Design Thinking for Software Engineering

Problem Statement: Daily commuters face unpredictable public transport schedules.

OBSERVATION NOTES

Common Problems Caused by Unpredictable Schedules

The unpredictability of public transport results in several hardships for daily commuters:

- **Risk of running late**: Unreliable timings can lead to missed appointments, late arrivals at work or school, and potential penalties.
- **Increased stress and anxiety**: The uncertainty surrounding travel times and potential delays raises stress levels and contributes to anxiety among commuters.
- **Long waiting times**: Passengers often experience extended waiting times at stops due to insufficient frequency and unpredictable vehicle arrivals.
- **Overcrowding**: Irregular schedules lead to overcrowded buses and trains during peak hours, which compromises comfort and safety.
- **Lack of flexibility**: When a service is missed due to a delay or cancellation, commuters often have to wait a long time for the next option or make last-minute alternative arrangements.

STAKEHOLDER IDENTIFICATION

1. Primary Stakeholders

- **Daily Commuters:** The most critical group.
- **Transport Operators:** Drivers, conductors, and station staff who deal with the "front-line" frustration of passengers and the logistical stress of falling behind schedule.
- **Transit Agencies/Authorities:** The organizations responsible for managing the network (e.g., city transport departments or private bus/rail companies).

2. Secondary Stakeholders

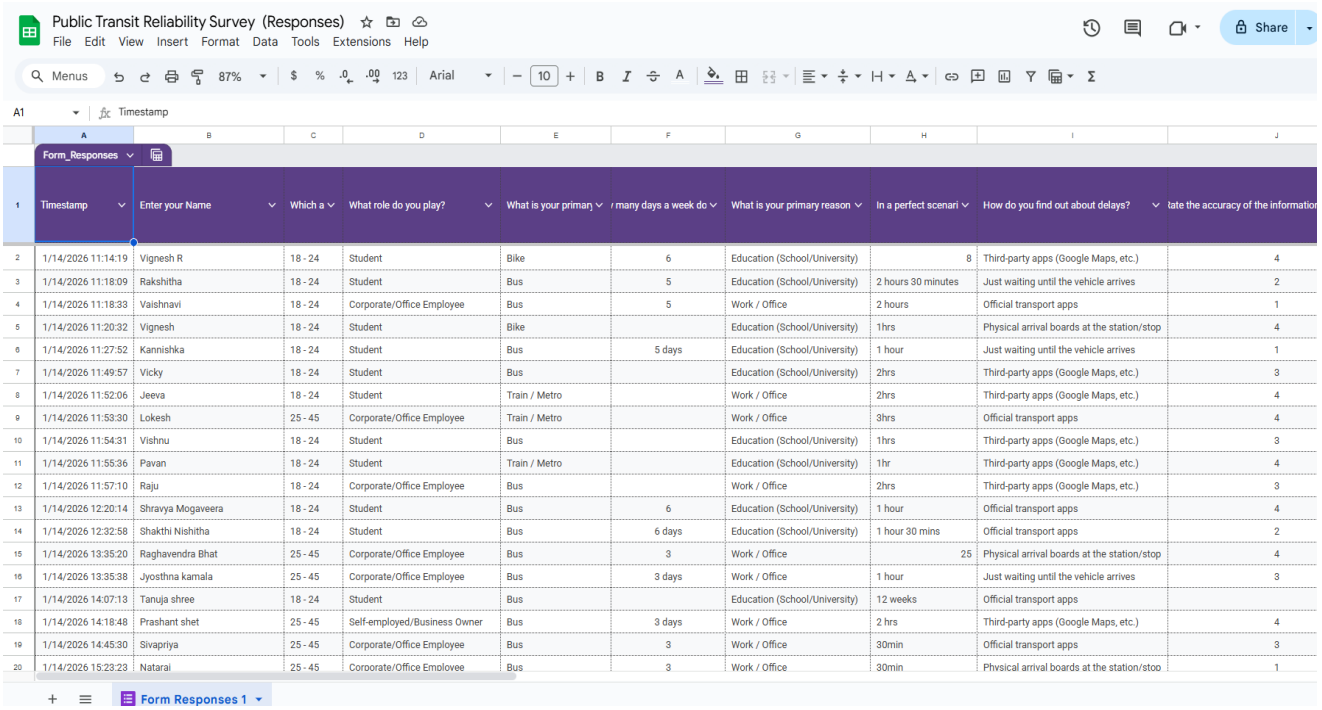
- Employers & Businesses
- Local Businesses near Hubs
- Educational Institutions
- Platform/App Developers

INTERVIEW QUESTIONNAIRE & RESPONSES

QUESTIONNAIRE

1. **Enter your Name**
2. **Which age group do you belong to?**
3. **What role do you play?**
4. **What is your primary mode of transport for your daily commute?**
5. **On average, how many days a week do you commute?**
6. **What is your primary reason for commuting?**
7. **In a perfect scenario, how long *should* your commute take?**
8. **How do you find out about delays?**
9. **Rate the accuracy of the information you receive**
10. **In the last month, how many times were you late for a professional or personal commitment due to transport issues?**
11. **Which of the following has happened to you in the last 6 months due to transport unreliability? (Select all that apply)**
12. **"My commute is the most stressful part of my day."**
13. **Can you describe a specific time when a delay caused a significant problem in your life?**
14. **When your primary transport is delayed, what is your "Plan B"?**
15. **Have you ever considered moving house or changing jobs specifically to avoid your current commute?**
16. **In your opinion, what is the *root cause* of the unreliability you face?**
17. **If you could change ONE thing to make your commute better tomorrow, what would it be?**

RESPONSES



Public Transit Reliability Survey (Responses)

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Form_Responses

Timestamp	Enter your Name	Which a	What role do you play?	What is your primar	many days a week do	What is your primary reason	In a perfect scenari	How do you find out about delays?	tate the accuracy of the information
1/14/2026 11:14:19	Vignesh R	18 - 24	Student	Bike	6	Education (School/University)	8	Third-party apps (Google Maps, etc.)	4
1/14/2026 11:18:09	Rakshitha	18 - 24	Student	Bus	5	Education (School/University)	2 hours 30 minutes	Just waiting until the vehicle arrives	2
1/14/2026 11:18:33	Vaishnavi	18 - 24	Corporate/Office Employee	Bus	5	Work / Office	2 hours	Official transport apps	1
1/14/2026 11:20:32	Vignesh	18 - 24	Student	Bike		Education (School/University)	1hrs	Physical arrival boards at the station/stop	4
1/14/2026 11:27:52	Kannishka	18 - 24	Student	Bus	5 days	Education (School/University)	1 hour	Just waiting until the vehicle arrives	1
1/14/2026 11:49:57	Vicky	18 - 24	Student	Bus		Education (School/University)	2hrs	Third-party apps (Google Maps, etc.)	3
1/14/2026 11:52:06	Jeeva	18 - 24	Student	Train / Metro		Work / Office	2hrs	Third-party apps (Google Maps, etc.)	4
1/14/2026 11:53:30	Lokesh	25 - 45	Corporate/Office Employee	Train / Metro		Work / Office	3hrs	Official transport apps	4
1/14/2026 11:54:31	Vishnu	18 - 24	Student	Bus		Education (School/University)	1hrs	Third-party apps (Google Maps, etc.)	3
1/14/2026 11:55:36	Pavan	18 - 24	Student	Train / Metro		Education (School/University)	1hr	Third-party apps (Google Maps, etc.)	4
1/14/2026 11:57:10	Raju	18 - 24	Corporate/Office Employee	Bus		Work / Office	2hrs	Third-party apps (Google Maps, etc.)	3
1/14/2026 12:20:14	Shravya Mogaveera	18 - 24	Student	Bus	6	Education (School/University)	1 hour	Official transport apps	4
1/14/2026 12:32:58	Shakthi Nishitha	18 - 24	Student	Bus	6 days	Education (School/University)	1 hour 30 mins	Official transport apps	2
1/14/2026 13:35:20	Raghavendra Bhat	25 - 45	Corporate/Office Employee	Bus	3	Work / Office	25	Physical arrival boards at the station/stop	4
1/14/2026 13:35:38	Jyosthna kamala	25 - 45	Corporate/Office Employee	Bus	3 days	Work / Office	1 hour	Just waiting until the vehicle arrives	3
1/14/2026 14:07:13	Tanuja shree	18 - 24	Student	Bus		Education (School/University)	12 weeks	Official transport apps	
1/14/2026 14:18:48	Prashant shet	25 - 45	Self-employed/Business Owner	Bus	3 days	Work / Office	2 hrs	Third-party apps (Google Maps, etc.)	4
1/14/2026 14:45:30	Sivapriya	25 - 45	Corporate/Office Employee	Bus	3	Work / Office	30min	Official transport apps	3
1/14/2026 15:23:23	Nataraj	25 - 45	Corporate/Office Employee	Bus	3	Work / Office	30min	Physical arrival boards at the station/stop	1

Form Responses 1

PAIN-POINT ANALYSIS

Based on the survey data provided, the **pain-point analysis** for the commuting experience. The data reveals a user base primarily composed of students and corporate employees who are struggling with the transportation system that lacks transparency.

Major Problems Identified

- Users are often forced to "just wait until the vehicle arrives" because tracking apps are inaccurate or non-existent.
- Commuters are facing serious professional consequences, including warnings at work/school and lost income.
- When the primary mode fails, the default Plan B for almost all users is switching to a more expensive option like Uber or Taxi.
- Traffic congestion and poor road planning are viewed as the primary reason for daily delays.

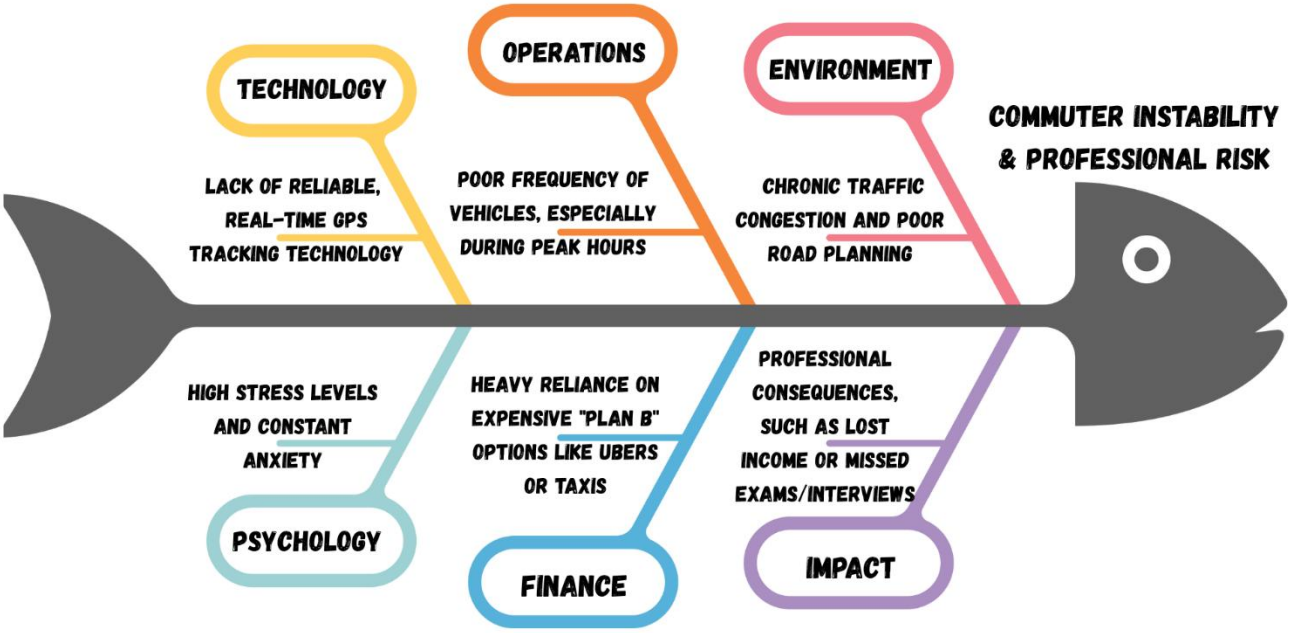
Pain-Point Categorization

Category	Specific Pain Points from Data
Functional	**Inaccurate Tracking:** Apps provide low-accuracy data, leading to wasted time at stops. **Low Frequency:** Not enough buses/trains during peak morning and evening hours. **Connectivity Gap:** Difficulty getting from the station to the final destination.
Emotional	**High Stress:** Commuters rate their stress levels as 4s and 5s (out of 5). **Anxiety/Fear:** Constant worry about receiving warnings from teachers or bosses. **Social Isolation:** Frequently having to cancel social plans due to transport unreliability.
Systemic	**Poor Infrastructure:** Heavy traffic congestion and inadequate road planning. **Economic Loss:** Users losing shift-based income or spending extra on private cabs. **Life Disruption:** Users considering moving house or quitting jobs just to escape the commute.

Most Critical Pain Point

The critical issue isn't just traffic, it’s the lack of **reliable tracking**. Without real-time data, commuters can’t turnback, forcing them into expensive backups or resulting in professional disciplinary actions.

ROOT CAUSE DIAGRAM/ IDENTIFICATION



WICKED PROBLEM EXPLANATION

Unpredictable Public Transport

The issue of unpredictable public transport schedules is a wicked problem because it is a tangled web of social, technical, and economic issues that cannot be fixed with a single "off/on" switch.

Why is it a Wicked Problem?

- **Hard to Define:** Is the problem a lack of buses, a lack of GPS tracking, or just because of traffic? Because the "cause" changes for every commuter, the definition is never clear.
- **Conflicting Needs:** Students need low-cost frequency during school hours, while corporate employees are willing to pay for alternatives but lose income when they are late. Solving it for one group (dedicated bus lanes) often creates traffic for others (bike/scooter users).
- **No Single Solution:** You cannot simply fix the schedule. Improving the app doesn't remove the traffic, and adding more buses might just add more vehicles to the already jammed roads.

This is not a **Simple** problem or a **Complex** problem. It is **Wicked** because every attempt to fix it makes the traffic worse for everyone else, creating a never-ending cycle.

REFLECTION

1. What assumptions were incorrect?

Initially, it might be assumed that the primary issue is a lack of technology. However, the data shows, even users with high-tech "Official transport apps" still face significant delays. Technology provides information, but it doesn't move the bus through traffic.
The survey proves that some suffer from poor vehicle frequency, others are stuck solely due to road congestion, meaning a better schedule wouldn't help if the roads are blocked.

2. How did user perspectives change your understanding?

The survey highlights that this isn't just a minor inconvenience, some users rate their stress as 5/5 and mention they have already moved house or changed jobs shows that transport unreliability dictates major life decisions.
The perspective of shift workers and corporate employees reveals that delays lead directly to lost income, turning a transport issue into a poverty or career-growth issue.

3. Why is jumping to solutions risky?

Jumping to a quick fix is risky because adding more buses might just add to the traffic congestion cited by most respondents. Similarly, investing in GPS tracking is pointless if the real issue is a lack of vehicles, you can't fix a service shortage by simply giving people a better way to watch it fail.

4. What skills did you develop from this lab?

Through this lab, I developed the following skills:

- I learned to turn individual stories into obvious patterns, such as how commuters are forced to pay for expensive Plan B options like ubers or taxis when public transit fails.
- I gained experience identifying how different groups, have unique needs and face different consequences within the same system.
- I learned to identify wicked problems where simple fixes, like adding more buses or better GPS might actually make the situation worse.