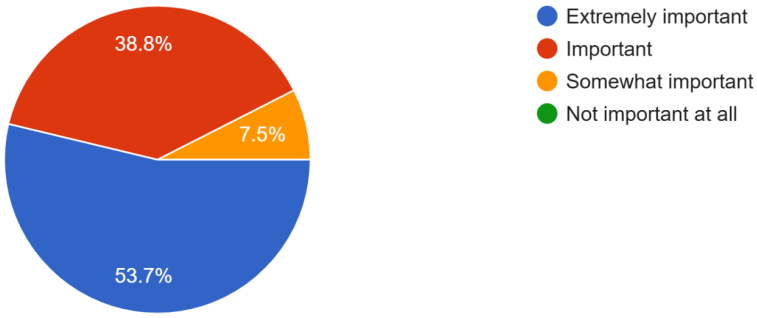
9.1. Questionnaire

- **End Users:**

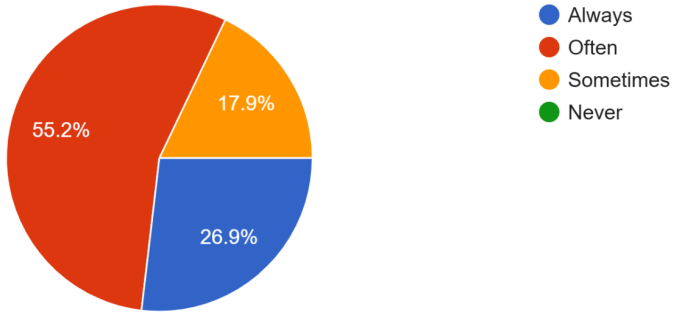
Have you ever experienced any of the following while travelling by road?



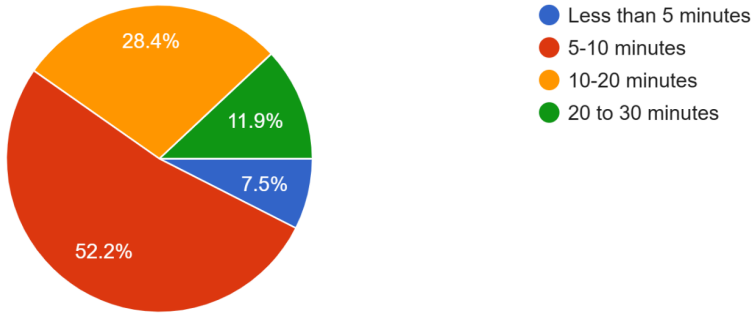
How urgently would you like these issues to be fixed?



How often do road issues (potholes, broken signals, drain leakages, etc.) affect your travel?



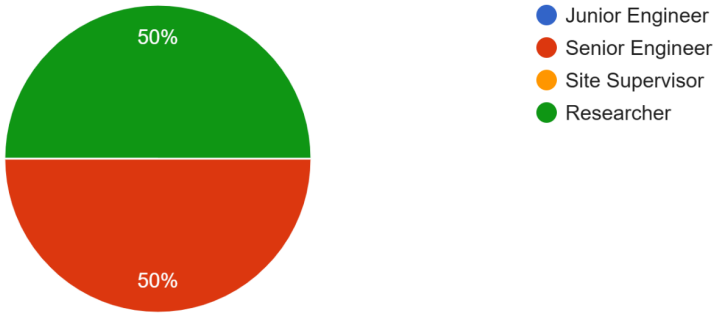
On average, how much extra time do you think road issues add to your travel?



Question	Yes	No	Maybe
Would you find it useful to receive alerts about nearby road issues (potholes, broken signals, etc.)?	86.6%	13.4%	0%
Do you think road issues increase the risk of accidents?	86.6%	0%	13.4%
Have you ever reported a road issue to authorities before?	86.6%	13.4%	0%
Would you be willing to use a mobile app like Raah to report road issues?	82.1%	17.9%	0%

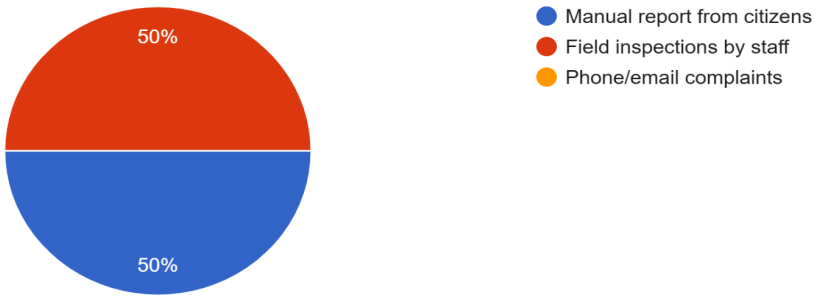
- **Civil Engineers:**

Designation/Role:



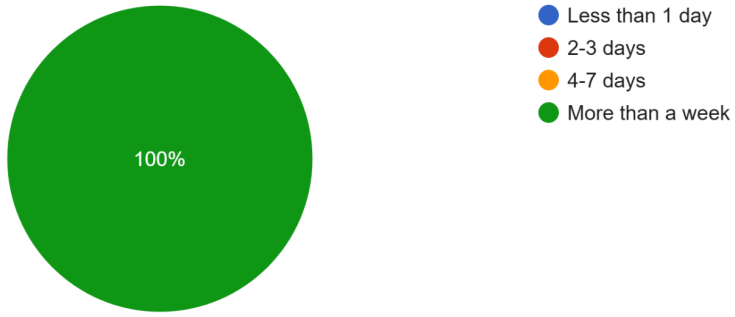
Years of Experience in Road or Urban Infrastructure Work :

How are road issues (e.g., potholes, broken signals, drain blockages) currently reported to your department?

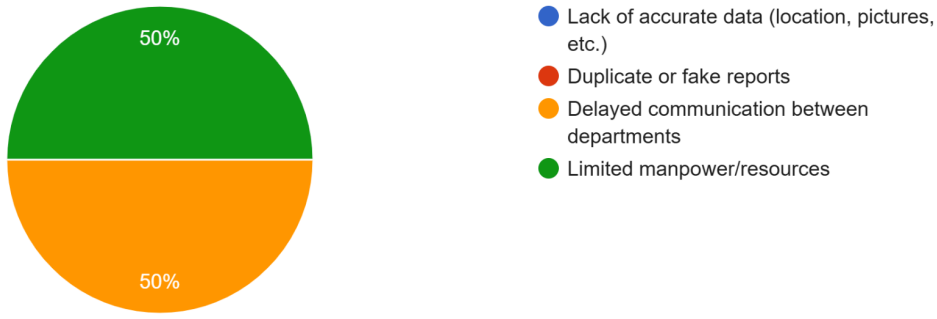


How often do you receive inaccurate or incomplete reports?

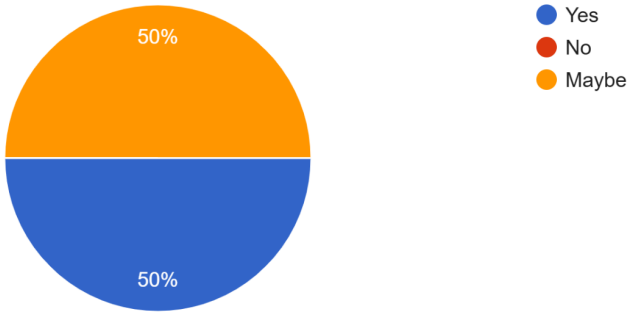
On average, how long does it take from report submission to issue resolution?



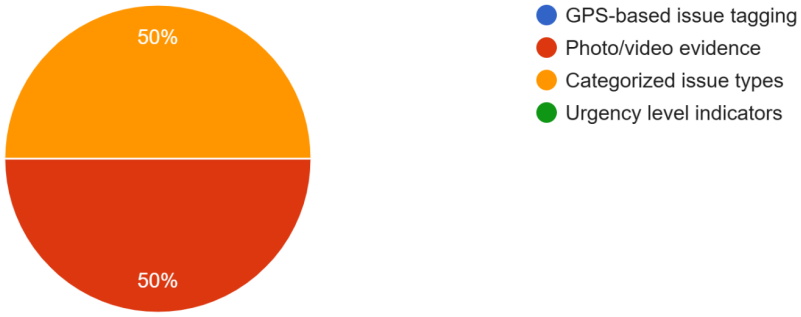
What are the main difficulties in managing road and infrastructure issues?



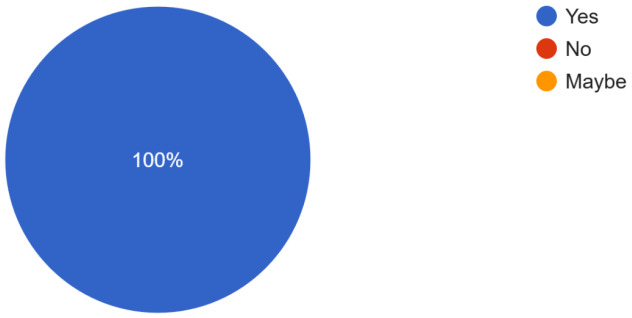
Do you think a mobile app like RAAH could improve how citizens report road issues?



What features would make such an app useful for engineers like you?



Would you recommend using such an app for your department's workflow?



Question	Category A	Category B
What challenges do you face while verifying and resolving reported issues?	Data accuracy, Resource and Safety Factors.	Mostly lack of communication between govt departments regarding funds execution procedure.
How do you prioritize which road issues to fix first?	Based on safety risk, severity of the issue and traffic volume.	Proper drainage system.
What data do you need from citizen reports to act effectively?	Exact location, visual evidence, and issue regarding safety and risks.	Accurate measurements of damaged roads.
Any suggestions for improving citizen reporting systems in your city?	Introduce AI and upgrade mobile reporting App.	A digital platform is necessary where all departments and communities are on the same page.

9.2. Interviews

Subject Matter Experts (SMEs)

- **INDRIVER DIFFERENT RESPONSES**

Question	Category A	Category B
How often do you use apps to solve daily problems (bills, food, rides, reporting)?	Uses Easypaisa / JazzCash / Food apps and inDriver; open to a road-report app if reliable.	Uses Easypaisa and ride apps (Careem/inDriver); rarely reports issues—usually complains to other drivers.
What do you usually do when you see a broken traffic light or a pothole?	Slow down or take a safer route; sometimes post in driver WhatsApp groups; usually do not report officially.	Slow down and drive around it; do not report because unsure who to contact.
How important is road safety in your daily life priorities?	Very important — affects work/study time and income.	Very important — drives long hours; a small mistake can cause a major accident.
What would encourage you to report road issues — rewards, recognition, or quick results?	Quick results and visible action; small incentives help but outcomes matter most.	Quick results — trust grows if the reported problem is fixed after reporting.
Which app features would you find most useful (alerts, complaint tracking, photo uploads)?	Real-time tracking, notifications, and a map of other users' reports.	Complaint tracking and photo upload to monitor progress.

- **INDRIVER Similar Responses**

Question	Response

How do you handle traffic congestion during peak hours?	Drivers adjust their routes using experience rather than digital tools; many rely on voice communication or quick local decisions to save time.
What challenges do you face on the road daily?	Roadblocks, uneven traffic flow, and unclear lane markings cause delays; lack of proper communication with traffic control adds to frustration.
How do you interact with other drivers or authorities?	Mostly informal gestures or verbal exchanges; digital reporting or systems are rarely used.
How do road conditions affect your performance?	Poor road surfaces and encroachments increase fatigue and fuel costs, directly affecting efficiency.
What improvements would make your work easier?	Real-time traffic updates, better road signs, and clearer coordination between authorities and drivers.

- **WARDEN DIFFERENT RESPONSES**

Question	Category A	Category B
How do you handle road hazards while on duty (redirect traffic, slow down)?	Stand near the damaged area, guide traffic manually; use cones/blocks; tiring and risky in heavy traffic.	Assign junior wardens to control flow; coordinate with traffic control and municipal teams; block lanes and inform rescue/maintenance for serious hazards.
During your daily routes, what road hazard do you encounter most — and how do you deal with it?	Potholes and water-logging; inform in-charge; fixes often take days.	Uneven patches, damaged dividers, water-filled potholes; monitor regularly and notify maintenance; slow response is frustrating.
How would real-time updates (e.g., “Your report is being fixed!”) change the way you work?	Would help plan shifts and manage traffic better than sudden wireless orders.	Extremely helpful — would enable planned diversions and reduce on-ground confusion.

How do you usually communicate road issues to higher officials?	Via wireless or phone calls to DSP/traffic control, who escalate to municipal teams.	Official wireless + WhatsApp groups for images; send reports to DSP; coordinate with smart city cameras when available.
Would you find it helpful if the public could report such issues directly to authorities?	Yes — reduces burden if complaints are accurate; must avoid fake/repeated reports.	Yes — citizen reports with photo/location reduce manual checks; needs verification to avoid spam.

- **WARDEN Similar Responses**

Question	Response
How do you manage traffic congestion during peak hours?	Follow manual traffic control methods; digital coordination tools are limited. Use walkie-talkies or personal phones for quick coordination.
What challenges do you face on duty daily?	High vehicle volume, heat, and non-cooperative drivers; lack of proper shade or support technology.
How do you interact with drivers or colleagues?	Mostly verbal communication; occasionally use mobile apps for internal coordination but not consistently.
How do road conditions affect your duties?	Broken or uneven roads make standing and control difficult; signal breakdowns cause manual workload increase.
What improvements would help your role?	Smart signal systems, more coordination with digital apps like InDriver, and awareness programs for public cooperation.

- **INDRIVER vs WARDEN SIMILAR RESPONSES COMPARISON**

Question	InDriver responses	Warden responses
Common road problems encountered	Potholes, poor drainage after rain, uneven patches causing damage and hazards at night.	Potholes, water-logging, uneven patches and damaged dividers; repeated problem areas require maintenance.

Primary reaction when seeing a hazard	Slow down, drive around; rarely stop to report unless reporting is one-tap fast.	Guide traffic manually, place warnings (cones/blocks), coordinate with the control room — manual and time-consuming.
Use of apps / tech for reporting	Comfortable with apps (payments, rides); will use a reporting app if it's reliable and fast.	Mixed: junior wardens have low app use; senior wardens use WhatsApp/wireless and can work with dashboards.
Effect of real-time updates	Would use an app if it provides progress updates and visible fixes; builds trust.	Crucial — would enable planning, reduce surprises, and improve field deployment.
Preferred app features / UI	Real-time tracking, complaint tracking, photo upload, map of reports; bilingual (Urdu + English).	Simple reporting with photo/location; integrated alerts to command center and verified inputs to avoid spam.

End Users

- **Different Responses**

Question	Rarely	Sometimes	Often	Frequent
How often do you use apps to solve daily problems like paying bills, ordering food, or reporting issues?	8.33%	8.33%	50%	33.33%

Question	Strongly Dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly Satisfied
How satisfied are you with the current road conditions in your city?	0%	25%	16.67%	25%	33.33%

Question	Lowest Priority	Low Priority	Medium	High Priority	Highest Priority
How important is road safety in your daily life priorities?	8.33%	0%	0%	25%	66.67%

Question	Broken Signals	Potholes	Others
If you had 3 complaints to report but could only send 1 today, how would you decide which is most important?	33.33%	25%	41.67%

Question	Alerts	Complaint Tracking	Photo Uploads
Which features would you find most useful in the app (alerts, complaint tracking, photo uploads)?	41.67%	50%	16.67%

- **Similar Responses**

Question	Yes	No	Maybe
If you saw a big pothole, would you stop to take a picture?	33.33%	50%	16.67%
Would you prefer updates on the progress of your complaint?	83.33%	16.67%	0%
Do you think your neighborhood gets enough attention from the authorities for road maintenance?	58.33%	25%	16.67%
Would you feel proud if your report helped fix a road for your entire neighborhood?	91.67%	8.33%	0%

Will you feel motivated if authorities thanked or acknowledged your report publicly?	75%	25%	0%

10. Persona Identification

Persona Type	Description
Primary Persona	Citizen commuter who reports road issues using RAAH.
Secondary Persona	Civil engineer who monitors and resolves complaints.
Supplemental Persona	Cargo driver or indriver encountering frequent road hazards.
Customer Persona	City authority using RAAH dashboard for data management.
Served Persona	General public benefiting from improved road safety and maintenance.
Negative Persona	Users submitting false or repetitive reports.

11. Conclusion

The qualitative research revealed that both citizens and professionals face persistent problems in road maintenance communication. Surveys and interviews confirmed the need for a bilingual, accessible, and transparent platform. RAAH effectively addresses this gap by providing an easy, reliable way for citizens to report road hazards and for authorities to respond efficiently. These findings will directly guide persona creation and user-centered interface design in future stages of the project.

References

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- SOR - Safety on The Road. (n.d.). *Safety on The Road app* [Mobile application]. Retrieved from SOR - Safety on The Road - Apps on Google Play

- Road Surveyor. (n.d.). *Road Surveyor app* [Mobile application]. Google Play Store.

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Appendix

- End User Questionnaire: https://forms.gle/nKYTj3UDvbVgQdms6
- Interview Responses: ResponseSheet.xlsx