Alertia

FDS 1—A.A. 2024/2025

GROUP 4

IN PARTNERSHIP WITH ITALDESIGN

A project designed by
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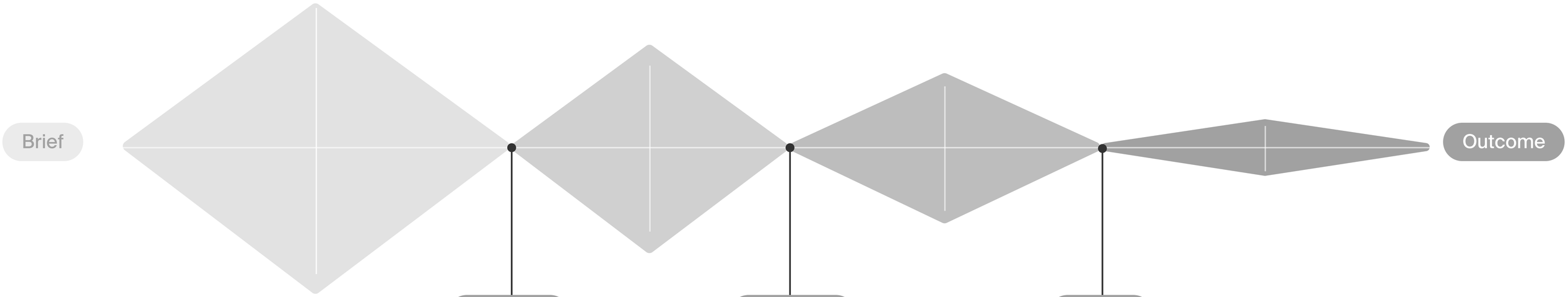
Workflow

What should we do?

Why do we want to do it?

How can we generate addedvalue from it?

Do others want it, too?



Delivery 1

An in-depth research effort led to the creation of posters summarizing the potential areas of interest for the automotive innovation sector identified by the group.

Delivery 2

Subsequently, our goal was to throughly explore the selected area in its full complexity to define the concept and tailor possible solutions. This phase included researching the mental states of drivers, with a focus on understanding why, how, and when their minds tend to wander.

Testing

Finally, the last phase involved the development of the features for the chosen solution. This phase actively engaged users, involving them in design decisions and iterations through questionnaires, interviews, and MVP testing.

Desk research / Automotive State of the Art

Mind wandering: a growing concern

53% of Europeans admits that they sometimes pay less attention to their driving and their mind wanders which is turning driving into a big challenge.

The risks of mind wandering

–Impact on safety: Mind wandering reduces vehicle control and reaction times, increasing the risk of accidents.

–Key insights: Studies link mind wandering to poorer driving performance and higher crash risks, often without the driver realizing.

How to adress the problem: tech solutions

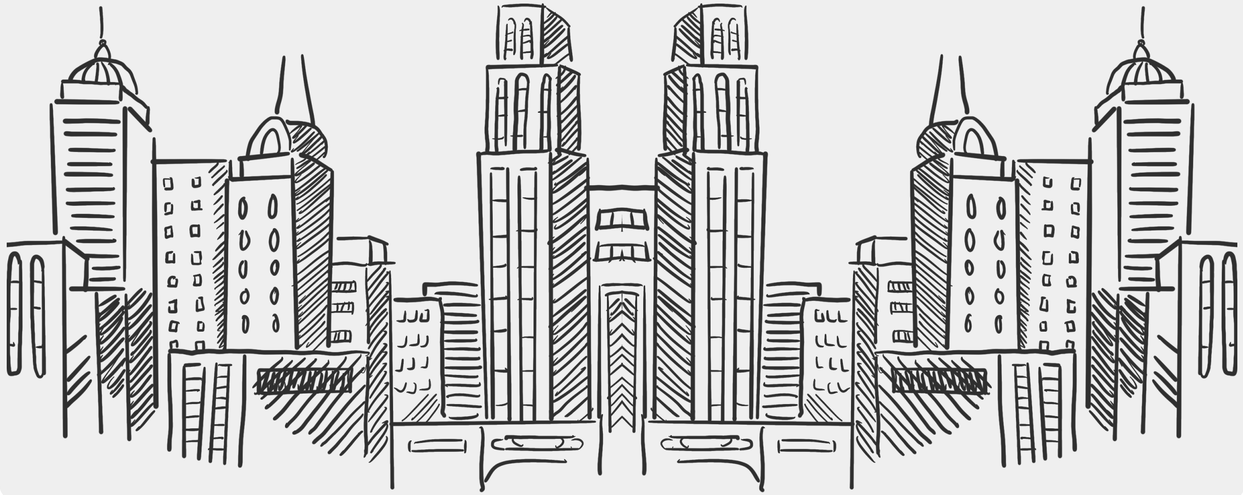
–Driver monitoring systems (DMS): Detect signs of drowsiness or distraction (e.g., head position, eye movements, blinking rate).

–ADAS (e.g., Tesla Autopilot): Automatically intervenes to keep the vehicle in lane or alerts the driver to stay focused.

Desk research / Future trends

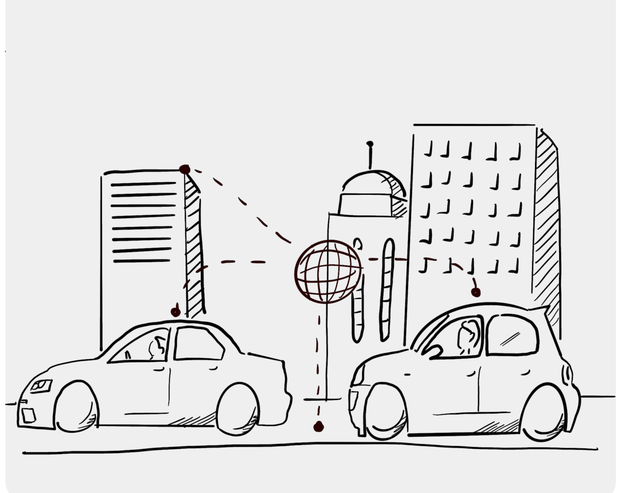
This desk research on future trends was essential for grounding our design process in the evolving realities of urban lifestyles, technological advancements, and societal trust in innovation.
By analyzing key areas such as changing cities, connectivity, and trust in technology, we aimed to ensure that our designs are forward-thinking, responsive to emerging needs, and aligned with the dynamic shifts shaping tomorrow's world.

Changing cities and lifestyles



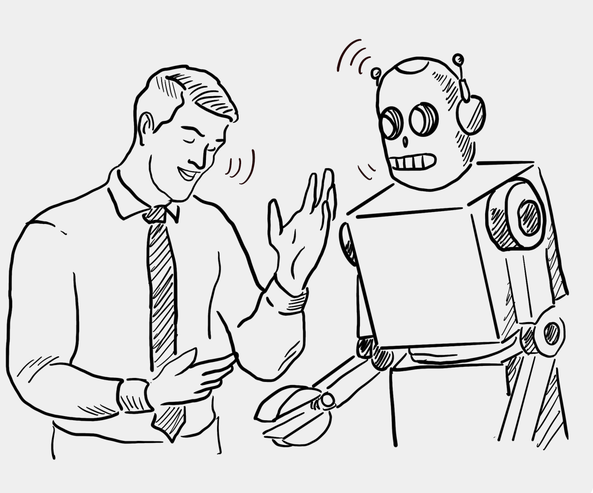
Evolving urban dynamics are shaping longer commutes, reduced traffic, and suburban living.

Connectivity



Seamless integration through IoT: smart roads, vehicle-to-vehicle communication, and environmental scanning.

Trust in technology



Emerging trust driven by conversational agents and personalized tech experiences for a new generation.

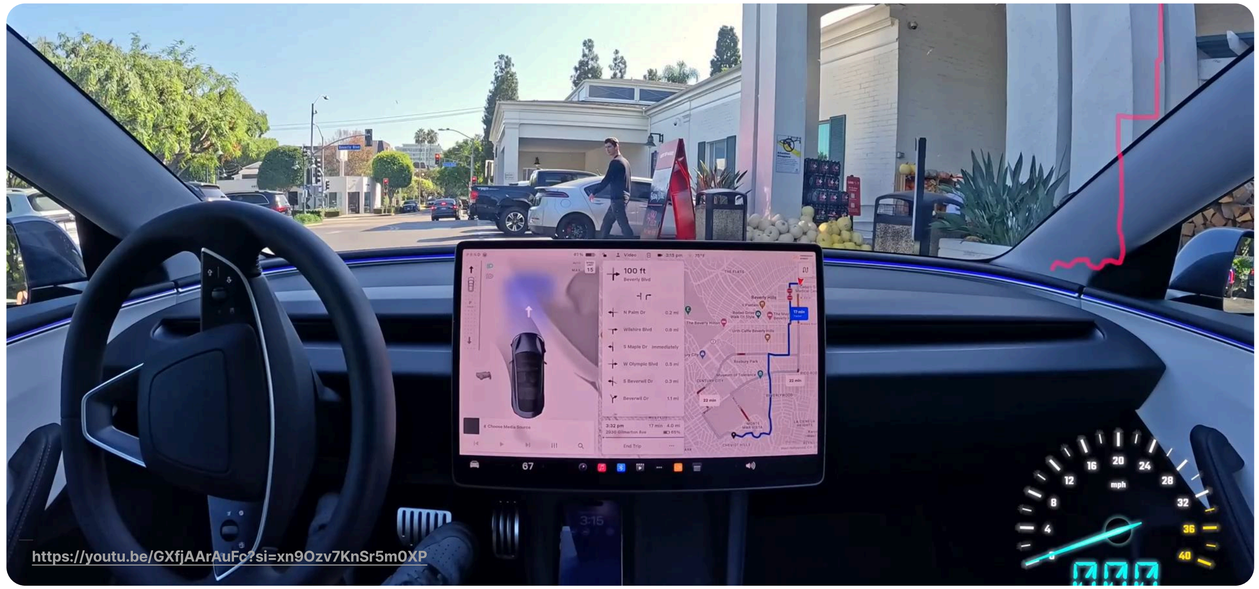
Desk research / Technology opportunities and Driver-Centric solutions

Tesla Driver Monitoring System

Detects signs of drowsiness or distraction through:

-Eye gaze tracking
-Blink frequency & duration
-Yawning detection
-Head position & orientation
-Phone use detection

Tesla HCI Support



Tesla dynamic filter interface visualizes:

-Pedestrians
-Cars
-Signals
-Animals

Research process / User research

To understand the needs and behaviors of drivers, we conducted a comprehensive user research process. This included three key methods: questionnaires to segment users and analyze data relationships, interviews to gather personal insights from drivers and passengers, and shadowing to observe behaviors in context and map the current driving experience.

Questionnaire

Objective

Segmentation of the users

Create relationships between data

Interview

Objective

Engaging conversation with the user about personal experience

Driver POV

Passenger POV

Shadowing

Objective

Understand the behaviour in context

Mapping the user journey of driving nowadays

Research process / Questionnaire

Structure of the questionnaire

To support drivers in staying entertained and informed, we created a questionnaire to explore their thoughts, emotions, and behaviors while driving.

We aim to understand mind-wandering, emotional responses, entertainment preferences, and what brings focus back to the present.

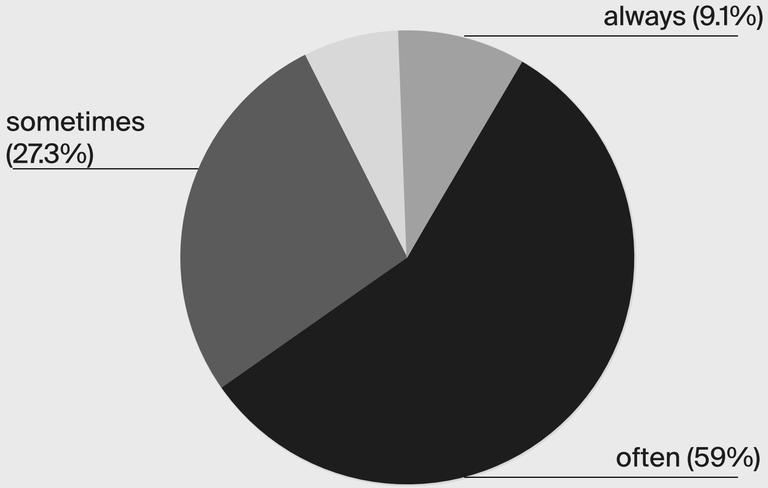
Additionally, we examined what drivers still notice around them when mind wandering and what they want displayed in their vehicles. These insights guided us in narrowing directions for enhancing engagement and awareness on the road.

Topic of the questions	Area of research	Type of questions
Frequency and context of mental distractions	This category explores how often the driver gets distracted and in which situations it occurs.	"How often do you find yourself thinking about something else while driving?"
Nature and content of thoughts	This category investigates the type of thoughts that arise while driving and whether they are related to driving or not.	"When your mind wanders for an extended period while driving, are your thoughts generally related to driving or about something else?"
Impact of distractions and associated emotions	This category examines the effects of distractions on driving and the emotions linked to those moments.	"Have you ever come close to an accident because you were too focused on your thoughts?"
Strategies for maintaining focus and preferences	Analyzing methods to stay focused and preferences for tools or information to assist while driving.	"What type of entertainment do you prefer to prevent your mind from wandering while driving?"

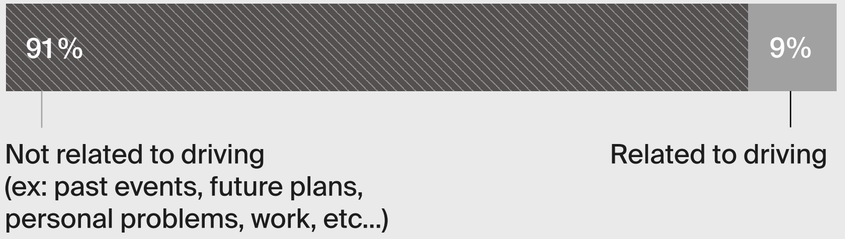
Results

The majority of respondents (59%) reported experiencing mind-wandering frequently during their in-car journeys. This result confirms how common it is for drivers to mentally drift, offering valuable insight into their cognitive state while driving.
Moreover we investigated the nature of their thoughts and 91% of partecipants admitted mind wandering about topics not related to driving, like past events, plans, personal problems, etc...

Meaningful data #1



Meaningful data #2



HMW / How might we-statement

How might we design a car that fosters the driver’s connection with the here and now?

Unique value proposition

A car that helps you in staying grounded to the here and now, transforming driving into a connected and attentive experience.

Concept definition: goal and strategy

Goal

Support the driver in staying entertained and informed about the present while driving

How

Detection of mind-wondering signs and activation of grounding techniques*

Strategy

Foster an engaging connection with the external environment

*Grounding techniques are exercises that may help you refocus on the present moment to distract yourself from mind wandering.

User needs and technical requirements definition

Goal: Support the user in staying present

	Prevention phase	Detection phase	Intervention phase
User needs to..	Be engaged by the trip and not get bored	Realize user was not focused	Restablish focus on the driving
Car needs to...	Stimulate attention and engagement during the trip	Detect distraction and warn the user in a unambiguous way	Maintain user's attention on the driving

Enabling technologies

Monitoring distraction+reaction of the car

	Prevention	Detection	Scenario A: Activation	Scenario A: Intervention	Scenario B: Activation	Scenario B: Intervention
Customer actions	Select preferences for routes and entertainment	Drive while system passively monitors attention	Respond to verbal prompts	Answer questions, follow prompts	Not answers questions	Car takes control, driver observes
Visible system actions	Display personalized suggestions	Show no visible actions; system operates in the background	Trigger verbal prompts or visual warnings	Engage driver with contextual questions	Display transition notification ADAS; assume control of vehicle	Control steering and pedals, ensure safety
Invisible system actions	Analyze user preferences with machine learning	Monitor eye-tracking and heartbeat data using sensors	Process distraction threshold and decide intervention	Process driver responses	Detect lack of response; activate Level 3 automation	Monitor safety parameters during automated control
Support processes	Update database of user preferences and profiles	Calibrate sensors for accurate data collection	Maintain AI algorithms for distraction detection	Update VUI prompts	Ensure safety and redundancy protocols for automation	Update safety protocols and automation algorithms
Technology used	–Machine learning for personalization; –GUI for displaying informations	–Monochrome infrared-sensitive camera; –Infrared light units (700-1000 nm); –Heartbeat monitoring sensors	–AI-driven analysis of sensor data	–VUI leveraging natural language processing	–Level 3 automation technology for steering and pedals	–Level 3 automation for car control

Building the features: MVP testing

Once the technical requirements were settled in terms of technology, this phase focused on testing and evaluating different options to shape the system's core features. The goal was to make strategic decisions and validate the direction to take across three key levels, corresponding to the fundamental phases of the user experience:

- Personalized Navigation during the Prevention phase.
- Vocal Assistant during the Activation phase.
- Vocal Interaction during the Intervention phase.

From the outset, we adopted a user-centric approach, ensuring that the users were at the center of every step. To do this, we worked with a pool of proactive individuals who were not only open to testing but also eager to share their feedback and opinions freely. This active participation was crucial in helping us create a solution that felt both meaningful and relevant to their needs. This approach allowed us to: Validate whether the proposed features aligned with user expectations and needs, Pinpoint areas for improvement to optimize the experience at each phase, Build a solid foundation for future development by grounding decisions in tangible user insights.

Prevention: personalized navigation

Research and testing process

When designing a feature for a car's personalized navigation system, the primary goal was to enhance the driving experience by reducing distractions and increasing the overall enjoyment of the journey. This formed part of a broader effort to address the "prevention phase" of safe and pleasant driving.
To achieve this, we aimed to tailor navigation routes based on individual driver preferences, helping users feel more connected and engaged during their trips. The concept revolved around understanding what makes a route more enjoyable, allowing drivers to stay focused and less prone to external distractions.

For this we opted for a driver-centered approach. We conducted a qualitative study by reaching out to real drivers to understand their actual experiences and habits while driving for staying engaged and attentive.

For understanding this we conducted this test by showing different mvp options with different personalized navigation settings and asked which one were the most apreciated and useful in their opinion.

If it didn’t spontanously emerged already during the user test, we then integrated with a few questions for stimulating more insights to be sure to fully uncover their potential needs.

For example:
- What aspects of a route make the journey more enjoyable or memorable?
- Do you have an environment in which you feel more at ease while driving?

Conclusion and key findings

Our research revealed three major elements that significantly impact a driver’s enjoyment: landscapes, route preferences and the driving style of the user.

By designing with the driver’s perspective in mind, we’ve created a feature that transforms navigation from a purely functional tool that assumes just the fastest option for reaching point X into an updating, personalized and distraction-reducing experience.
This approach is a step forward in making driving not just safer, but more pleasurable and user-centered.

Activation: vocal assistant

Evaluation process

When we designed a test to explore the activation modes of the voice assistant, the primary goal was to ensure maximum driver safety during driving while simultaneously improving the accessibility of information. This is part of a broader effort to minimize distractions, as every designed element was carefully evaluated for its impact on the user experience, with particular attention to the automotive context.

We did not limit ourselves to testing only the graphical options for activating the assistant; we also gave equal importance to the sounds emitted during key interaction moments. This approach allowed for a more comprehensive evaluation of the activation modes, considering both visual and auditory aspects.

During the process, we examined in detail all the phases of interaction with the voice assistant. We paid particular attention to the moment the assistant activates, the time when it verbally interacts with the user by asking questions about the surrounding environment, the time that elapses between processing the command and the assistant's feedback, and finally the moment the user responds, interacting again with the system based on the information received.

The tests conducted allowed us to collect valuable feedback and to better understand how to make the voice assistant more effective and intuitive for drivers.

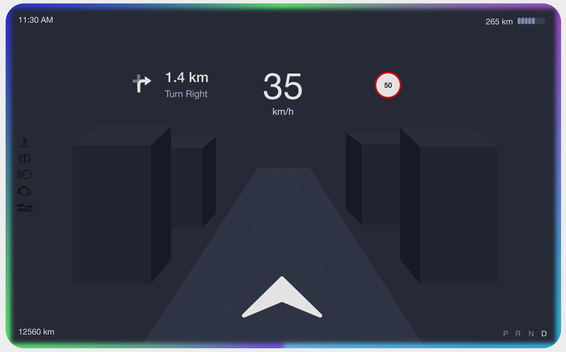
Key findings

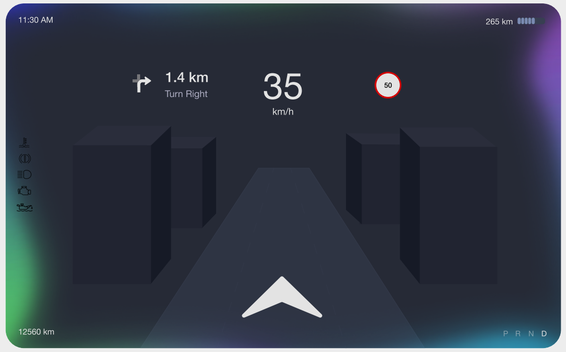
- Auditory feedback proved essential for all users.
- The need to integrate the voice assistant within the system emerged, avoiding the creation of a separate section.
- It was considered important to position the voice assistant on the display behind the steering wheel, allowing users to interact in a more natural and intuitive manner.
- The test prompted an exploration of how the assistant could be graphically integrated into the system without causing distractions for the user.
- It was crucial to determine which sounds would be appropriate to simulate the various stages of activation, listening, and responding.

Activation: vocal assistant

Option 1

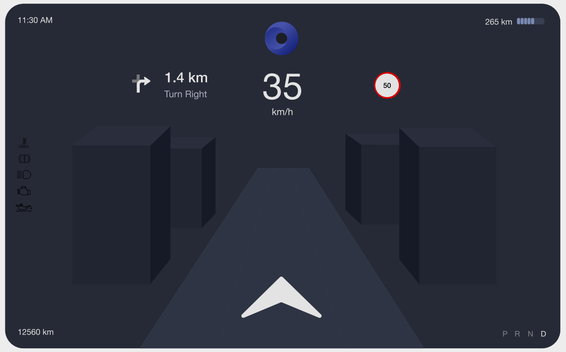
Option 1 tested focused on an activation that would emerge from the borders of the display. The animation blinks for activation then the colors when Alertia is talking and pulse when listening.





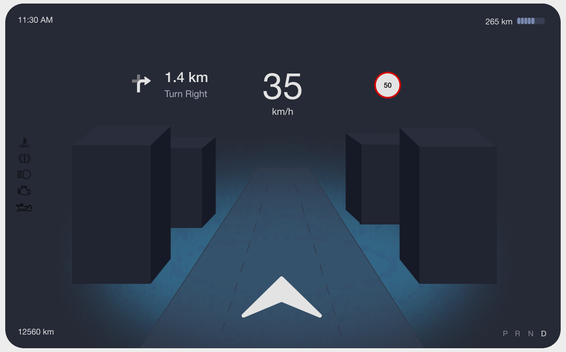
Option 2

Option 2 focused on the use of an abstract “character”: an element evoking an eye shape that turns when activated.



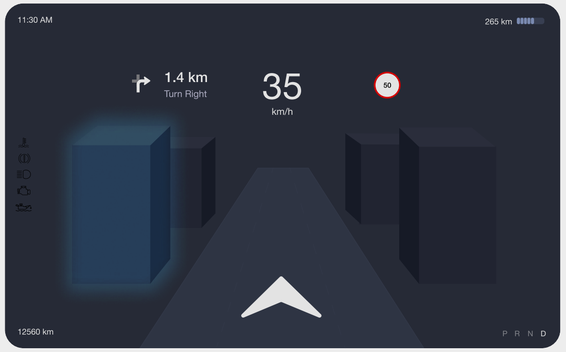
Option 3

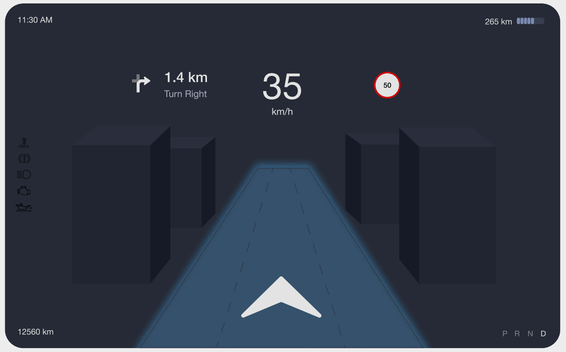
Option 3 focused more on the concept of “activating the environment”. When Alertia activated a soft and fading light lighted the environment of the head-by display.



Option 4

Option 4 focused on highlighting the single elements related to the question asked by Alertia in that moment.





Intervention: vocal interaction

The Vocal Interaction is the embodiment of the Intervention phase, where the system actively supports the driver by re-establishing a connection with the dimensions of space and time—the here and now. Acting as a grounding presence, much like a rock, it helps the driver stay focused and engaged in the present moment. To develop and refine this part of the user experience, a driver-centric approach was adopted. The research phase was divided into two key stages:

Stage 1: Exploring driver attention

The first part of the research focused on understanding what captures a driver's attention in different contexts. Through simulated driving scenarios, both in urban environments and on highways, at various times of the day (day and night), we observed drivers to uncover key insights.

The study was guided by the hypothesis that:

- In urban contexts, the field of vision is narrower due to constant stimulation and imminent dangers, requiring heightened focus on nearby elements.
- On highways, the field of vision is broader, allowing for greater observation of the surrounding environment and distant elements.

The primary objective of this phase was to identify the elements that naturally attract drivers' attention in these contexts. This understanding informed the development of a curated set of questions designed to spark a vocal interaction and foster an active conversation with the system's vocal assistant.

Stage 2: Testing the pool of questions

The second stage of the research focused on exploring and testing different types of questions to determine what best engaged drivers and supported the system's goal of grounding them in the present moment. This phase involved presenting a variety of question types to participants during simulated driving scenarios in both urban and highway contexts.

The questions were tailored to each environment: Highway scenarios emphasized distant elements, encouraging observation of the broader landscape, While urban scenarios focused on nearby details, reflecting the denser and more immediate stimuli.

Examples of tested questions included:
Highway scenarios: Questions like "Can you see any points of interest in the distance?" or "Do you notice any changes in the color of the sky?" encouraged drivers to engage with the broader environment.
Urban scenarios: Questions such as "Can you identify three different shapes of street signs in view?" or "Do you see any neon signs or billboards nearby?" prompted drivers to focus on specific, immediate details.
The testing process aimed to:

- Evaluate how drivers responded to different types of questions in varying contexts.
- Assess which questions naturally drew attention to relevant aspects of the environment.
- Identify patterns in driver preferences and engagement with different question formats.

Final insights

Key findings from the testing phase revealed that drivers preferred:

- Questions with instant answers, focused on elements immediately visible and requiring minimal search time.
- Questions related to what the car's scanning system detects, aligning with the driver's field of vision.
- Questions personalized to the driver's preferences, incorporating elements of the surroundings that are particularly interesting to them.

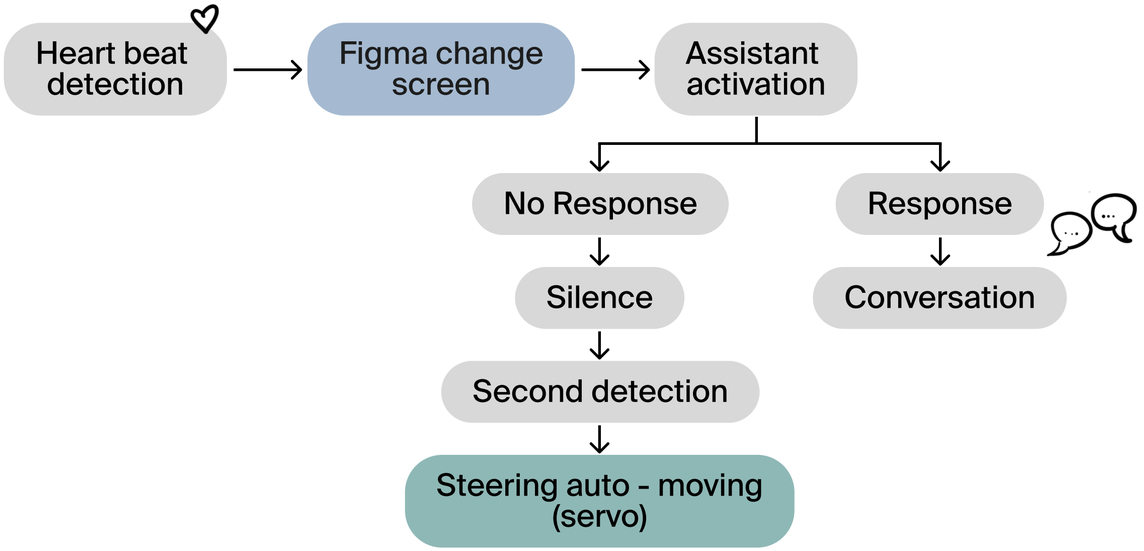
Project refinements: madness showcase

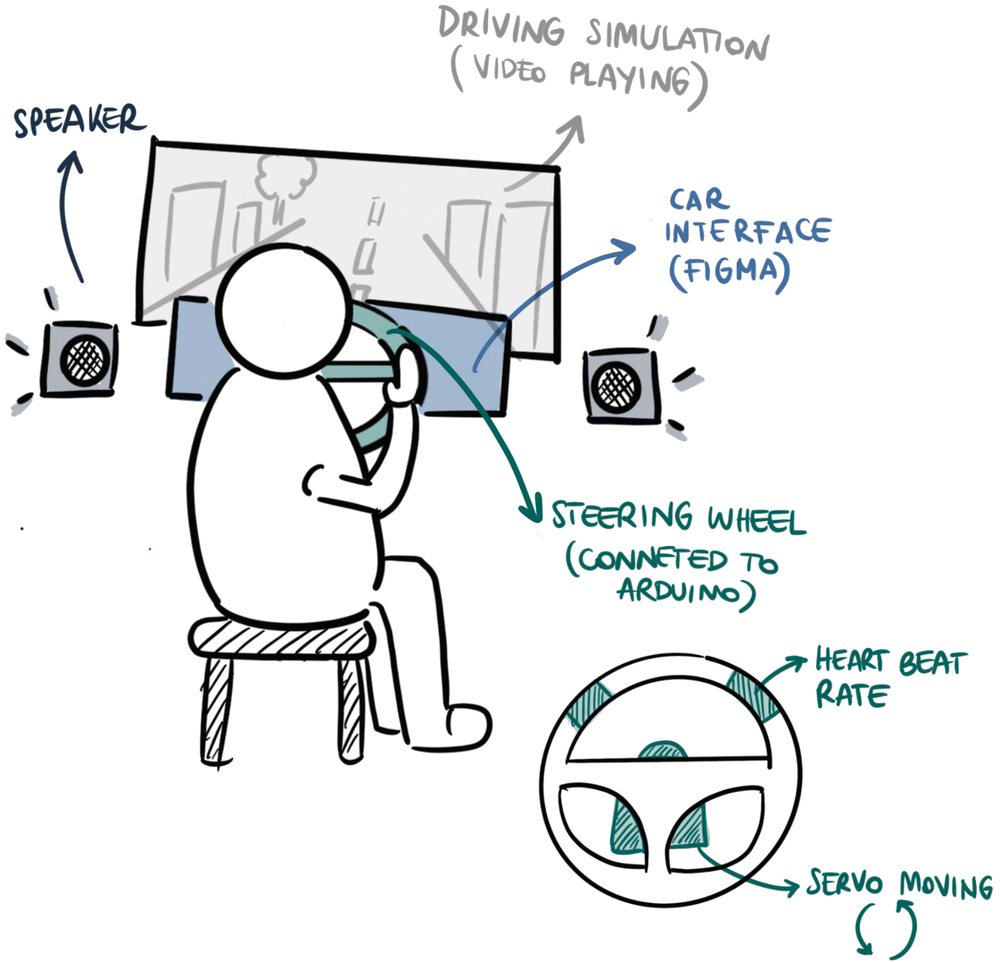
The Madness was a milestone in testing our concept with a diverse group of users in a realistic and immersive setup.

We recreated the interior of a car using a low-fidelity dashboard, a steering wheel connected to an Arduino (to simulate autonomous driving), and two displays showing interactive Figma prototypes of the head-up and side screen interfaces.

To enhance realism, a driving video projected city streets from the driver's perspective. Through integrated speakers, participants could interact with Alertia, the AI assistant, allowing us to test its ability to deliver alerts, guidance, and feedback.

This simulation provided invaluable insights into user behavior and usability, enabling us to refine our design and validate core aspects of our concept.





Insights of the user test

Insights

Driving style according to the next route you want.
like how do you feel today? and you set your mood like sporty - quiet... on the avatar before the driving

Keep in consideration the icons ADAS to put in the UI after the steering weel

The detection parameters in the report interface can be put but integrated with other insights useful for improving the driving (compare data with a average range).

Driving style selection

The option to select the driving style based on the user's mood has been introduced directly during the route selection phase, using a simple click. If the user selects a different driving style, the route regenerates, modifying its characteristics to reflect the current preferences.

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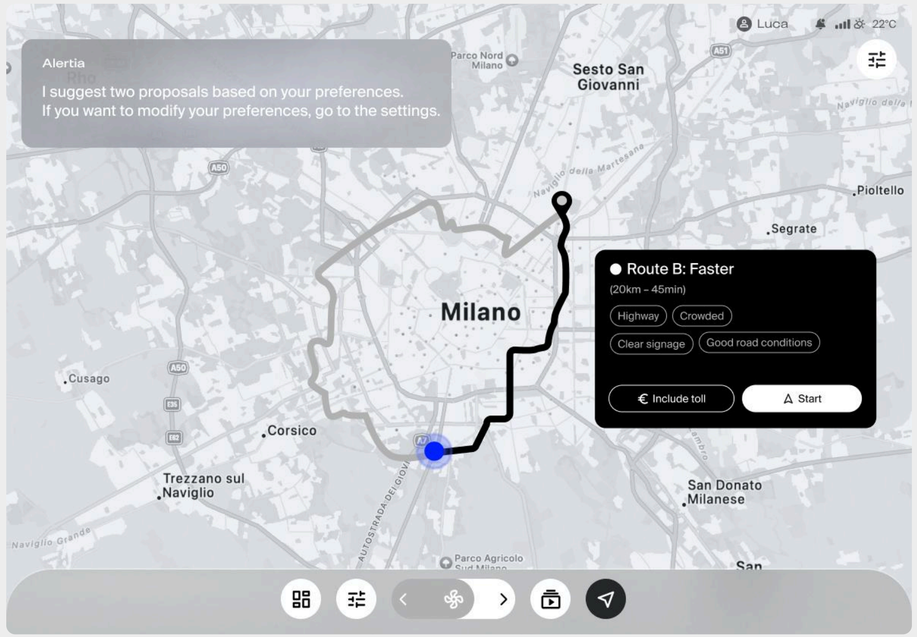

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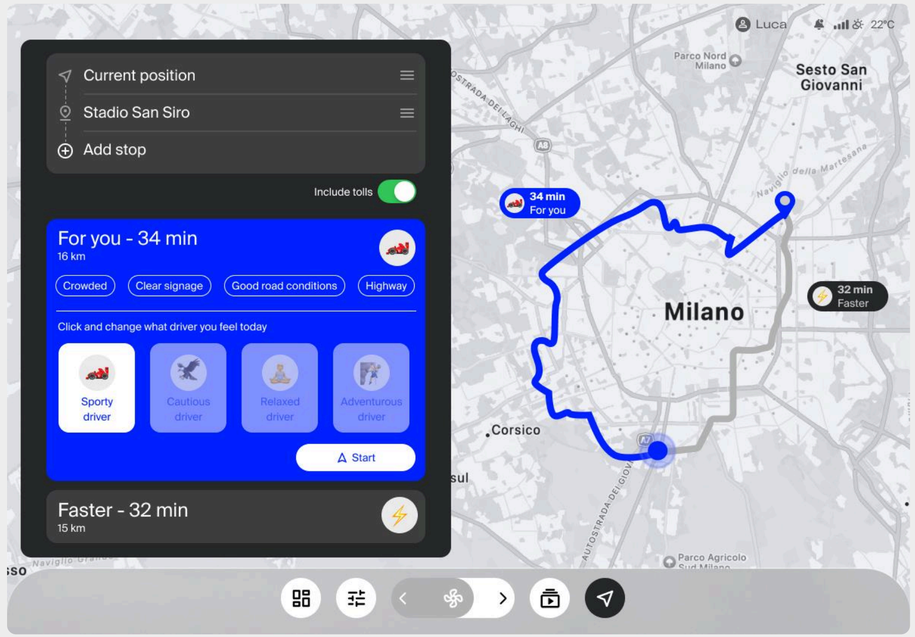

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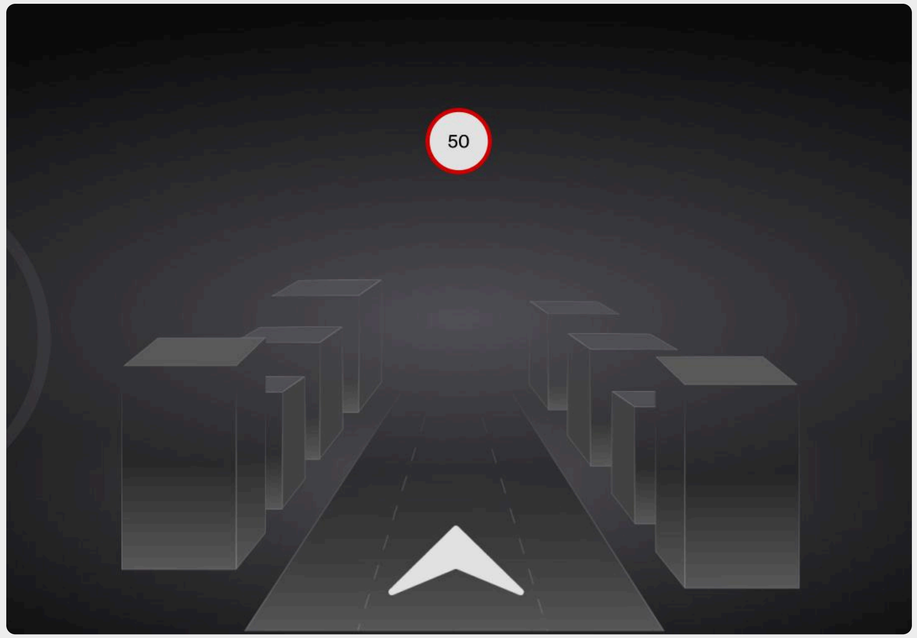
Integration of the ADAS Icon

Following an in-depth analysis of existing ADAS icons used in Europe, we decided to integrate the coffee icon, accompanied by the phrase “Driver Alertness Warning.” This icon will be used as a signal to activate the voice assistant, making it an integral part of the project concept.

Before



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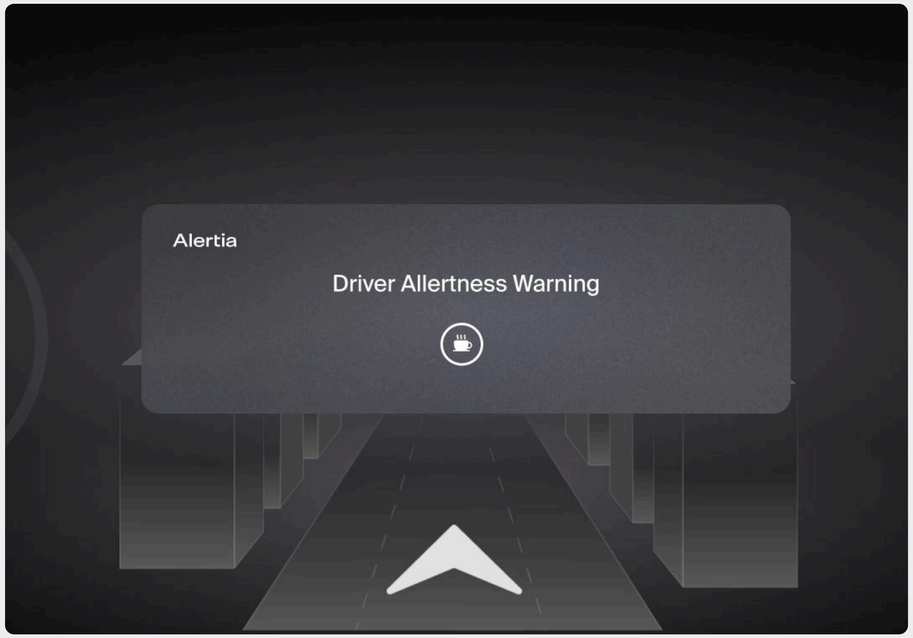

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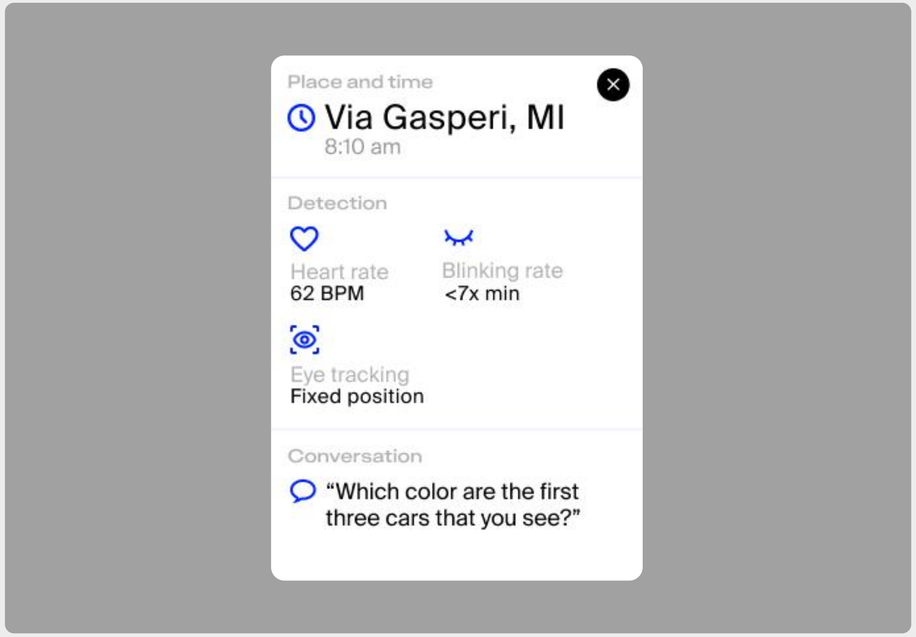
Data Communication

Following further studies to determine relevant data for enhancing driving safety, we revised the report's information. In the eye tracking analysis, we added an example of a distraction cause, such as "Phone use". For environmental scanning, a description of the road situation at the moment of distraction has been included, along with an option to view a photo taken externally from the car. Additionally, an average heart rate value has been provided for consideration.

Before



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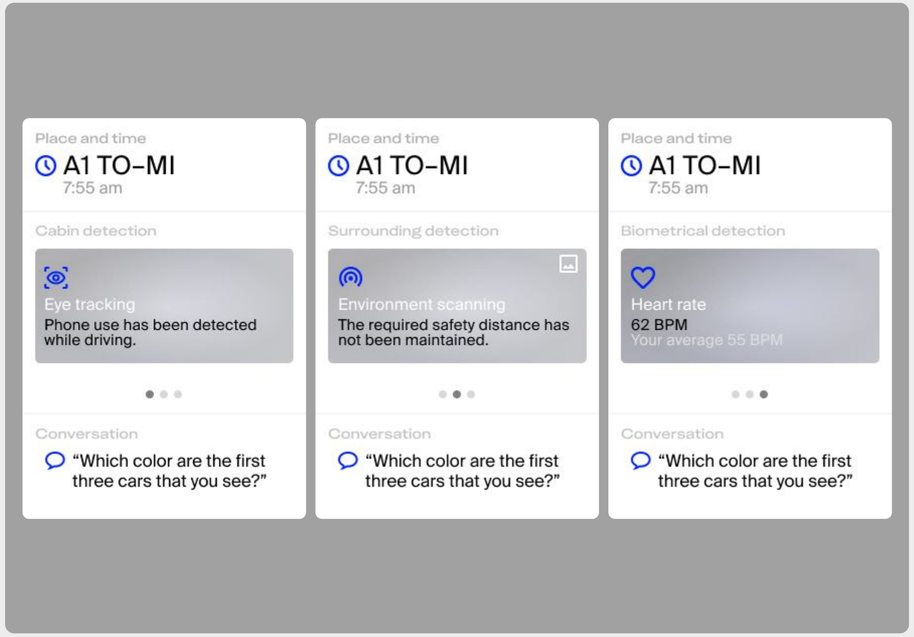

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