Raahi

Designing for Safer Highways

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Duration: 1.5 Month

Role: Research & Synthesis, Behavior Modeling, Conceptualization, Prototyping, Usability Testing

Overview

This project addresses highway fatigue and monotony through **behavioral design** and **gamification**. By using timely nudges, habit loops, and positive reinforcement, it motivates drivers to rest and stay alert. Gamified feedback, progression, and rewards go beyond reminders, actively shaping safer and healthier long-term driving behaviors.

Secondary Findings

Insufficient breaks during driving lead to **increased fatigue, stress, drowsiness, and impaired cognitive performance**, which intensify over time due to cumulative fatigue.

Fatigue builds up in a **non-linear** manner, increased by **monotonous** driving. This leads to **microsleeps**, brief lapses in attention that significantly **impair** driving performance

Indian drivers often underestimate the **necessity of regular breaks** due to psychological factors such as **overconfidence**, resulting in prolonged driving sessions and heightened fatigue.

Primary Research

Ajay Kumar
Loves Road Trips, Works in Marketing

- At times, the road conditions determine when he stops, rather than his actual fatigue levels.
- He often downplays tiredness, relying on past driving experiences, which results in reduced focus and slower reaction times.

Rajesh Shukla
Intercity Cab Driver

- Experiences mounting fatigue from inconsistent sleep and heavy workloads.
- Hesitant to pause for rest, often driven by passenger expectations or personal overconfidence.

1. Competitors (Current Coping Strategies): Drivers currently rely on makeshift solutions to fight highway monotony—ranging from **chewing tobacco, smoking, and consuming energy drinks**, to relatively safer tactics like **singing along to music, or adjusting air conditioning.**

2. Barriers to Break-Taking: Cab drivers rarely stop on their own, usually only when passengers insist. Key reasons include **underestimating fatigue**, worries about the **safety of rest stops**, and a **persistent drive** to keep going despite exhaustion.

How might We design a seamless solution for Indian drivers that encourages regular breaks and helps combat highway monotony, ensuring a safer and more engaging experience when driving.

Behavior Modelling

We applied behavioral frameworks to shape gamified interventions. Octalysis to **map motivations**, Hook's Model to build **habit loops**, and Fogg's Model to **align ability, motivation, and triggers**. Theory of Planned Behavior and Barrier Analysis revealed **attitudes and blockers**, guiding nudges for safer break-taking.

Current Behavior

- Fatigue is often recognized too late.
- Breaks are skipped due to passenger pressure.
- Long drives lead to disengagement and highway hypnosis.
- Existing systems intervene only after fatigue has set in.

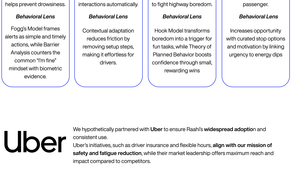
Desired Behavior

- Fatigue is detected early through real-time sensing.
- Breaks are prompted contextually, involving both driver and passengers.
- Gamification keeps drivers active and engaged.
- Focus shifts toward preventing fatigue rather than reacting to it.

Ideation

We chose the **Voice Assistant Companion** over other options because it keeps drivers' focus on the road while still **providing timely nudges, reminders, and engagement**. Unlike visual HUDs, it minimizes distraction, is easier to **adopt across vehicles**, and effectively combats both fatigue and monotony through contextual, conversational interactions.

Prototyping



Final Product

Raahi is a smart in-car voice **companion** that enhances **driver safety and engagement**. It monitors fatigue, suggests breaks, combats monotony with voice games, adapts to passenger presence, and rewards safe driving — all while integrating seamlessly with your vehicle's ecosystem.

Fatigue Tracking

Real-time monitoring of driver energy levels through sensors, paired with visual feedback, helps prevent drowsiness.

Behavioral Lens

Foggi's Model frames alerts as simple and timely actions, while Barrier Analysis counters the common "I'm fine" mindset with biometric evidence.

Active & Passenger Modes

The system adapts seamlessly for solo drives or trips with passengers, adjusting alerts and interactions automatically.

Behavioral Lens

Contextual adaptation reduces friction by removing setup steps, making it effortless for drivers.

Monotony-Breaking Activities

Quick audio-based challenges—like "Complete the Lyric"—add playful engagement to fight highway boredom.

Behavioral Lens

Hook Model transforms boredom into a trigger for fun tasks, while Theory of Planned Behavior boosts confidence through small, rewarding wins

Rest Stop Recommendations

Smart prompts suggest nearby breaks based on fatigue levels, notifying both driver and passenger.

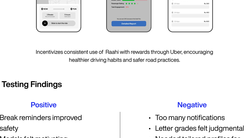
Behavioral Lens

Increases opportunity with curated stop options and motivation by linking urgency to energy dips

Uber

We hypothetically partnered with **Uber** to ensure Raahi's **widespread adoption** and consistent use.
Uber's initiatives, such as driver insurance and flexible hours, **align with our mission of safety and fatigue reduction**, while their market leadership offers maximum reach and impact compared to competitors.

Drivers Flow



Uber drivers receive a notification from the app directing them to install Raahi at the nearest Raahi Center.

A quick tutorial guides new drivers through Raahi's features and highlights its benefits.

Incentivizes consistent use of Raahi with rewards through Uber, encouraging healthier driving habits and safer road practices.

User Testing Findings

Positive

- Break reminders improved safety
- Medals felt motivating
- Quest bonuses were engaging
- Voice assistant helped initiate breaks

Negative

- Too many notifications
- Letter grades felt judgmental
- Needed tailored profiles for different drivers
- Clarity on how fatigue is calculated was lacking

Key Takeaways

- If you truly enjoy what you're working on, it never feels like work, echoing James A. Michener's idea that the master of living blurs the line between work and play
- Designing impactful systems requires understanding how human behavior influences every interaction and decision.
- Iterative testing is invaluable, prototypes and user feedback reveal blind spots that theory alone can't solve.
- The best solutions are seamless, not forced, when technology blends naturally into existing habits, adoption becomes effortless.