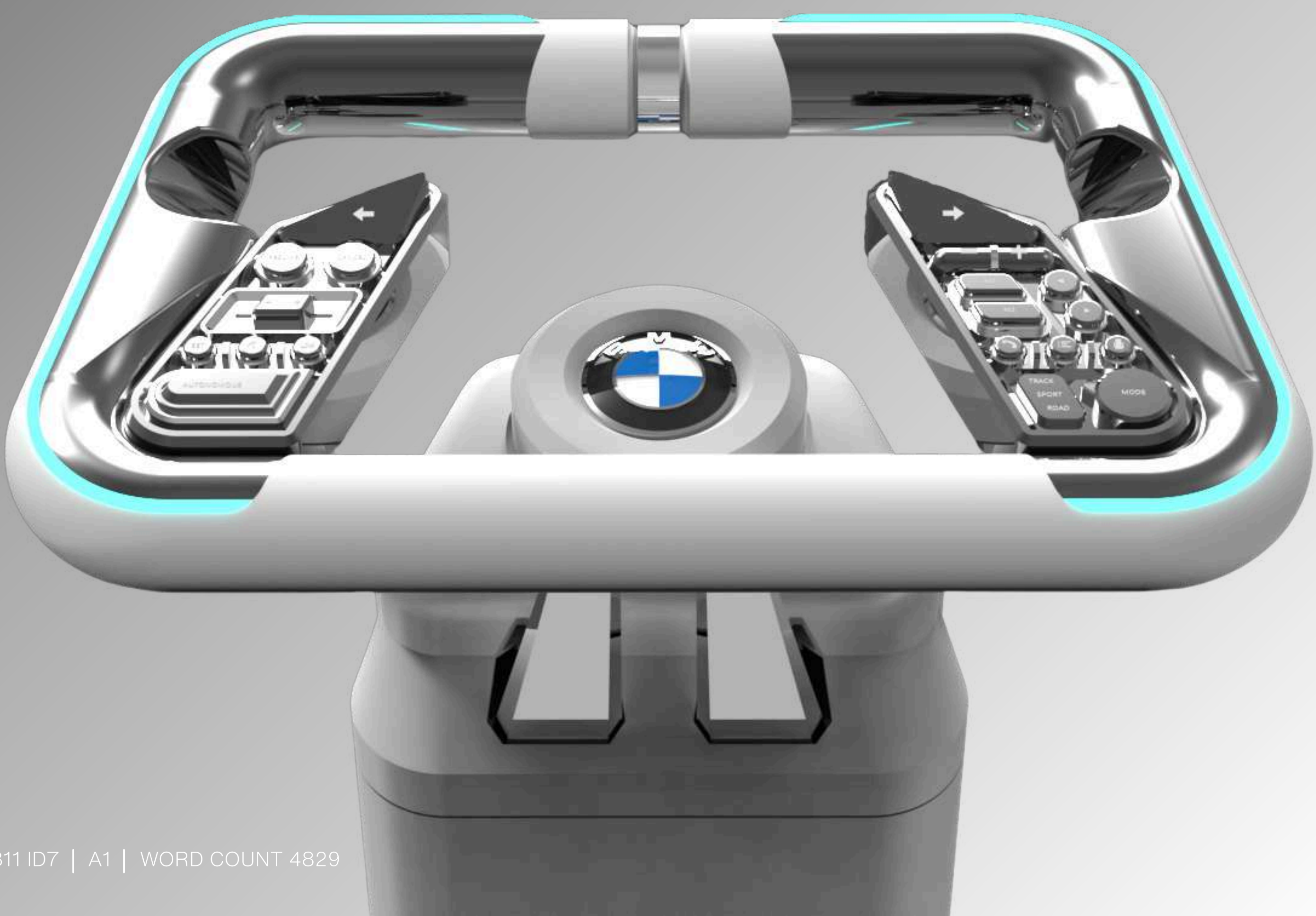
BROOKLYN GOSSLING | N11250241

RESEARCH REPORT

SEMI-AUTONOMOUS STEERING WHEEL



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STATEMENT OF AUTHENTICITY

This is to certify that to the best of my knowledge, the content of this report is my own work. This report has not been submitted for any subject or for other purposes. I certify that the intellectual content of this report is the product of my own work and that all the assistance received in preparing this report and sources have been acknowledged.

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5/9/25

STATEMENT OF USE OF AI

I have utilised Generative AI in this report (Chat GPT, and MS Co-pilot) to assist in various ways. The way I have used AI includes, extracting quotes from transcriptions, and condensing long text to meet word counts and improve clarity.

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EXECUTIVE SUMMARY

This report investigates the human–machine interaction challenges of Level 3 semi-autonomous driving, with a focus on the steering wheel for the BMW M8. As vehicles move toward greater automation, one of the most critical issues is how drivers disengage during autonomous mode and safely transition back to manual control when prompted by a takeover request (TOR).

A mixed-method research approach was adopted to examine these challenges. Background literature established the broader context of SAE automation levels, TOR performance, trust calibration, and transparency in automated vehicles. Benchmarking compared leading global systems such as those by Mercedes-Benz, BMW, Honda, Tesla, GM, Ford, Lexus, and emerging Chinese manufacturers. First-hand research triangulated three methods: observations of participants in a BMW M8 show car, a semi-structured interview with a human–machine interface researcher, and a survey distributed to a wider audience.

Analysis identified four themes to consider when designing this steering wheel: driver habits, TOR reactions, trust and transparency, and steering wheel form. Research showed participants tended to engage in light secondary tasks, expressed strong preferences for gradual and multimodal TOR alerts, valued clear system transparency, and showed cautious attitudes toward radical wheel redesigns. These findings informed the design implications section, which highlights opportunities for future design intervention.

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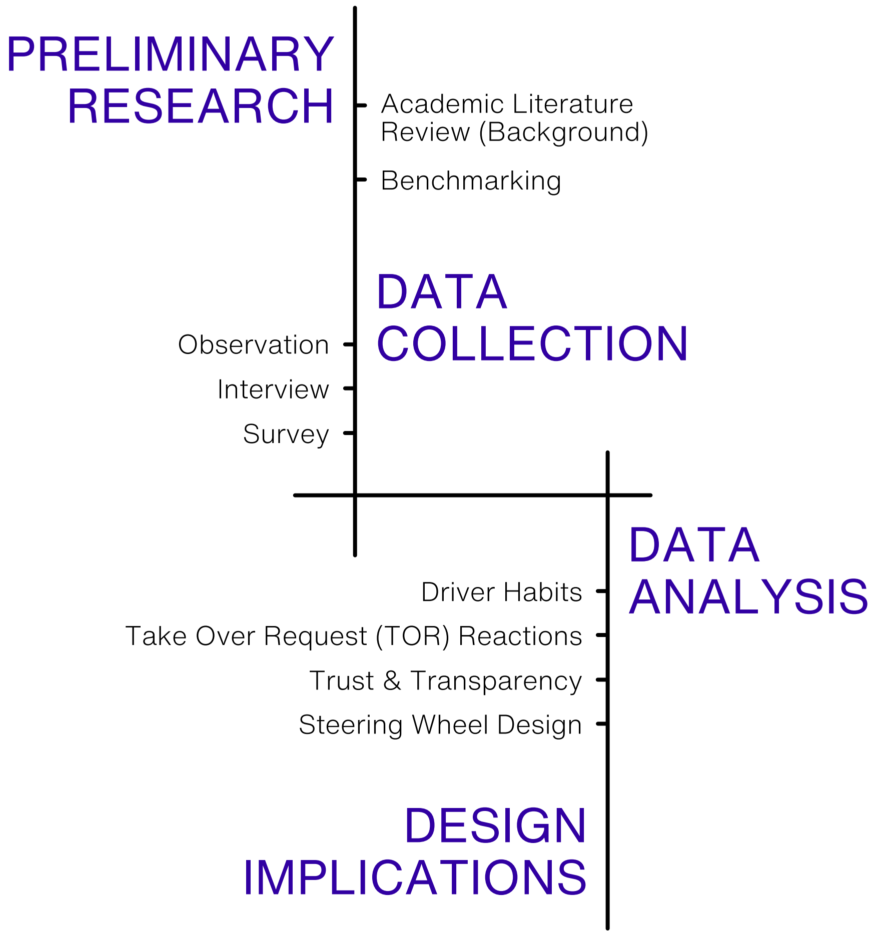
INTRODUCTION

As the automotive industry moves toward fully autonomous driving, it faces significant challenges in the transition phase. Modern vehicles are now capable of taking over most driving tasks, allowing drivers to disengage, but they still require the driver to be ready to retake control at short notice. This creates a complex human–machine interaction problem, where safety and user experience depend on how smoothly the driver can shift from “eyes-off driving” back to full attentiveness.

Designing for this gap is essential to enhancing both driver safety and overall user experience. A key opportunity lies in the human–machine interface (HMI), where steering wheel design can build trust in automation, provide predictive cues about system behaviour, and support safer, less stressful takeover requests.

The aim of this project is to investigate emerging technologies, current trends in semi-autonomous driving, and insights from both literature and first-hand research to develop an innovative steering wheel that addresses the challenges of handover, enhances user experience, supports smoother takeover transitions, and preserves the aesthetic identity of the BMW M8. To achieve this, the report draws on a mixed-method approach, including a review of existing literature, user observations, an interview with a professional, and a survey to identify opportunities for innovation in steering wheel design during the semi-autonomous era.



BACKGROUND

The global automotive industry is rapidly advancing toward automation, motivated by the promise of improved safety, efficiency, and accessibility. According to the World Health Organization, approximately 1.19 million people die in road crashes each year, with human error accounting for the majority of causes (World Health Organisation, 2023). Automated driving technology offers a potential reduction in these numbers by reducing reliance on human recognition, decision-making, and reaction time. Beyond safety, automation also promises benefits such as increased comfort, the ability to reclaim travel time for other activities, and greater mobility access for those unable to drive.

To track this progress, the Society of Automotive Engineers (SAE) defines six levels of automation from 0 to 5, ranging from no automation to full self-driving capability (SAE International, 2021). Levels 0 to 2 provide varying degrees of driver assistance, while Levels 3 to 5 allow drivers to disengage under certain conditions, with Level 3 requiring drivers to be ready to take over. Today, manufacturers such as Mercedes-Benz, BMW, and Honda have introduced certified Level 3 systems in limited markets, while Level 4 is limited to ride-hailing fleets like Waymo (Mercedes-Benz Media, 2022) (BMW Group, 2023).

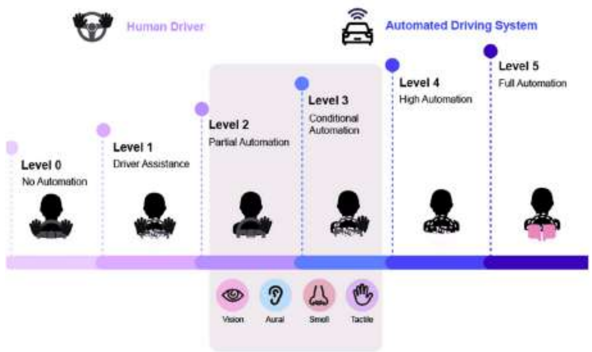


Figure 1 - SAE Levels (Zhou & Jiang, 2024)

The current industry focus is on Level 3, which presents unique human-machine interaction challenges. Research shows that takeover requests (TORs) are a critical point of failure. Drivers engaged in non-driving tasks often require several seconds to reorient, with performance shaped by posture, gaze, and situational awareness (Deo & Trivedi, 2020). Studies indicate that delayed or poor-quality takeovers can lead to unsafe lane changes, harsher braking, or even collisions. For example, one study (Kim, et al., 2023) found that drivers responded fastest when they perceived high risk but often performed worst in medium-risk situations due to misjudging urgency. Researchers emphasise that TOR design must consider both timing and modality, with multimodal alerts such as visual, audio, and haptic cues increasing comprehension and reducing panic (Riener, Jeon, & Alvarez, 2022). At the same time, system transparency that communicates what the vehicle is doing and why plays a vital role in building appropriate trust. Over trust may encourage complacency, while under trust can discourage use altogether. The HMI must therefore carefully calibrate user expectations (Riener, Jeon, & Alvarez, 2022).

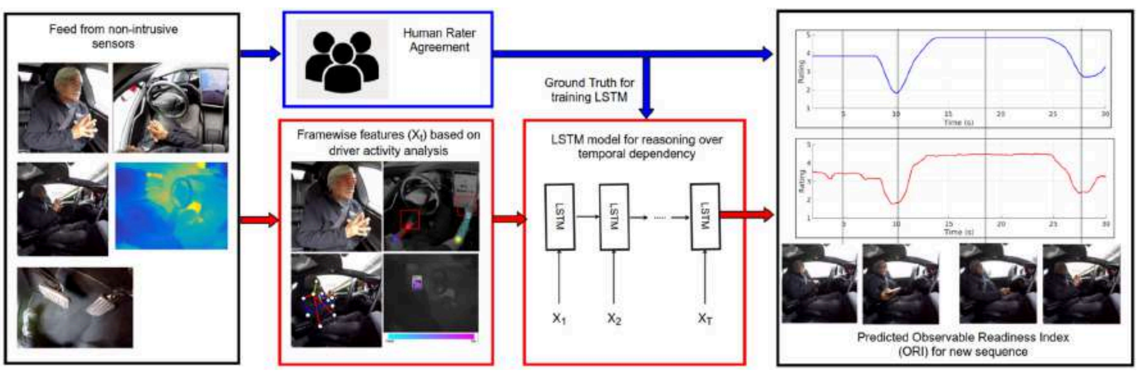


Figure 2 - Study on Driver Readiness, an Overview of the Approach (Deo & Trivedi, 2020)

Passenger comfort further complicates adoption. In semi-autonomous modes, drivers often act more like passengers, engaging in secondary tasks such as reading, phone use, or conversation. This shift increases the likelihood of motion sickness due to sensory conflict, especially when the vehicle makes sudden or unpredictable manoeuvres (Diels & Jelte, 2019). Literature also shows that in-vehicle interaction design plays a significant role in both safety and comfort. An In-Vehicle Interaction toolkit was developed, demonstrating how modalities such as steering wheel haptics, HUDs, alarms, and ambient lighting can be combined to balance reliable takeover cues with enjoyable user experiences in semi-autonomous driving (Zhou & Jiang, 2024). This interactive toolkit will be used to review existing vehicles in the benchmarking section of this report. For performance vehicles like the BMW M8, the challenge is balancing the excitement of sporty driving with the comfort and predictability required for longer autonomous journeys.

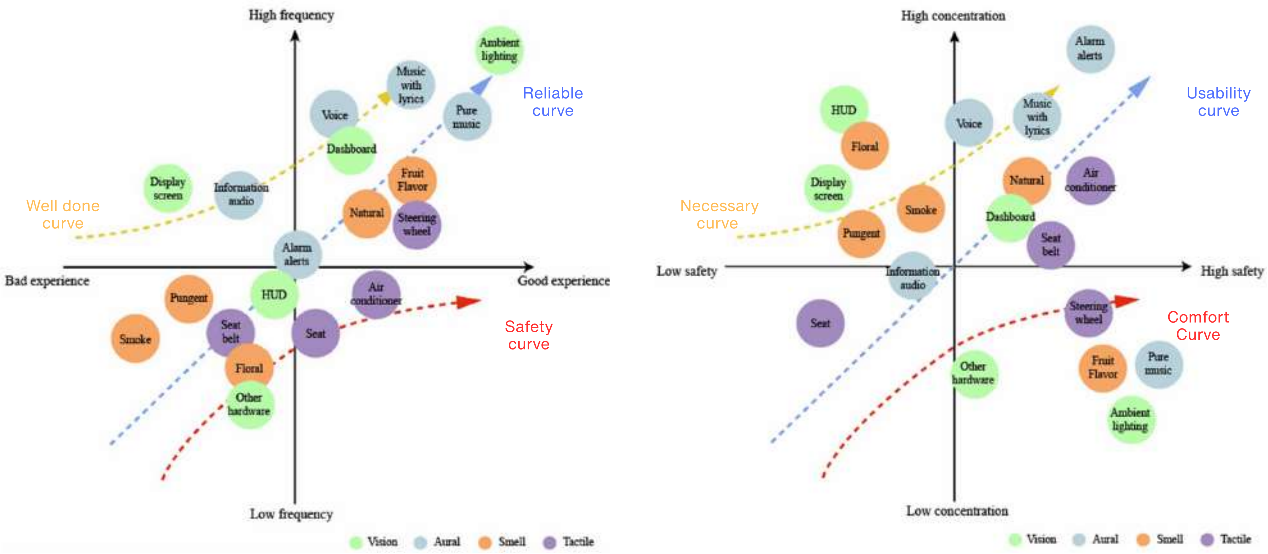


Figure 3 - Reliable Interactive Toolkit (Left) & Usability Interactive Toolkit (Right) (Zhou & Jiang, 2024)

In summary, the literature underscores that while automation promises clear safety and lifestyle benefits, the semi-autonomous era introduces critical challenges in takeover readiness, trust, and comfort. These insights directly shape the scope of this project, which focuses on designing a steering wheel that improves user experience, enhances takeover safety, and maintains the BMW M8's brand identity.

BENCHMARKING

Level 3 (L3) automation allows the car to take over the dynamic driving task so the driver can look away from the road and remove their hands from the wheel, while still remaining ready to respond to a takeover request. This grey zone of shared control is considered risky by many brands, due to legal liability and the difficulty of regaining situational awareness in time. As a result, most manufacturers are either enhancing Level 2 systems, that are often marketed as “2+” (not officially recognised by SAE) or aiming directly for Level 4, leaving only a few pursuing certified L3 systems (Mobileye, 2020).

BROAD MARKET

It is therefore necessary to map out the industry to understand how different manufacturers are approaching automation.

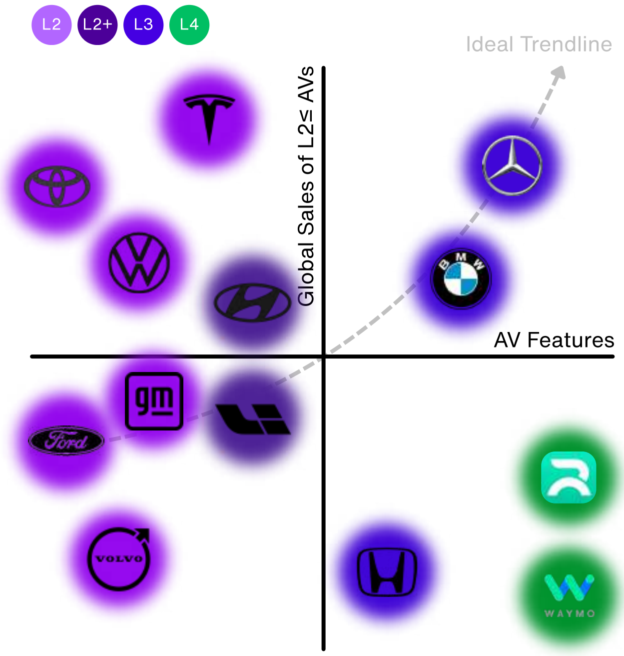


Figure 3 - Car Manufacturer AV Positioning Graph

Figure 3 demonstrates that BMW is in a good position with their Personal Pilot system, however the opportunity here is to surpass Mercedes-Benz in terms of AV adoption and AV distribution.

Currently only three automakers offer certified L3. Mercedes-Benz Drive Pilot is the frontrunner, approved in Germany and parts of the U.S, though still restricted to certain roads and speeds (Mercedes-Benz USA, 2023). BMW Personal Pilot L3, launched on the 7 Series in Germany, provides comparable functionality while building on BMW’s L2 Highway Assistant architecture (BMW Group, 2024).

Honda Sensing Elite, deployed only in Japan on a small run of Legend sedans, demonstrates feasibility but remains the most limited of the three (Honda, 2024) (Honda, 2021).

The bulk of the market lies at Level 2 and 2+. Tesla dominates by scale, with over two million vehicles equipped with Autopilot/FSD, though SAE continue to classify it as L2 (Tesla, 2025). Other strong players include GM’s Super Cruise and Ford’s BlueCruise, both offering hands-free highway driving on mapped roads, alongside Hyundai/Kia’s HDA2, Nissan’s ProPILOT Assist, and Toyota/Lexus Teammate (General Motors, 2025) (Ford, 2023) (Lexus, 2022). In Europe, Audi, and VW continue to expand their L2 AV systems.

In China, brands such as NIO, XPENG, Li Auto, and many others are rapidly rolling out advanced L2+ packages that mimic L3. Though not formally certified, their rapid adoption makes them critical in global benchmarking. At the frontier, Waymo (USA), and Baidu Apollo Go (China), operate Level 4 robotaxi fleets in selected cities. While small in scale compared with L2 uptake, they illustrate the split between consumer-supervised automation (L2/L3) and fully driverless fleet services (L4).

Consumer adoption remains concentrated around Level 2 and 2+, with only a handful of L3 deployments. BMW is well placed with its early rollout but trails Mercedes in regulatory and market positioning, leaving scope to close the gap through innovation in user experience and HMI.

CURRENT MARKET ANALYSIS OF WHEEL, TOR, & HMI

To design an L3 steering wheel for the BMW M8, it is necessary to examine how leading manufacturers approach steering-wheel interaction, takeover requests (TORs), and HMI. A decision-matrix table was created using five weighted criteria: visual, auditory, tactile, HUD/predictive cues, and comfort features. These features are based on the IVI toolkit (Zhou & Jiang, 2024), which links multimodal alerts to safe and comfortable automated driving. Find the weighted matrix to determine the positioning graph in the appendix (Appendix A).

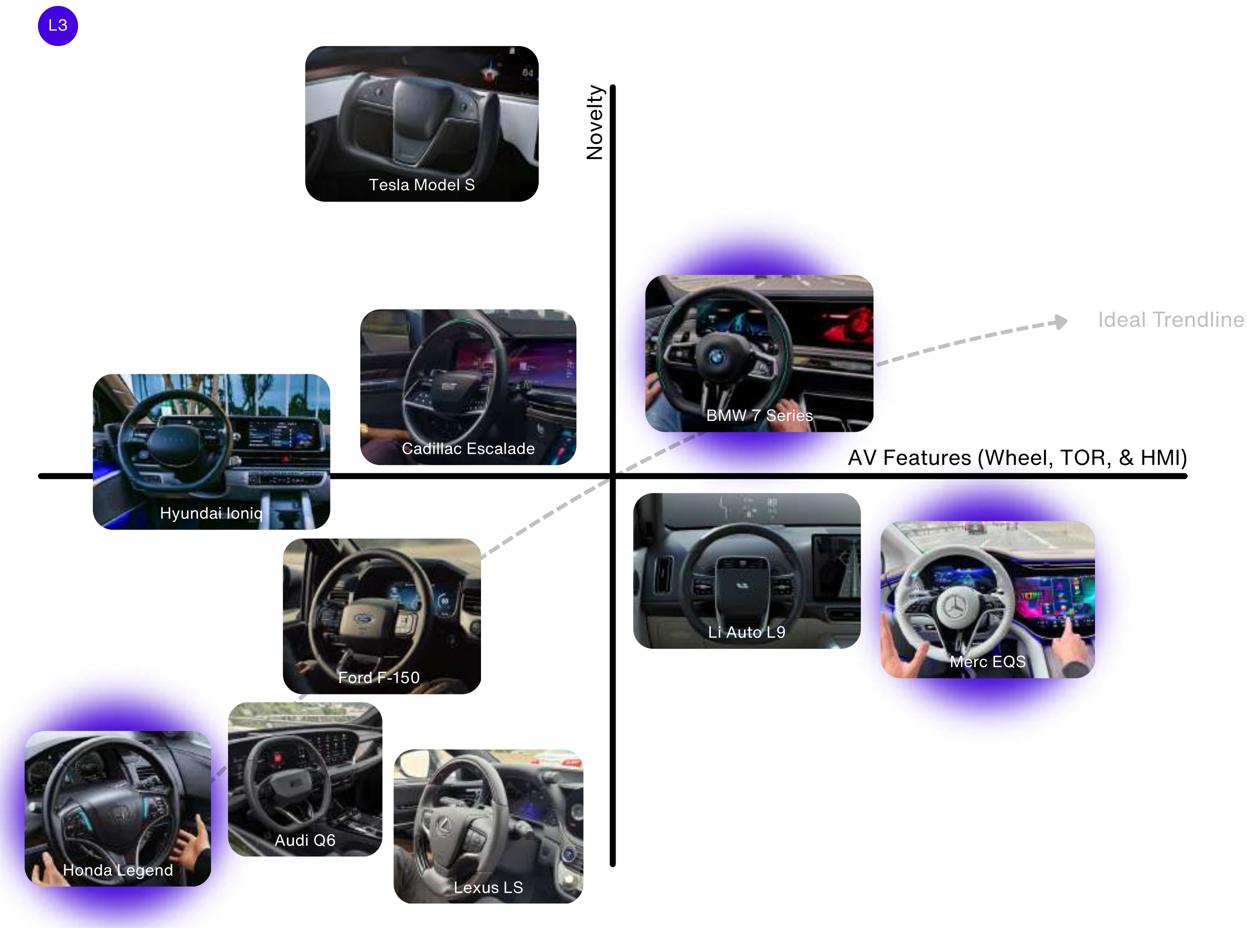


Figure 4 - Current Steering-Wheel, Take Over Request (TOR) and Human Machine Interface (HMI) Positioning Graph

Results show that Mercedes-Benz, and BMW lead through strong multimodal integration, combining predictive HUDs with wheel haptics, capacitive sensors, and clear audio-visual cues. Li Auto scored almost as highly, showing how China's L2+ systems are approaching L3 sophistication. Lexus, GM, Ford, and Hyundai form a middle tier, while Audi lags slightly due to limited haptic features. The Honda Legend demonstrates that certification does not guarantee advanced HMI, while Tesla ranks low, relying heavily on screen visuals and torque sensing without haptics or HUD support.

When these results are compared with steering-wheel novelty, most current models retain a traditional round wheel with incremental innovations such as rim lighting, grip sensors, and vibration. This makes L2 and L3 automation appear more like an added feature than a radical design shift. Unconventional wheels, such as Tesla's yoke, remain confined to L2/L2+ systems, while retractable wheels, like Audi's AI:ME, are still conceptual.

Overall, the current market shows a cautious trajectory. Certified L3 leaders have prioritised multimodal TOR effectiveness over wheel redesign, while more radical wheel concepts are confined to supervised systems. There is opportunity to explore novel ways to integrate L3 automation.

EMERGING TRENDS

Future design must also consider emerging trends. Artificial intelligence is increasingly integrated into vehicles to personalise experiences and predict driver needs, for example Honda's Saloon was built around AI with the goal of humanising the autonomous driving experience (Honda, 2025). Many manufacturers are already experimenting with AI to enhance driver assistance and user experience, but these systems are still in their infancy such as the recent Mercedes-Benz and Nvidia partnership (Mercedes-Benz Group, 2020).

Steering wheels are also sites of experimentation, with some brands testing yokes or retractable designs like the Audi AI:ME. Tesla's yoke illustrates both the appeal and limitations of radical change; while visually striking, consumer feedback often frames the yoke as "a band aid with added cost and complexity simply to solve a problem no one has had before." suggesting familiarity remains central to trust (Seabaugh, 2021).

Other than typical futuristic concepts like Honda's Saloon, another notable direction is retro-modern design language, such as Hyundai's N Vision 74, which fuses 1970s rally aesthetics with emerging hydrogen-electric technology (Hyundai, 2025). This concept car has received overwhelmingly positive feedback from the automotive community. This shows that future trends are not always limited to minimal futuristic designs.

To visualise these trends, the following matrix positions established manufacturer concept vehicles by their use of abstract technology and steering-wheel novelty.

Figure 5 - Established Car Manufacturer Release Concept Steering Wheel Positioning Graph

Concept analysis suggests the industry is moving toward unconventional forms paired with high-tech interiors. Whether this aligns with user preference is less certain. Observational research in the BMW M8 display car will provide insight into how users balance conventionality, which supports comfort and trust, with advanced technology, to improve UX, safety and effective TORs.

RESEARCH

This section outlines the research methodology, and methods used to investigate user interactions, behaviours, and preferences in semi-autonomous vehicles. A qualitative approach was adopted to explore habits, feelings towards TORs, levels of trust and transparency, and attitudes towards unconventional steering wheel design. To ensure rigour and depth, a triangulated research strategy was employed, combining observations, expert interviews, and quantitative surveys.

METHODOLOGY

A qualitative methodology was chosen as the primary framework, as it enables the exploration of nuanced human experiences, perceptions, and behaviours in real-world contexts. Given that Level 3 semi-autonomous vehicles (L3 AVs) are still emerging in the market, it was important to capture subjective user perspectives to inform design directions. Triangulation was applied by using three complementary research methods: observational studies, semi-structured expert interviews, and quantitative surveys. This multi-method approach provided richer insights and reduced the limitations of any single data source.

METHOD 1: OBSERVATIONS

The first method consisted of ten participant observations conducted in pairs using a 2019 BMW M8 (see Figure 6), displayed at the BMW Design Academy at QUT. The goal was to gain a first-hand view of how users might behave in an autonomous context, while probing their thoughts on TORs and unconventional steering wheel forms.

Figure 6 - BMW M8 Used For Observations

Participants were asked to simulate a typical commute under an L3 system, with scenarios that allowed them to disengage (hands and eyes off) while remaining ready to retake control within 10 seconds. Observations lasted 20 minutes, with participants alternating between the driver and passenger seat. For the first five minutes, behaviours were observed without intervention, followed by semi-structured questioning to encourage discussion and reflection (see appendix C for the observation question sheet).

Conducting the observations in pairs fostered comfort and natural conversation, making the sessions more akin to an enactment-based focus group.

Sessions were video recorded using an iPhone on a tripod in the rear seat (see Figure 2), capturing both dialogue and non-verbal behaviours (see Figure 3). Recordings were later transcribed and coded around four themes: driver habits, TOR reactions, vehicle trust and transparency, and steering wheel form/ergonomics. These themes were identified during analysis and became central to later stages of the research.

Figure 7 - Tripod Setup

Figure 8 - Camera Angle

The sample consisted of eight males and two females, all in their early twenties. While this offered valuable insights into a younger demographic, it also introduced limitations, particularly around generalisability. None of the participants had significant experience with AVs, although all were open to experimenting with the scenario.

METHOD 2: SEMI-STRUCTURED INTERVIEW

To complement user-focused insights, a semi-structured interview was conducted with a PhD researcher specialising in Human–Machine Interfaces (HMI) for automated vehicles. His research focuses on the design of multimodal HMIs that optimise safety and user experience, with practical experience evaluating interfaces in simulators, on test tracks, and in real-world urban trials. He has also led human-centred, multimodal data collection studies with AVs.

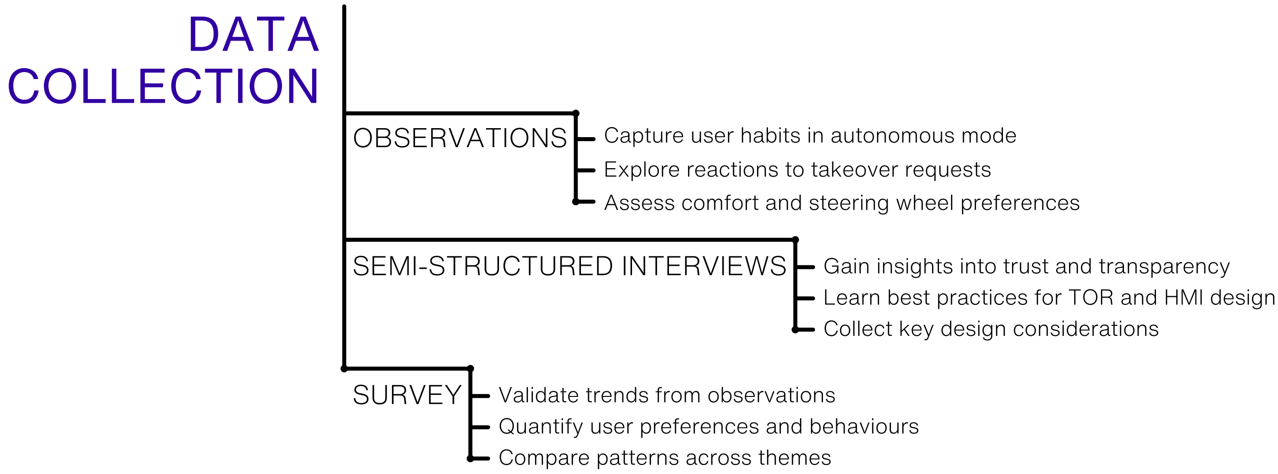
The interview, conducted via Zoom, was recorded and transcribed for analysis. The conversation provided valuable context on key design considerations, such as the role of trust calibration, the balance between over-trust and under-trust, and the importance of attention levels in L3 AVs. While his research was not steering wheel specific, his insights into user behaviours, transparency, and effective takeover support directly informed the direction of this project. See the list of questions in appendix D.

METHOD 3: SURVEY

The third method was a quantitative survey, designed to validate and expand on themes emerging from the observations and interview. The survey asked multiple-choice questions across the four coded themes: driver habits, TOR preferences, trust/transparency, and steering wheel form. Questions were designed to capture both preferences and behavioural likelihoods (e.g., whether participants would use their phone, nap, or talk during autonomous mode; how they would prefer TOR alerts to be delivered; and their openness to unconventional steering wheel shapes).

The survey was created on Qualtrics and distributed through three channels: a research survey Facebook group, the QUT ID7 cohort chat, and my personal Instagram, with a total of 37 responses. Two of these channels may have introduced some bias, therefore efforts were made to mitigate this through neutral question wording and broad response options. The survey provided quantitative reinforcement of the observational themes, offering a clearer picture of generalisable trends. See the list of survey questions in appendix B.

In summary, this study adopted a triangulated qualitative approach, supported by quantitative validation, to explore human factors in semi-autonomous driving. Observations provided rich behavioural insights, the expert interview contextualised findings within industry and academic knowledge, and the survey quantified key trends. Together, these methods generated a holistic understanding of how users perceive and interact with L3 AV systems, with implications for steering wheel design, HMI integration, and takeover request strategies.



ANALYSIS AND FINDINGS

This section presents the analysis and results of the three first-hand research methods: observations, a semi-structured interview, and a survey. Each method generated complementary forms of data, which were examined individually and then compared to identify patterns in user behaviour, takeover response, trust in automation, and steering wheel form preferences.

OBSERVATION FINDINGS

The observation data was qualitative and therefore required coding for effective analysis. Video recordings were transcribed and systematically coded to identify recurring patterns. From the discussions, four key themes emerged: driver habits, takeover request (TOR) reactions, trust and transparency, and steering wheel form, which were applied consistently across all ten observations. Find observation transcripts in appendix F.

Table 1 - Observation Coding

Theme	Code	Transcript Examples
Driver Habits	Phone & media consumption	“I’d probably pull my phone out and scroll Instagram.” “I’d watch Netflix if the system was in control for a while.” “Phone’s easier than a laptop because you can still keep half an eye on the road.” “I’d put on a podcast or music.”
	Conversation & socialising	I’d probably just talk to the passenger next to me.” “If I trusted the system more, I’d look at the person instead of the road.” “On long trips, I’d rather chat than sit on my phone the whole time.”
	Napping reluctance	“I wouldn’t nap, I don’t think I’d ever feel safe enough.” “Maybe on a really long highway trip, but only if I trusted someone else in the car to watch.” “If I was alone, I couldn’t switch off to sleep.”
	Attention to the road	“I’d still keep one eye on the road, even if I wasn’t driving.” “Even with autonomous mode on, I don’t think I could look away completely.” “I’d glance up every now and then just to check what it’s doing.” “I’d feel safer if I was still watching, especially in traffic.” “Queensland drivers are unpredictable, so I’d keep watching regardless.”
Takeover Request (TOR) Reactions	Stress & panic under sudden alerts	“If it just yelled TAKEOVER, I’d panic and grab the wheel.” “A loud alarm would stress me out more than help.”
	Preference for gradual escalation	“I’d want a countdown, like 10, 9, 8, so I know how long I have.” “Build-up warnings make it easier to focus before I take control.”
	Modality diversity	“Seat vibration would wake me up if I was drifting.” “A light strip on the wheel would get my attention without scaring me.” “Sound is the clearest, but it can’t be too aggressive.”
Driver Trust & Transparency	Skepticism & caution	“I’d still be watching the road, even in autonomous mode.” “I don’t think I could ever fully trust it.”
	Desire for system communication	“If it’s changing lanes, I want to know before it does it.” “A HUD showing where the car’s going would make me feel safer.”
	Conditional trust	“I’d use it more on highways where I know the road well.” “I might trust it after a while, but not straight away.”
Steering Wheel Form	Wheel position in autonomous mode	“I’d want it to move slightly forward to give me more leg room.” “Keep it close enough so I can grab it quickly.” “Pushing it away would help with a laptop, but not too far.”
	Traditional shape preference	“Round wheels are more natural, I’d stick with that.” “Flat-bottom would be fine, more leg space.” “Yokes look cool but don’t feel practical.”
	Role of wheel in takeover	“The wheel moving back down could signal it’s time to take over.” “If it turns by itself, I’d want to see that feedback, not have it stay still.”

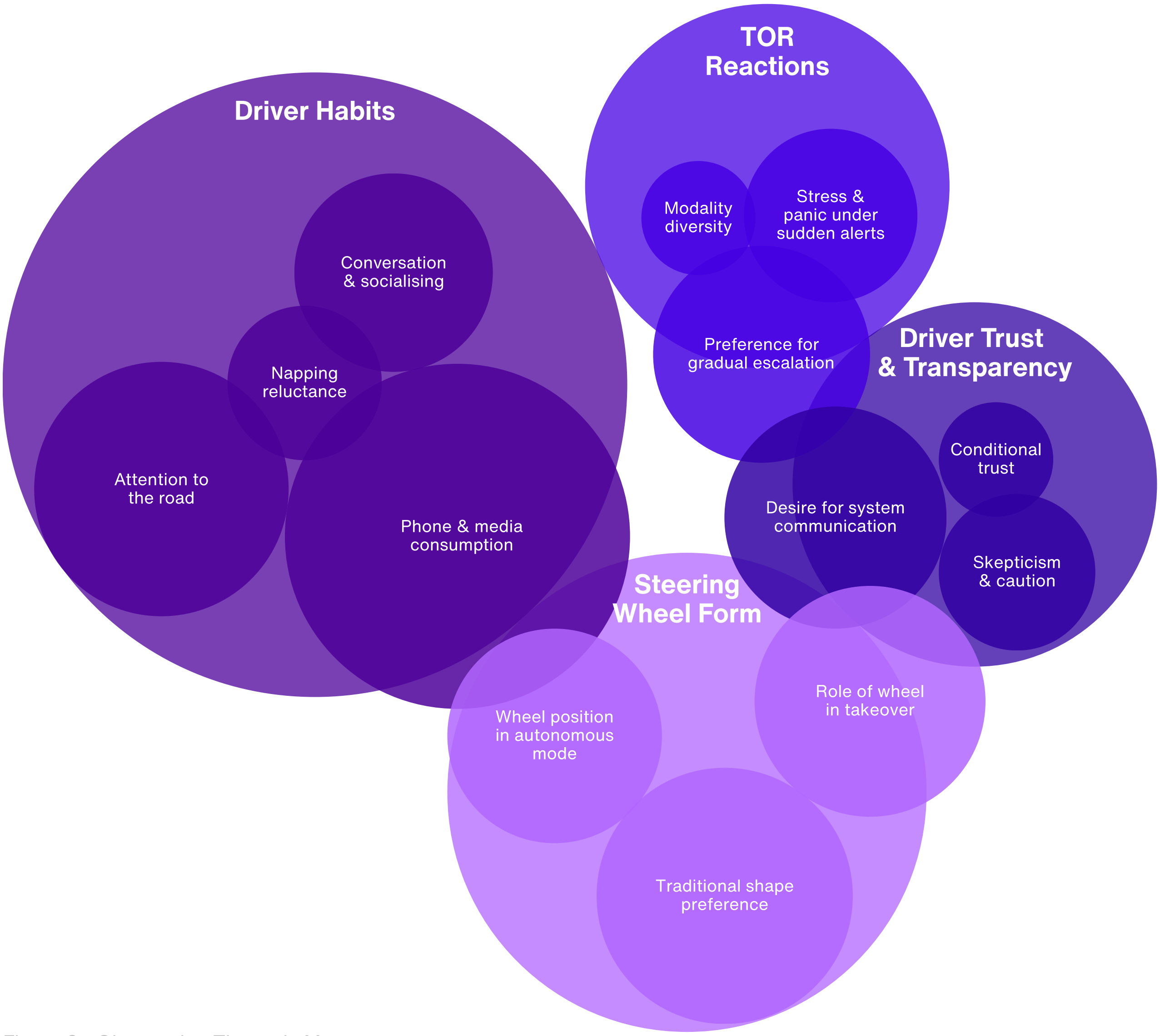


Figure 9 - Observation Thematic Map

Figure 9 illustrates the coded findings from the ten observations, grouping them into four key themes. The size of each circle reflects the frequency and emphasis given by participants, while overlaps indicate how different codes complement each other. For example, the desire for system communication closely links with preference for gradual escalation and the role of the wheel in takeover, highlighting how expectations for trust, TOR delivery, and steering wheel form are interdependent.

Driver behaviour during autonomous mode was dominated by phone and media consumption, which almost every participant identified as their default activity. Attention to the road also scored highly, as many reported they would still glance at traffic and surroundings even when disengaged, signalling a residual caution and reluctance to give up control. Conversation and socialising were common in paired settings, while napping reluctance was nearly universal, with participants rejecting sleep due to trust concerns. Together, these findings reveal that users balance engagement with distraction, favouring activities that can be paused quickly in case of a takeover request.

Participants consistently described stress when imagining sudden, loud alerts, with many stating that abrupt warnings could induce panic or unsafe reactions. Instead, there was a strong preference for gradual escalation, where cues begin subtly and intensify only if ignored. Modality diversity also emerged, with participants favouring multimodal alerts (sound, lights, haptics) to ensure redundancy without overwhelming the driver. These findings indicate that TOR design must carefully balance urgency with clarity, offering progressive and multimodal communication to re-engage the driver effectively.

Trust in automation was conditional, with participants expressing scepticism and caution about fully disengaging, particularly in suburban or unpredictable traffic conditions. At the same time, there was a strong desire for system communication: participants wanted clear feedback on upcoming manoeuvres such as lane changes, braking, or slowing for hazards. This shows that transparency is not only a safety factor but also a comfort mechanism, shaping how much drivers are willing to disengage and what activities they feel safe doing in autonomous mode.

Across participants, there was a strong preference for traditional shapes, with many rejecting unconventional forms such as rectangular or yoke-style wheels. However, wheel position in autonomous mode divided opinions: some participants wanted the wheel to retract slightly for comfort, while others preferred it to stay within easy reach for reassurance. The role of the wheel in takeover was widely acknowledged as critical, with many suggesting that its positioning could act as a cue for regaining control. These findings suggest that while radical redesigns may face resistance, subtle adjustments that balance comfort and accessibility could improve the semi-autonomous driving experience.

To strengthen and validate these qualitative insights, I will be conducting a survey to quantitatively verify the findings and test their broader relevance.

SEMI-STRUCTURED INTERVIEW FINDINGS

The semi-structured interview with Yueteng, a PhD candidate at CARRS-Q, QUT, provided valuable insights into the challenges of human–machine interaction in SAE Level 3 automation. His research focuses on multimodal human–machine interfaces (HMIs) that enhance safety and user experience. Find the interview transcript in appendix G.

One of the key points raised was the difference in driver attention between regular and automated driving, illustrated in Figure 10. In conventional driving, the driver's attention demand remains consistently high, whereas in automated driving attention drops significantly during non-driving activities and must rapidly spike during a takeover request. This steep increase creates a vulnerability, as drivers are often unprepared to regain situational awareness within the short timeframe required.

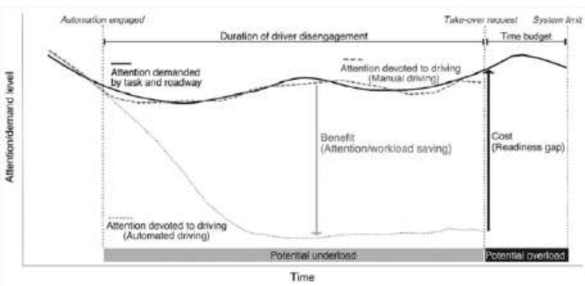


Figure 10 - Demand level between regular driving and semi-autonomous driving

The interview also highlighted that takeover requests (TORs) should be understood as a process rather than a single moment. This process involves multiple phases: pre-transition (when the driver is engaged in secondary tasks), request-to-intervene, physical takeover, and stabilisation of the vehicle. Supporting the driver across these phases is crucial to reducing risk and improving handover quality.

Another recurring theme was the problem of trust. Over-trust can lead to unsafe disengagement, such as attempting to nap or ignoring road conditions, while under-trust discourages drivers from using the system at all. Achieving the right balance requires communication that is clear, consistent, and context sensitive.

Finally, Yueteng emphasised that steering wheel design should not only accommodate handover but also serve as a medium for delivering multimodal cues such as haptics, lights, and audio. These cues become especially effective when they align with the driver's mental model of how the system operates.

Takeover is a multi-phase process involving pre-transition, intervention, takeover, and stabilisation. Each phase requires clear system support, highlighting that TORs are not a single event but a managed sequence.

Attention drops dramatically in automated mode and must be actively managed to prevent unsafe spikes in workload. Smooth transitions and pre-emptive cues are vital to re-engage the driver effectively.

Both over-trust and under-trust present risks. Over-trust can lead to complacency and misuse, while under-trust discourages engagement with the system. HMI design must therefore carefully balance communication to calibrate trust appropriately.

TOR effectiveness depends on timing, modality, and clarity. Escalation should be gradual yet decisive, with multimodal cues reinforcing urgency without inducing panic.

SURVEY FINDINGS

Building on the insights from the observations and interview, a survey was developed to quantify key themes. The survey had 37 participants and focused on driver habits, takeover request preferences, trust and transparency, and steering wheel form, allowing trends identified in the qualitative research to be measured more broadly. Figure 11 shows the age dispersion of survey participants. See appendix E for raw survey data.

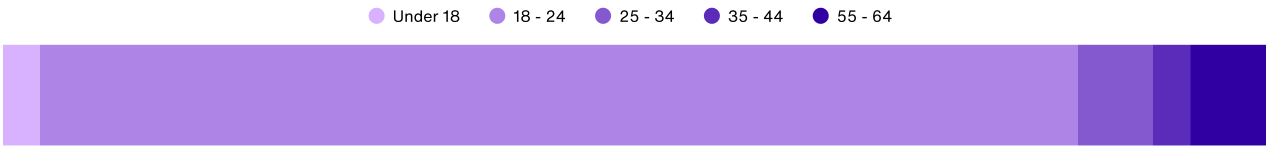


Figure 11 - Survey participant age dispersion

For driver habits, participants indicated they would most often use autonomous mode in long highway trips and stop-and-go traffic, with engagement in low-effort secondary tasks such as phone use, listening to music, or talking to passengers being most common. This aligns with literature suggesting drivers favour familiar and low-risk activities during disengagement. This is also backed up by figure 12, demonstrating that the top 4 activities done by passengers would be limited distraction tasks. This also confirms observations such as many drivers would use their phone, neglect napping and using a laptop.

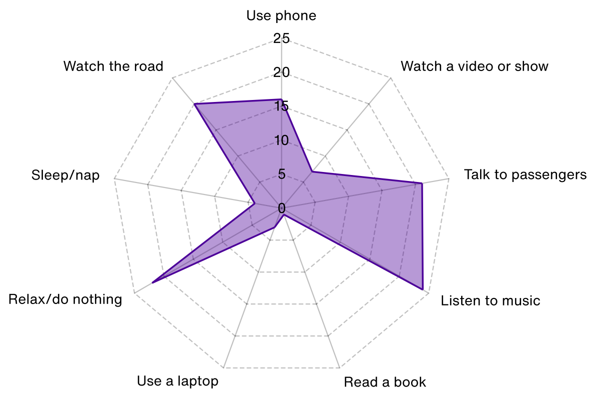


Figure 12 - User habit in autonomous mode radar chart

When asked how they preferred to be alerted for a non-urgent TOR, over half (51%) preferred a multimodal combination of sound, visual, and haptic cues. Sound alone (14%) or visual alone (11%) were much less popular, reflecting the need for redundancy in alerts.

For delivery style, 54% favoured a gradual escalation (gentle cues that intensify if ignored), while 26% preferred sudden alerts and 20% wanted dynamic severity-based alerts. This indicates that participants value clarity but dislike being startled, aligning with literature and observation trends advocating smooth, predictable transitions.

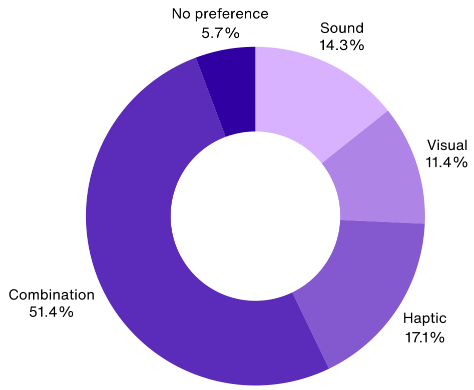


Figure 13 - Preferred alert method in a TOR

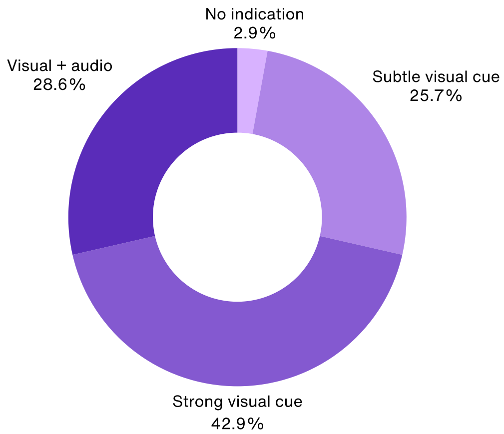


Figure 14 - Preferred level of AV transparency

For the third theme; driver trust and transparency, participants expressed strong interest in knowing the vehicle's intended actions. 43% wanted a clear display of upcoming manoeuvres, and 29% preferred combined visual and audio cues, with only 3% preferring no indication (figure 14).

When asked directly about importance of understanding the AV's intended actions, 49% rated it "very important" and 17% "extremely important." These findings reinforce the high value drivers place on transparency, as seen mentioned in earlier observations and in the interview.

When asked about wheel positioning in autonomous mode, the overwhelming majority (71%) preferred it to stay in the normal driving position, while 26% supported a slight adjustment out of the way. Very few wanted a fully retractable wheel (3%).

On wheel form, most respondents were cautious: 46% were neutral, while only 20% were willing to accept unconventional forms such as a Tesla-style yoke. This suggests that while participants are open to minor ergonomic improvements, strong attachment to traditional steering wheel forms persists. This trend follows the findings within the observations.

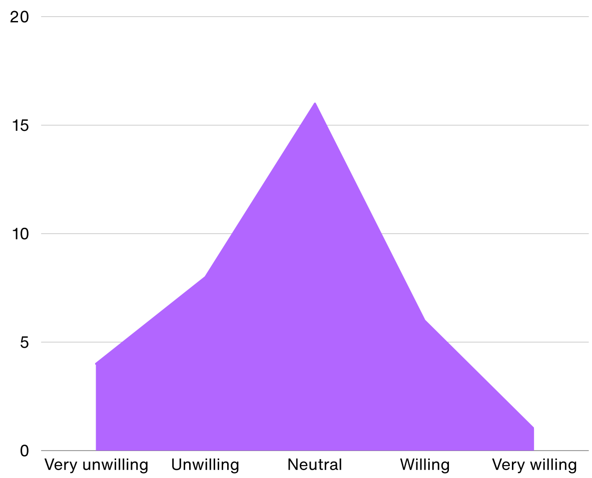


Figure 14 - Willingness to take on a non-traditional wheel

DISCUSSION

The findings from this research support what was outlined in the background research while also adding new knowledge about user habits and preferences for semi-autonomous driving. The literature focussed heavily on best practices for takeover requests (TORs), trust calibration, and system transparency, while the first-hand research provided insight into what people actually do and prefer. The middle two themes, TOR reactions and trust/transparency, were consistent across both literature and research, while the first and last themes were driven more by participant habits and opinions.

Themes two and three aligned closely with prior studies. Participants emphasised that TORs should be carefully calibrated to attention and urgency, with gradual escalation and multimodal cues proving most effective. Similarly, system transparency was viewed as essential for maintaining trust without tipping into over-trust or under-trust.

The first-hand research findings add the most value is in themes one and four. Initially, I expected participants to use autonomous mode for highly distracting tasks such as laptop work or sleeping. However, both observations and surveys showed most would engage only in mildly distracting activities such as using their phone, listening to podcasts, or casual conversation. In terms of steering wheel form, most participants preferred traditional forms and were resistant to unconventional concepts like yokes. This contradicts the benchmarking analysis, which showed concept vehicles trending toward minimal or radical designs. Familiarity and clarity may explain these preferences. The positive reception of retro-modern concepts such as Hyundai's N Vision 74 supports the idea that innovation paired with familiarity may be more widely accepted.

Additional insights emerged from observations, as drivers claimed the steering wheel was not obstructive, when they switched to the passenger seat they brought their knees up essentially where the steering wheel would sit. This suggests that users may underestimate potential ergonomic benefits of more flexible wheel forms due to what they are familiar with, leaving space for innovative but carefully framed solutions.

There are limitations to acknowledge. The survey sample was skewed toward the 18–24 age bracket, limiting generalisability, though this group is most likely to experience semi-autonomous driving as normal in their lifetime. Participants for the observations were also industrial design students, whose openness to innovation may not reflect the wider public. Despite this, triangulation across interviews, observations, and surveys strengthened the findings overall.

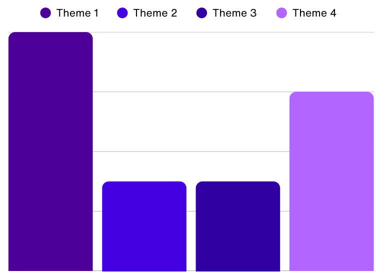
DESIGN IMPLICATIONS

The findings from the research highlight that the steering wheel design must address all four themes identified in this study: driver habits, TOR reactions, trust and transparency, and steering wheel form. Each theme brings its own challenges and opportunities, and while some implications are more heavily weighted toward one theme, most span across multiple. The chart next to each implication shows the severity of each theme.

1	2	3	4
Driver Habits	**TOR Reactions**	**Driver Trust & Transparency**	**Steering Wheel Form**

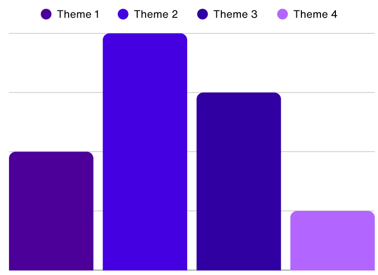
MAINTAIN VISIBILITY OF THE WHEEL WHILE OPTIMISING SPACE

Findings showed that most participants did not want the wheel to fully disappear, as its presence provides reassurance and quick access during a TOR. A wheel that slides back or changes size could give more legroom and comfort without undermining trust. However, following emerging industry trends, a fully retractable wheel into the dash could also be explored as a radical alternative.



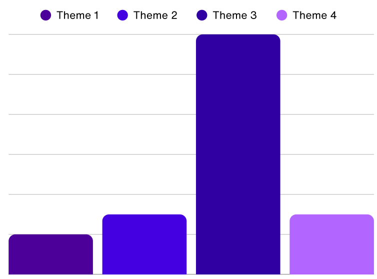
PREDICTIVE CUES AND ATTENTION MAINTENANCE

Observations, surveys, and the interview all highlighted the sharp gap between driver disengagement and takeover readiness. To bridge this, the steering wheel should use predictive and progressive cues that build attention before a TOR. Subtle movements, grip lighting, HUD projections, or pulsing patterns could signal upcoming control changes keeping attention levels high.



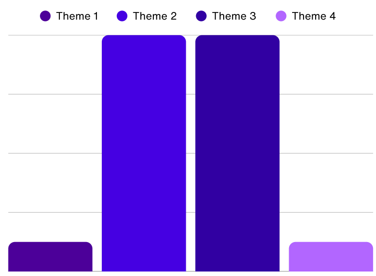
REINFORCE TRUST WITH TRANSPARENT VEHICLE INTENTIONS

Trust and transparency emerged as critical from both literature and firsthand research. Predictive HUDs, interactive wheel displays, or route projections could show drivers what the vehicle intends to do (lane change, braking, overtaking). This helps prevent under-trust, which is a common pattern in observations and surveys.



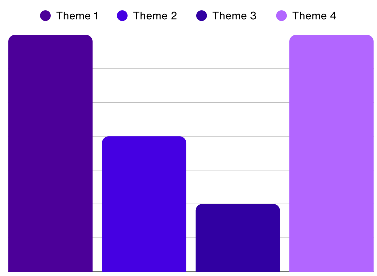
PROVIDE MULTIMODAL, CONTEXT-AWARE TOR COMMUNICATION

Drivers preferred adaptive warnings that adjust to urgency and user state. Combining haptic, visual, and audio cues with AI situational analysis and driver-monitoring cameras could ensure TORs are not overwhelming but still capture attention effectively, while the AI could communicate vehicle intentions.



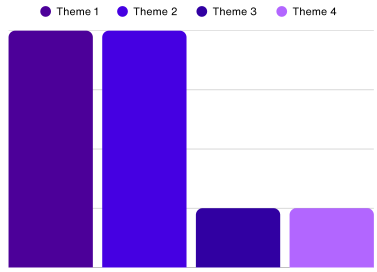
SUPPORT SECONDARY TASKS WHILE KEEPING ROAD IN PERIPHERAL VISION

Most observed habits involved mild distractions such as phone use or conversation. Designing integrated holders for phones or media displays on the wheel with the road in peripheral vision would allow drivers to engage in these tasks without fully disconnecting from the driving environment, or integrating HUD.



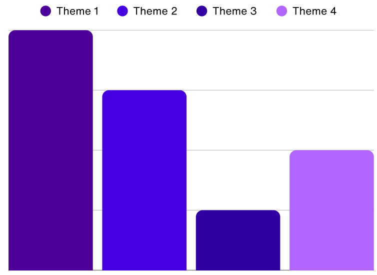
ADAPT THE DRIVER'S ENVIRONMENT DYNAMICALLY

Participants often discussed seating comfort. Automatically reclining or swivelling the seat during autonomous mode, then moving it upright during a TOR, could enhance relaxation without compromising readiness. Subtle shifts toward the centre console could also support conversation and reduce neck strain.



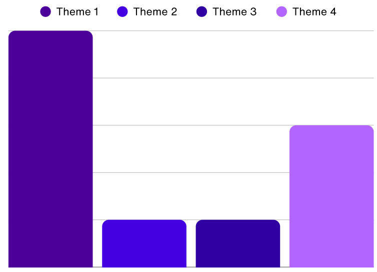
FACILITATE QUICK MANAGEMENT OF DISTRACTIONS DURING TOR

Several participants highlighted the difficulty of quickly putting aside items like laptops, food, or phones during takeover. Adding smart storage pockets or a quick "drop zone" in the centre console could give drivers a safe place to stash items when alerted to retake control.



INTEGRATE WORKSTATION FEATURES FOR LONG AUTONOMOUS TRIPS

While most participants engaged in mild tasks, some said they would consider using a laptop or eating food on long drives. An extendable table or side-mounted workstation could accommodate this need safely, especially when paired with predictive TOR alerts to give drivers time to store devices before resuming control.



CONCLUSION

This research report examined the human–machine interaction challenges of Level 3 semi-autonomous driving with a focus on the BMW M8 steering wheel. A triangulated research approach was applied, combining observations, an expert interview and a survey to build a well-rounded understanding of user experience. The study was structured around four key themes: driver habits, takeover request (TOR) reactions, trust and transparency, and steering wheel form.

Findings showed that most users engaged in light tasks such as phone use, music or conversation rather than highly distracting behaviours. This indicates that steering wheel design should support mild activities while keeping drivers prepared to retake control. Insights from the expert interview reinforced the importance of attention management, noting that TORs should not only escalate gradually but also anticipate lapses in driver focus. Participants across methods preferred multimodal cues that provided clarity without inducing sudden stress. Trust in automation was conditional, with users more confident when the vehicle communicated its intentions through predictive signals. Preferences for wheel form remained conservative, with most favouring traditional shapes but open to small ergonomic changes or retractable adjustments for comfort.

These findings highlight the need to address driver habits, TOR design, transparency and wheel form as interconnected factors rather than in isolation. Together, these themes informed the design implications section, which provides a foundation for future development of the semi-autonomous BMW M8 steering wheel.

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APPENDIX

APPENDIX A - WEIGHTED DECISON MATRIX

System / Car	Visual (3)	Auditory (2)	Tactile (3)	HUD (3)	Other/Comfort (1)	Weighted Total (out of 60)
Mercedes EQS (L3)	5×3=15	5×2=10	5×3=15	5×3=15	3×1=3	**58**
BMW 7 Series (L3)	5×3=15	4×2=8	5×3=15	5×3=15	3×1=3	**56**
Honda Legend (L3)	4×3=12	4×2=8	2×3=6	3×3=9	2×1=2	**37**
Tesla Model S Yoke (L2)	4×3=12	3×2=6	2×3=6	2×3=6	2×1=2	**32**
GM Cadillac Escalade (L2)	4×3=12	4×2=8	4×3=12	4×3=12	2×1=2	**46**
Ford F-150 (L2)	4×3=12	4×2=8	4×3=12	4×3=12	2×1=2	**46**
Audi Q6 e-tron (L2)	4×3=12	4×2=8	3×3=9	4×3=12	2×1=2	**43**
Hyundai Ioniq 6 (L2)	4×3=12	4×2=8	4×3=12	4×3=12	2×1=2	**46**
Lexus LS (L2)	4×3=12	4×2=8	4×3=12	5×3=15	3×1=3	**50**
Li Auto L9 (L2+)	5×3=15	4×2=8	4×3=12	5×3=15	3×1=3	**53**

APPENDIX B - SURVEY QUESTIONS

DEMOGRAPHICS
What is your age group?

How many years of driving experience do you have?

THEME 1: DRIVER ENGAGEMENT / DISENGAGEMENT BEHAVIOURS
When would you use an autonomous driving mode (where the car drives itself and you don't need your hands on the wheel or eyes on the road, but you must still be ready to take over)?

How often would you use this autonomous driving mode?

When using this autonomous mode (hands and eyes off, but ready to take over), what activities would you most likely do? (Select up to 3)

THEME 2: TOR RESPONSE & ALERT PREFERENCES
If the car requests you to take over control (not urgently), which alert method would you prefer?

How would you prefer a takeover request (TOR) to be delivered?

THEME 3: DRIVER TRUST, TRANSPARENCY & SYSTEM COMMINICATION
When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?

How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?

THEME 4: STEERING WHEEL DESIGN & ERGONOMICS
During autonomous mode, how would you prefer the steering wheel to be positioned?

If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?

APPENDIX C - OBSERVATION QUESTION SHEET

Name and Participant Number:

Environment Checklist

- M8 turned on
- Camera set up and recording
- Documents signed

Induction

Welcome, thank you for taking part today. This session will run for about 20 minutes in total.

Here's how it will work:

- One of you will start in the driver's seat and the other in the passenger seat.
- After 10 minutes, you'll swap seats so that both of you get a turn in the driver's seat.
- Please feel free to interact naturally — talk to each other and do what you think you would normally do if the car were driving itself.
- In the first 5 mins I'll be more observant, and in the last 5 minutes of each turn, I'll begin asking some questions. Think of this almost like an enactment focus group — I want to hear your thoughts while you're experiencing the scenario.
- You're also welcome to use personal items if you think that's realistic for you, such as your phone, laptop, or a book.

GET THEM IN THE CAR AND START RECORDING

Now make yourself comfortable, change the seat and wheel, and now imagine you're on a wide, well-marked highway you drive often. Traffic is heavy and moving slowly and you're on your commute from work. It's a clear day, good visibility, and your car has an automation system that can drive completely on autopilot. And you legally don't need to keep your hands on the wheel or eyes on the road during autonomous mode, but you must be ready to take over within 10 seconds if the car alerts you (this is if roadworks is detected and other reasons). Let's get started, I'll just observe you guys from here and at some point, I will ask you to take over the driving.

Observations

1. Posture & body orientation (are they leaning back, legs up, relaxed, sleeping, do they shift posture when told to take over, are there any things that make them look uncomfortable)
2. Hands (where are the hands going, on wheel, phone, down by side, when told to where they put their hands when they get told to take over)
3. Head & gaze direction (where are they looking, are they looking out the window or mirrors at all, sleeping with head to the side, are they turning to the passenger)
4. Engagement (do they fidget, phone, chat, work-like behaviours, how quick are they to focus on the road when told so, is it light distraction or deep engagement)

Questions

Broad / General Experience

1. What are your overall thoughts on the car driving itself and what did you find yourself doing?
2. If you had a semi-autonomous car and you made this commute daily, what do you think you would do while in autonomous mode?
3. How do you think could the car better accommodate that (activity they are doing)?
4. In general, what do you think would make your experience more enjoyable in autonomous mode?
5. Would you ever consider having a nap if the car was in control?

Takeover & Trust

6. How would you feel when asked to take control when you are completely distracted?
7. What would make the takeover process easier or more comfortable?
8. What sort of warnings would you ideally want to receive in that situation — lights, sounds, vibrations, visual cues or a combination?
9. Would you find it beneficial if the car gave you a built-up warning or visual countdown before the takeover request?
10. How transparent would you want the system to be? For example, if the car was about to change lanes or slow down, would you want a signal to notify you?

Steering Wheel Design / Physical Comfort

11. How did you feel about the positioning of the wheel in autonomous mode?
12. Would you find it beneficial if the steering wheel could tuck away when not in use?
13. Do you feel legroom is an issue when the car is driving itself?
14. Would you feel comfortable if the wheel had a different shape (e.g., rectangular) to give you more legroom?
15. Would you prefer the steering wheel to move/turn with the car in autonomous mode, or stay still?

Extras

16. Would you speak to the passenger most of the time if there was one?
17. If you were alone, what do you think you would do differently?
18. Would you feel safe letting the car drive itself, or will you still be alert?
19. Is there anything that would make you trust the car more in autonomous mode, or have better peace of mind?
20. Would you prefer alerts to be subtle and less intrusive, or very noticeable even if they feel disruptive?
21. If this was your BMW M8 or another sports car that had an autonomous mode, how important would it be that the steering wheel still felt sporty and typical, rather than an unconventional shape?
22. And when do you think you would use this autonomous mode?

Post Experience Summary

APPENDIX D - INTERVIEW QUESTION SHEET

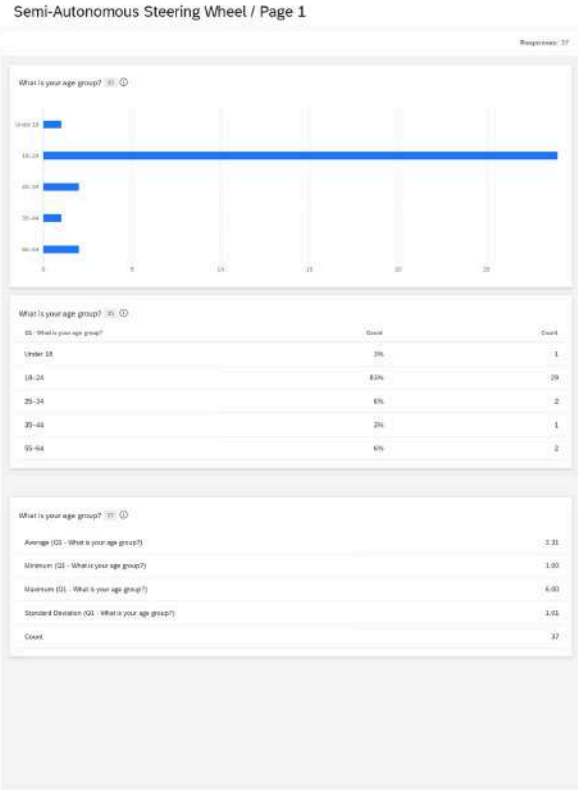
Yueteng Yu Question Sheet

Yueteng is currently a PhD candidate at CARRS-Q, QUT. His research is devoted to advancing the Human-Machine Interface (HMI) in automated vehicles. Specifically, it seeks to generate new knowledge about designing **multimodal HMIs** to optimise safety and user experience effectively. He has practical experience in evaluating automotive interfaces in **driving simulators, test-track** and has conducted studies on drivers and passengers in real-road urban scenarios. He also has experience organising human-centred, multimodal data collection studies with an autonomous vehicle.

Questions

1. Can you give me a quick rundown of your PhD research and some of the key findings so far?
2. In the real-road studies you have conducted, what are some interesting things you discovered about human behaviour in AVs?
3. From your research, what do you think are the key strengths and weaknesses of multimodal HMIs (visual, audio, haptic) in automated vehicles?
4. Based on your studies, what makes a takeover request most effective — in terms of timing, modality, or the way cues are combined?
5. Have you noticed differences in how drivers respond to HMI cues in simulators compared to test-tracks or real-road scenarios?
6. From your experience, what are the most effective ways to balance safety-critical information with maintaining a positive user experience?
7. What emerging HMI technologies (e.g., AR overlays, adaptive haptics, AI-driven personalisation) do you think have the most potential for AVs?
8. What are your key considerations I should have when designing a steering wheel for a semi-autonomous vehicle?

APPENDIX E - SURVEY RAW DATA



Semi-Autonomous Steering Wheel / Page 1

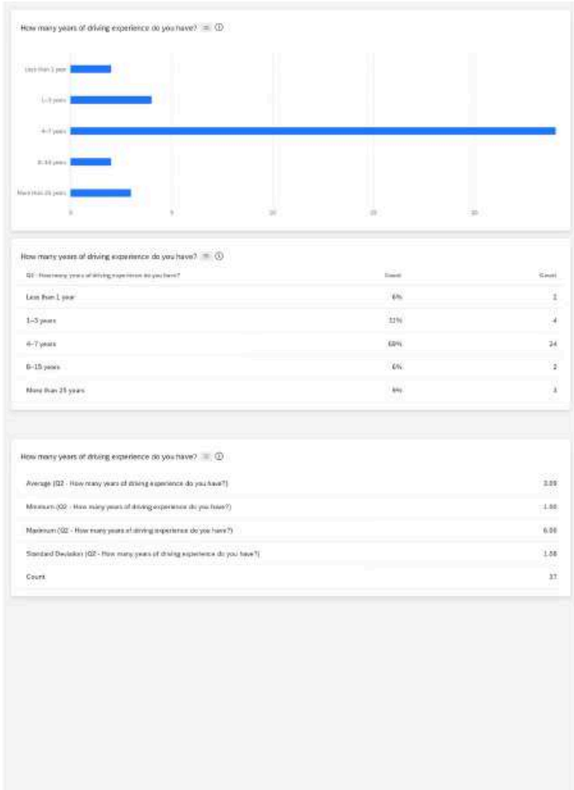
Responses: 37

What is your age group?

Q1 - What is your age group?	Count	Count
Under 18	3%	1
18–24	83%	29
25–34	6%	2
35–44	3%	1
55–64	6%	2

What is your age group?

Average (Q1 - What is your age group?)	2.31
Minimum (Q1 - What is your age group?)	1.00
Maximum (Q1 - What is your age group?)	6.00
Standard Deviation (Q1 - What is your age group?)	1.01
Count	37

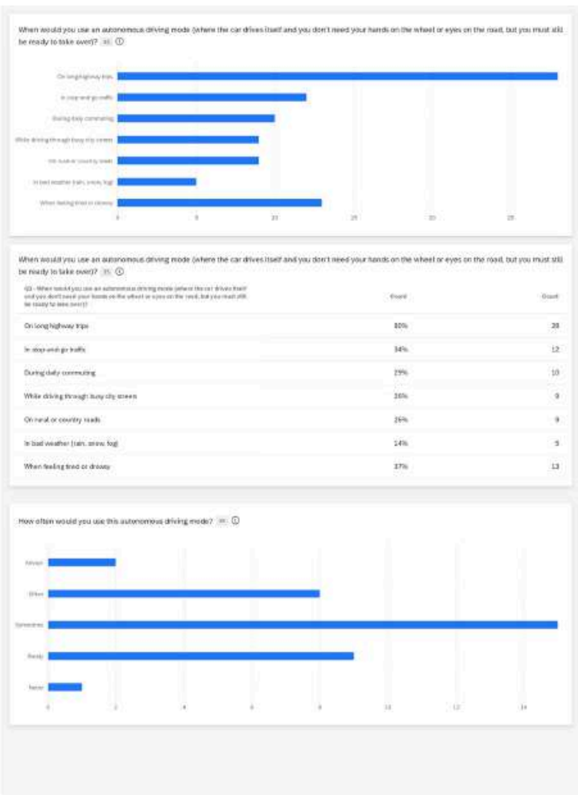


How many years of driving experience do you have?

Q2 - How many years of driving experience do you have?	Count	Count
Less than 1 year	6%	2
1–3 years	11%	4
4–7 years	69%	24
8–15 years	6%	2
More than 25 years	9%	3

How many years of driving experience do you have?

Average (Q2 - How many years of driving experience do you have?)	3.09
Minimum (Q2 - How many years of driving experience do you have?)	1.00
Maximum (Q2 - How many years of driving experience do you have?)	6.00
Standard Deviation (Q2 - How many years of driving experience do you have?)	1.08
Count	37



When would you use an autonomous driving mode (where the car drives itself and you don't need your hands on the wheel or eyes on the road, but you must still be ready to take over)?

Q3 - When would you use an autonomous driving mode (where the car drives itself and you don't need your hands on the wheel or eyes on the road, but you must still be ready to take over)?	Count	Count
On long highway trips	80%	28
In stop-and-go traffic	34%	12
During daily commuting	29%	10
While driving through busy city streets	26%	9
On rural or country roads	26%	9
In bad weather (rain, snow, fog)	14%	5
When feeling tired or drowsy	37%	13

How often would you use this autonomous driving mode?

How often would you use this autonomous driving mode?

Q4 - How often would you use this autonomous driving mode?	Count	Count
Always	6%	2
Often	23%	8
Sometimes	43%	15
Rarely	26%	9
Never	3%	1

How often would you use this autonomous driving mode?

Average (Q4 - How often would you use this autonomous driving mode?)	2.97
Minimum (Q4 - How often would you use this autonomous driving mode?)	1.00
Maximum (Q4 - How often would you use this autonomous driving mode?)	5.00
Standard Deviation (Q4 - How often would you use this autonomous driving mode?)	0.91
Count	37

When using this autonomous mode (hands and eyes off, but ready to take over), what activities would you most likely do? (Select up to 3)

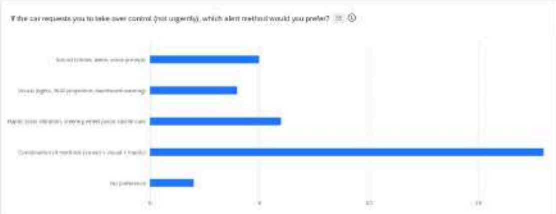
When using this autonomous mode (hands and eyes off, but ready to take over), what activities would you most likely do? (Select up to 3)

Q5 - When using this autonomous mode (hands and eyes off, but ready to take over), what activities would you most likely do? (Select up to 3)	Count	Count
Use phone	46%	16
Watch a video or show	20%	7
Talk to passengers	60%	21
Listen to music/podcast	69%	24

APPENDIX E - SURVEY RAW DATA

Q5 - When using fully autonomous mode (hands and eyes off, but ready to take over), what activities would you most likely do? (Select up to 3)	Count	Count
Read a book/magazine	3%	1
Use a laptop	9%	3
Relax/do nothing	63%	22
Sleep/nap	11%	4
Watch the road	57%	20

If the car requests you to take over control (not urgently), which alert method would you prefer?



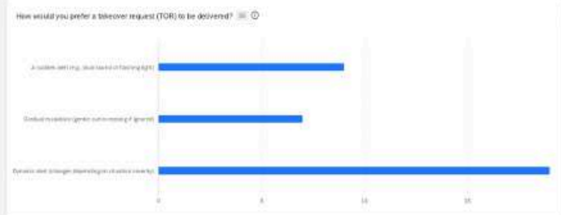
If the car requests you to take over control (not urgently), which alert method would you prefer?

Q6 - If the car requests you to take over control (not urgently), which alert method would you prefer?	Count	Count
Sound (chime, alarm, voice prompt)	14%	5
Visual (lights, HUD projection, dashboard warning)	11%	4
Haptic (seat vibration, steering wheel pulse, tactile cue)	17%	6
Combination of methods (sound + visual + haptic)	51%	18
No preference	6%	2

If the car requests you to take over control (not urgently), which alert method would you prefer?

Average (Q6 - If the car requests you to take over control (not urgently), which alert method would you prefer?)	3.23
Minimum (Q6 - If the car requests you to take over control (not urgently), which alert method would you prefer?)	1.00
Maximum (Q6 - If the car requests you to take over control (not urgently), which alert method would you prefer?)	5.00
Standard Deviation (Q6 - If the car requests you to take over control (not urgently), which alert method would you prefer?)	1.17
Count	37

How would you prefer a takeover request (TOR) to be delivered?



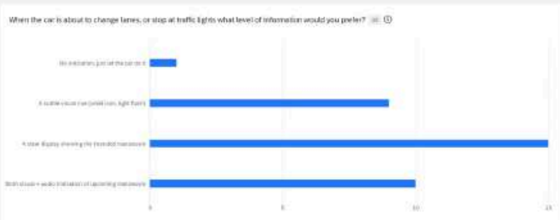
How would you prefer a takeover request (TOR) to be delivered?

Q9 - How would you prefer a takeover request (TOR) to be delivered?	Count	Count
A sudden alert (e.g., loud sound or flashing light)	26%	9
Gradual escalation (gentle cue increasing if ignored)	20%	7
Dynamic alert (changes depending on situation severity)	54%	19

How would you prefer a takeover request (TOR) to be delivered?

Average (Q9 - How would you prefer a takeover request (TOR) to be delivered?)	2.29
Minimum (Q9 - How would you prefer a takeover request (TOR) to be delivered?)	1.00
Maximum (Q9 - How would you prefer a takeover request (TOR) to be delivered?)	3.00
Standard Deviation (Q9 - How would you prefer a takeover request (TOR) to be delivered?)	0.85
Count	37

When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?



When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?

Q11 - When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?	Count	Count
No indication, just let the car do it	3%	1
A subtle visual cue (small icon, light flash)	26%	9
A clear display showing the intended manoeuvre	43%	15
Both visual + audio indication of upcoming manoeuvre	29%	10

When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?

Average (Q11 - When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?)	2.97
Minimum (Q11 - When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?)	1.00
Maximum (Q11 - When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?)	4.00
Standard Deviation (Q11 - When the car is about to change lanes, or stop at traffic lights what level of information would you prefer?)	0.81
Count	37

How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?

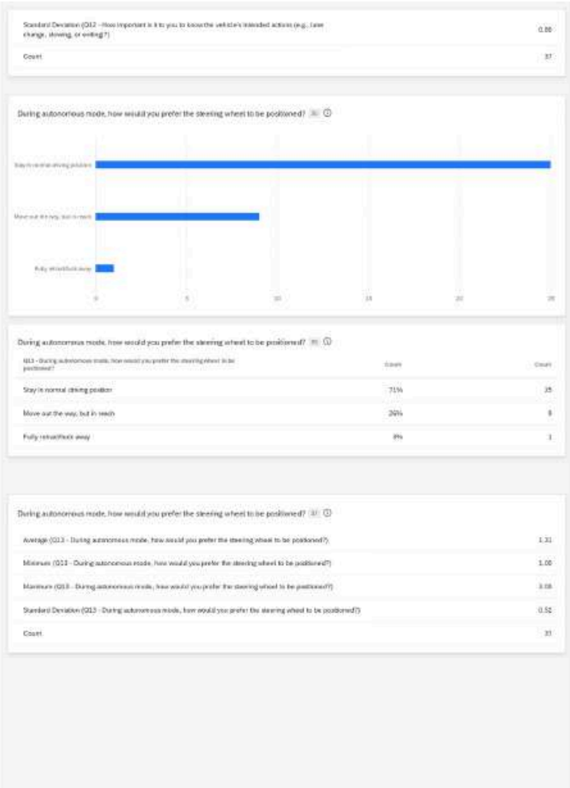
How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?

Q12 - How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?	Count	Count
Slightly important	6%	2
Moderately important	29%	10
Very important	49%	17
Extremely important	17%	6

How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?

Average (Q12 - How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting?))	2.77
Minimum (Q12 - How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting?))	2.00
Maximum (Q12 - How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting?))	5.00

APPENDIX E - SURVEY RAW DATA



Standard Deviation (Q12 - How important is it to you to know the vehicle's intended actions (e.g., lane change, slowing, or exiting)?)	0.88
Count	37

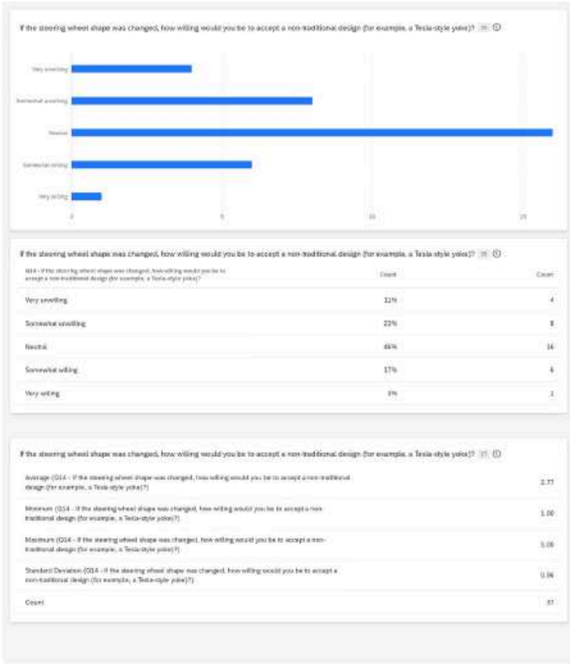
During autonomous mode, how would you prefer the steering wheel to be positioned?

During autonomous mode, how would you prefer the steering wheel to be positioned?

Q13 - During autonomous mode, how would you prefer the steering wheel to be positioned?	Count	Count
Stay in normal driving position	71%	25
Move out the way, but in reach	26%	9
Fully retract/fold away	3%	1

During autonomous mode, how would you prefer the steering wheel to be positioned?

Average (Q13 - During autonomous mode, how would you prefer the steering wheel to be positioned?)	1.31
Minimum (Q13 - During autonomous mode, how would you prefer the steering wheel to be positioned?)	1.00
Maximum (Q13 - During autonomous mode, how would you prefer the steering wheel to be positioned?)	3.00
Standard Deviation (Q13 - During autonomous mode, how would you prefer the steering wheel to be positioned?)	0.52
Count	35



If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?

If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?

Q14 - If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?	Count	Count
Very unwilling	11%	4
Somewhat unwilling	22%	8
Neutral	46%	16
Somewhat willing	17%	6
Very willing	3%	1

If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?

Average (Q14 - If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?)	2.77
Minimum (Q14 - If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?)	1.00
Maximum (Q14 - If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?)	5.00
Standard Deviation (Q14 - If the steering wheel shape was changed, how willing would you be to accept a non-traditional design (for example, a Tesla-style yoke)?)	0.96
Count	35

APPENDIX F - OBSERVATION TRANSCRIPTS

Observation 1
Yeah, grab your laptop. I just go okay. tell me about a jaggle. Yeah, Yeah, yeah, definitely. The's long. Jag. Oh, it's just 40 years Holy. This is so low. So a little comfortable, the seat in the steering wheel you wish. Oh, well, everything will be automatic, okay's.'s this thing looking? Hey? What's this thing? Oh, it's like a set. So, like, it sets your seat in a position. Oh, does it? Oh.. Oh, what the hell? There you go. Right.. Let's imagine. traffic is heavy and moving slow slowly. You're on your commute from work. It's a clear day, good visibility, and your car has an automation system that can drive completely on autonomous mode. But you must be ready to take over within 10 seconds if the car alerts. This is if roadworks is detected or anything like that. All right, let's get started. Harry, you're driving. Let's go. What are you doing if you're driving right now? Getting work done. And then bang, you've put an autonomous mode.. You, Harry. Ew. Wait, so, when does the... when do I have to flick it into normal mode? No, just pretend you just driving it normally, and then I'll give you a warning if you've gotta like switch it back... So do you reckon you'd be comfortable using your computer with your daughter? That's what I. I.. I guess it depends, like, how much work I need to get done. Yeah. Like, say if I'm, like, oh, I got a deadline, I'm, like, I'm feeling a little risky. Yeah. But if, like, I don't need to, I won't. Yeah. Or, if I had just got, like, an idea, like, I got a research, yeah. Probably more likely my phone, though. Right now, bang, 10, nine, seven, six. Oh, where do you put your laptop? Three, two, one, and bang on. You on the road. you're gone around the roadwork, and now's a little more timeous. You need somewhere to put the laptop there. Yeah, I need a laptop holder. Or your laptop holder. Remember that. I like a fabric, though. A fabric's. I wonder if it's all real leather. All right, there's a little tan accent. Yeah, it's very good. I's like, oh, the backseat will be cramped. Yeah.. But it looks actually really cosy. Yeah. Okay, if you had this if you had an autonous car. Yeah, what do you reckon you would do like, if you had a daily commute? Do you reckon maybe something you do different or do you reckon you just go on your laptop? Laptop and phone. Laptop and phone? Yeah. you get motion sick? No, I don't get motion sick.. And then maybe, like, if I'm really feeling it, I might read a book. Yeah.... Yeah, I got like my mart and in the middle. formative. Or, yeah, I'll be looking around, I'll listen to like a podcast or something. Yeah. Okay, okay. All that's, would you ever have a nap? Would I ever have a nap? It just driving. No. Maybe like driving home from the Gold Coast, like if I really have to. Yeah. 'Cause you legally can't. Damn. But you just gotta take over in 10 seconds. So what wakes you up? Well, How would you feel when us to take control if you were completely distracted? Let's say you were sleeping and bang, bang, would you get stressed or do you reckon you'd be sleep? if I wake up and I hear, like, 3, 2, I'm like, oh shit. But if it's still like 10, nine I'm like, "O, okay, okay. So, like, I feel like you've gotta have have, like, the most effective method of waking you up. Um, like, right on the 10 mark or before it starts doing the countdown. Yeah. Yeah, cool. So that's what I was going to say, what sort of visual ideally one? I reckon shaking. I reckon like shaking my seat. Shaking. And sound and sound like... Shaking your seat. But not like an alarm sound where it's like, oh, crap, like I'm about to poop myself. I reckon something just like that can wake you up.. But not, like, threatening. Yes, I'. Maybe, maybe, um, I had a trip to Disneyland once and it was like a bug's life theme thing. Yeah. And it was like for the interactive. And when like bugs would, the bugs would pop up on the stage or on the screen, your seat would poke you? Right. Like, I reckon, and 'cause that's such a weird feeling, I feel like that could wake you up. Yeah.'Cause it's really uncomfortable, especially if it goes up the bum that haven't... Yeah.. Yeah. Something pokes you on the bum to wake you up. Yeah. The steering wheel. Yeah. Did it feel in the way at all if you an autonomous mode? No way.. Would you prefer if it was tucked away or anything? Maybe if I could, like push it in so I can, like, get my laptop.. Because I can't really move back. I can only move down and up. And the down and up super slow. So with the 10 seconds, it's not, yeah. It's not. Yeah, if you could push it in, that would, I think. Um, was leg room ever an issue? Oh, I'll get heaps. Um, but do you mean just in cars in general?. No. It's that? Have you see like the Tes on it? That like, cut off with top off and Yeah. Yeah, that's. I feel like if you're a bigger fella, yeah? Yeah. Because actually, I'm gonna go higher so I can actually look over the steering wheel.Cause in this car, there's actually not much of a view. I feel like in this car it would be nice if that was cut off. Yeah. Yeah.Cause even like, you have to be, like, actually semi tall to have that not cut your view at all. Yeah. I'm hoping I didn't just block your camera.. If this was your MA sports autonous mode, how it be to you that the steering wheel for sporty and typical rather than unconventional? Um.. Sporting typical. So like, for example, like this kind of wheel we see, that's like a traditional circle, you know? Yeah. So it's like a rectangle or a different shape. I feel like just's long, just as long as the signifiers of where to hold it and it's comfortable is enough. Like, you know in design how we talk about signifiers, like, something that signifies how to use it. Yeah.. Yeah, so, like, if that, the top and bottom was cut off, I'd still know it's obvious. Just as long as I don't need to, like, do any extra steps, you know. So you? Yeah., sweet. Switch. Hey, Brooklyn, where's our consent format? Actually, the leg room getting in and out if this is at the top. Yeah. A little squish. The leg is it.

Observation 2
Oh, bro, there's. Yeah, see how it is the t? Oh, blood.? Yeah. No, this is probably good. Yeah. Yeah, yeah. I. You're a flex here. your f What am I driving in? Is a PMW. Yeah. On the way to Dubai. Have you seen all the Asian drivers? Yeah, they're the worst. The amount of views is ton of concerning. Like, to me, it is so small. The wind, yeah.y.. So pretend you're driving right now. Yeah. Look forward it on the road, how would you sit. Just in the acceler. Yeah. Yeah. Yeah. And then boom, you're in heavy traffic and you switch on autonomous mode. B? Yeah, just press out your bottom.. What are you doing?ing my phone out. your phone out?. Oh, yeah, that's. Uh. has the leg room feeling comfortable? You know what? There is enough leg room. Would you shift your knees off for anything? If I was in autonomous, I would. Yeah. Because I assume if you press down on the gas, this will be like cruise control where you just take over. Yeah. Yeah. So I'll just be on my phone. Watching YouTube. watching like, yes. holding it? you put it up somewhere? Yeah. I would, if there was a choice, I would leave it here. Have it on the steering wheel.'Cause, oh, or something like for my hand to rest on, you know what I mean?'Cause it will get tired when you looking down and not being receip it. nap? No, no. You think so. No. I don't nap in cars unless I'm that extremely tired or. unless someone that I trust is driving me. Yeah, yeah. So I don't think I would take a nap. So what would be like your maximum distraction? Max distraction? Would you ever work your laptop out? On. if it's like an hour and a half drive, maybe. If it's like 20 minutes, no. Yeah, but that would probably be my mass distraction. Watching Netflix is with something on my phone. If it's like a show that I'm into, I'll probably be distracted. Yeah. So I would want something that, like, I can still see the front in case it's out. Yeah. And let's say, yeah, I'm on my phone. And then let's say you get a warning, bang, you got to take over. What are you doing? I will probably keep this open and just chuck my phone there and keep driving. I want somewhere if I was to have a laptop like Harry did, I would want somewhere to put my laptop somewhere accessible. So, if you got a warning, what would be your ideal, do you? I like the vibration idea. We're gonna let the seat vibrates a little bit. I don't know, maybe like heat indicator on the wheel. Oh, yeah. lights or anything? Yeah, if lights would I shine on the wheel, because I say my phone's here, and it will alert me and that would, yeah. You looking in my direction? Yeah. It would indicate me off. I don't think I would like sound, just because, I don't know, if it's just happens that randomly, I'll get a bit, like shitted by Yeah, but there's sounds that don't shock you, though. Yeah, yeah, there's, there's some.. The thing is with the sounds, an issue companies have is if it's too like, irritating, then it can cause panic and then might, like, stress out crash. Yeah. They didn't just play chief keepers on when it is your takeover.. So yeah, do you reckon like a countdown would be good, or would you prefer like just takeover? If it sound, I would want something relaxing, like, maybe not counting countdown, but definitely not, like, takeover, takeover to. I want something like.. Just audio. Yeah, a nice slight alarm that I can wake up to, but it's gonna be quieter. Yeah. You know what I mean? Like a nice audio. Yeah. But yeah. And then how transparent would you want the system to be? So let's say if the car was slowing down or change changing remains, would that benefit you if you had a warning? If it was changing lane? it was showing you what it was going to do. Personally, I would prefer it not changingly lane, like, too often. You say you're on a highway. I prefer just staying in the same lane. But if that makes it a bit sl. Yeah. If it does change lane, I would. It would be fine not telling me, but I wouldn't want, like a sudden change. I want, like a subtle change, or if it tells me that would be good. And so because of that, you, let's say the string wall here you want that to turn with the car or you want that to stay still have your phone If I have my phone it, then I don't want it to move because I might get emotion sick. Yeah. Yeah. But if I didn't, if my phone was on it, I would be fine with it moving. Yeah. But if it moves, like, let's say my foot, my legs might, like, hit it, something, that might cause me to stress out a little bit, whether it changes changing. thing... Semic Colin as good as you use them all. So, if you were in the car's with Harry, do you reckon you'd be speaking to him? Yeah. Yeah. Yeah. Would you be doing that rather than on your phone? Yes, I would be more inclined to speak to people. Would you be looking at him or at the road? Him? Yeah? Yeah. I'd be doing, like, every once in now again, like, have a glance over, you know? Like every now and then, like. Yeah. Yeah. Because I think the biggest problem for me driving, like, just driving is I don't usually speak a lot. Yeah. Because I I'm pretty concentrated, but if I was the trust and system, I would probably turn around and talk to. You know what I mean? So, I'll ask you the same question. If you had this car, this MA, or like any other sports car, just sports likey Mustang or whatever, how important would it be to you that the wheel is like a cool shape? Or how open would you be to be in your next shape? I wouldn't mind it. I don't think the shape would actually affect me. I think it might be sick having something different. but there might be a standard that you have to hold up to like show this standards., but. But you wouldn't mind having an unional? No, no, I think it would be safe. Would you prefer an unconventional reel more or having more leg? Or just that? Yes. Yes. I think that would help a lot. Like, you know this race car driver you know how they have like the very tiny ones?. Yeah, those one would be sick, but I don't know. I will need to see it to decide whether I like it. You also still want to know, like hand rooms so there's options? Like, you don't want it like two, like only. Yeah, sometimes I want to have my hands up, you know. Why woulds the question? What would be beneficial a rectangle? Why would you reckon it's better than? I wouldn't want it to be a rectangle, but like. Well, like, it would be like Harry said, like, what's good about conventional driving whe is like you can hold it in a lot of different positions. They say, if it's like a more. race car shape, you can only hold it that way. You know what I mean? F one shape. See? That's a wrap. Easy. Daddy's face card or what? Yeah, with that pink eye. Yeah.

Observation 3
Not necessarily. So first?. Sweet. How's it feeling in there? Yeah, pretty good. Having not having a bucket seat for a minute.. bucket. Yeah, it's a bit of a deep one. Yeah, I know. It gets you down low, so your guest does its job. Alright, so make yourself comfortable, like you're gonna drive it Lovely stuff and whatever. Alright, so, imagine you're on a wide well mark tiway and you're driving often. traffic is heavy, moving slow, and you on your commute from work. Your car has automation system that can drive completely on the autopilot, and you legally don't even need to keep your hands on the wheels or eyes on the road during the automonomous mode, but you must be ready to take over within 10 seconds. Okay. If it tells you. So for example, if there's roadworks or something, it will tell you.. So let's get started. So I said you're driving, how would you go? The steering wheel's a little bit high, but it's okay. Can you change it? I think this. I wasn't sure. Okay. Oh, lovely. Thank you. Yeah, how do you. Yeah.. Yeah, just sort of sit here. Yes. I would say bang, you's an automous mode. Yep. And I myself. I mean, yeah, I've never really drove one, so sort of just sit. Just to hand on the cereal so I hand on the wheel the road. Would you on your phone? Probably not. No. No. Queensland drivers is not exactly an ideal situation. I don't know what any of these buttons do, but. I'll find out. It's my new navigation on the screen, probably. Yeah. Yeah. Okay. Hmm. I can look at like, engine data and stuff. Mm hmm. Navigation, okay. You can look more into, like, the car, vehicle status.. High pressure monitor, engine oil level. Check control. OK. That's pretty cool. Like, tells you, like, where you think. So reckon when you're in smoke, would you just sit back and watch the road? Yeah, honestly. Yeah, I'd still watch. Yeah. Yeah. Queensland drivers are interesting.. So I'm guessing, if it gives you a warning, saying, bing takeover, it' be sweet. Yeah, I'd be. Ont it. Yeah. Yeah. Um. Yeah, no, I'd sort of still be watching the road regardless. Yeah.. Yeah. I'd know. I'd drive a decent bit with cruise control, so I guess that's similar if you're sitting on like a sort of little bit of traffic on the highway. Same here. Other cruise. Yeah.. Yeah, exactly. It's not like, you can like, I don't know, stop other people from being silly. Yeah, so do you reckon if you used this automous mode, let's say you, if you used it daily on like good commute, do you reckon you do anything different or you reckon you just sit there and just relax? Honestly, not really. Like, I might be a little bit less focussed on the road, but outside of that, I don't believe so. Yeah.. Yeah, just because there's a lot of unpredictable drivers on the road. Yeah. It's also weird because the steering wheel's on the opposite side. Yeah, there's out. Yeah, no, because I thought I was getting into the passenger seat on this side, and then I was like, "Oh, you can take the driver's seat first." And I was like, "What?" Yeah. It's pretty cool, though. If there be anything in autonomous mode that would make the experience more enjoyable, so let's say it was took control of breings, driving, changing ways, everything. Do you reckon you'd like, there'd be any features that you'd want? Like, you know, pillow or you know, or whatever? Um, honestly, maybe like an option. I don't know if it's possible, but like for the seat to to change out of like a bucket seat because a bucket seat is like quite uncomfortable for like long periods of time. Yeah, I feel like that would be pretty cool. Like, if you could have a choice, but, I don't know. Yeah. Between bucket seat and non. Yeah. So you never have a nap? Probably not, no. Yeah, yeah. No, I don't I don't know. I feel like that would be pretty difficult. Yeah, I don't know how you'd wake up to that because if you're a bit jolty when you wake up and depending on how you coming out of, I guess, the automous moment, like if you jerk the steering wheel bit you might send yourself off the road. That's what I mean. That's a lot of the problem that they're looking at is when you alert someone too scared and they kind of f out and make a mistake, you know? Yeah. stresses them out. Could there be like a sensor that like trucks their eyes? So, like, if they're awake, you know, it only engages when they' awake, but if it's a asleep, it just automatically pulls over the side of the road and like wakes them up or something, that could be pretty cool. Or if, like, the person's obviously quite distracted and, you know, say, looking at their phone and not looking at the road, maybe, I don't know, like a timer. Yeah. Because, yeah, obviously not looking at the road for prolonged periods of time isn't ideal when you're driving. Yeah, yeah. So the maximum distract you would be, what do you reckon I would be?. I don't know. Like I might pull up. Like, I don't know, my car, I've got a phone holder that sits in there. What I might do is maybe like pull up a podcast or something and I don't know, just I'm distracted from the road, obviously pulling up that podcast or maybe, you know, I'm answering a call or something like that. Yeah. So, if you were in this situation, where you're maximum distracted, what warnings would you want in this situation? So, would you like lights, sound, or vibration, combination? It'd be cool if like I think vibration would work, but that obviously only works if like your hands on the steering wheel. So maybe like, you know, your seat vibrating a little bit. That could be an interesting one or if they's there's any possibility to you know, have like a light bar like going in between the seams or something and that just sort of flashes different colours because that way even, you know, if I'm looking over here and my hands aren't on the wheel because it's in autonomous mode, you know. maybe that sort of gets my attention. Would it benefit you if it had like a built up warning if it said it was saying, oh, you know, it gives you a countdown or it gives you like a, we're getting this close to need you to take over. Yeah, that would be good. beneficial? Yeah. if you just? I'd like a buildup, honestly, because yeah, I feel like dropping you straight in would be a little bit iffy. Yeah. Maybe like a gradual return to like driver control. So like, instead of going zero to 100, maybe like zero 50 and then like slowly like gradual buildup towards the end. So then like, obviously autonomous mode controlling your throttle and braking, you know, you don't have that such big jump when you go straight into between autonomous. I think that would be pretty cool.. But that would be more of like a system kind of thing. Yeah, yeah. And so let's you an automous. How transparent would you want the system to be? So let's say it was changing, but if it was slowing down, would it be important let you know what it's doing? Yeah. Yeah. Yeah. If possible, like a couple seconds ahead, just so I can be like, oh, you know, like, because I'm going to this place, or like, you know, my experience with on this road, maybe a P left lane is quicker than the right lane. because, you know, there's a left turn down here and the car's trying to get into the right lane because you got to turn right, you know, maybe a couple kilometres after, like, I don't know, maybe maybe a bit of like a yes, no option. Like after, say, you know, two, three seconds, it's like automatically goes with yes, but I don't know, maybe it's still an option to say no would be pretty cool though. Yeah, okay, cool. Um. So, when you were in autonomous mode and you would che him. Yep. How did you feel like about the positioning of the steering wheel? Does that bother you at all? Having it set up a little bit was.. I don't know, I do I naturally have, um.. my hands go to side of the wheelc I do a decent better track racing, but it's bring it, like, after bringing it down, it was quite comfortable. I mean, if you bring it up in autonomous mode, it sort of discourages hands on the wheel, depending on like your driving style as well. So would you find it would you personally find it beneficial if the steering wall could like tuck away or anything like that? That might just be a bit useless. Tucking away would be a little bit too far. Maybe making it, like, a little bit out of the comfort. So for me personally, because I like having the wheel down low, like having it up sort of like mentally, you know, makes me think of it being in an autonomous mode and as it's coming out, you know, coming back down. That could be pretty cool. So you reckon you'd find it to have the wheel grab? Yeah. Just in case there's like not enough time, you know, for it to give me that, you know, say, five, ten seconds between the switching between autonomous and manual. And do you reckon that's just from that room that you kind of? Um. Yeah, a little bit. I guess it's more so of the fact of, like, up here, it's uncomfortable, so I don't. Like, my hands have been sitting more down here, if anything. But, like, coming back down, it's more of like a visual sense of, you know, it's like you're going to have to take over control of the vehicles. soon, I guess. It's like a mental thing and in that sense, I'd assume. Yeah. So, if you had a passenger, like we did a bath.. Passenger princess.. You want to go Mackey's? Would you talking toous mode or dockon you on your phone? Yeah, we'd talking, be talking, yeah.. Yeah, honestly.. I mean, there's only so much you can do on your phone anyways. Yes. It'll be boring after like 10 minutes, so... Yeah, yeah, for sure. So, because you said you had you did a bit of your track, it's like sweet. So let's say this was your MA for another sports car, the M sports. Yep. How important would it be to you that the wheel is like kind of sporty and typical rather than an unconventional shape? Honestly, I feel like if I'd take this to track, I'd do a completely different steering wheel. What would you do? Instead of having it as a conventional round type, I'd prefer more of a, not really the conventional racing ones, I forgot the name of them, but the go-karting style of steering wheels. They're more of like a 10 yoke? Yeah, they're they're of like, they're not quite a yoke. They're more of like a circular yoke. I don't know how to explain it. It's very weird, but those ones are very, very comfortable and I've sort of made my own for all my vehicles. Sweet. Okay. So. You have to me after Yeah. It's, yeah, it's quite literally just that. And then it's sort of, you've still got your little curve at the top and bottom, but not as heavy. So it's more of a kind of an oval. Yeah, it's more of an oval with like those, like still you've got that geometry at the end and it's in a little bit. Solely because when you're turning some corners, it's easier to just drop your hand down a little bit and force that over if you've got such a heavy, you know, underster. And it's it gets, you know, if you're steering isn't working or, you know, if you broke your power steeringring, then it's quite heavy to turn, so you've got to get under and use that leverage. So I quite like it for that aspect.. I' choose.. No worries.,

APPENDIX F - OBSERVATION TRANSCRIPTS

Observation 4
Yeah, I know. It's a bit of a. It'd be cool if it was like an option, like you could stock change a wheel. Yeah. option. Yeah, exactly. So if you want to, you can take it on track. Yeah. Awesome sorts.. There we go. Yeah. Yeah, it's pretty close. I think. wheel. Yeah, how do you move the sea? Is it time from hobs on the side. Yeah. So that one.. Oh, yeahep, actually. Yeah, okay. That's goodge. Yeah. You' better have a like that. Yeah. So it's like bang you're driving along. And you're in traffic. I may as well put it in theous mode. And then bang is switching to itsous mode. Yeah. What do you reckon you're doing? I'd still be like this, honestly. Like, I still would, yeah, definitely. Because, I don't know. There's only so much I can trust and, you know, sometimes something really crazy can happen on the road. I feel like I've just got to be ready for that. situation at all times. Yeah. I'd be similar to like cruise control. If I have cruise control and I'm still like this at all times, it's just like keeping an eye out, but just giving my feet a rest, really is all it is. your like your feet up on the Yeah, I'd kind of just like, put it down, kind of like how it is now. Yeah. Yeah. Or I'd kind of like, hover over. the way at all or not really. a little bit. It's not really at the moment. Yeah. Yeah. I'm quite alright with this because it comes out quite a bit bit. Yeah. What about if the wheel say it was like changing lanes or something for you? Yeah. Would you have your hands on the wheel and the wheel like turns with the car? Yeah, I'm trying to envision how that would be like. I might.. Yeah, maybe I would. Like, maybe I would kind of have my hands like this. Maybe I'd follow the wheel with it. I'm not entirely sure. Yeah. Yeah. It'd be one of those too. I'd maybe change it up. Maybe if I got more comfortable, I'd kind of like take my hands off. But yeah, I'd still have them like nearby. Yeah, let's you run called James and then. Are you chatting or what do you reckon you can do? Yeah, we'd be chatting. Yeah. wheel. That's right. Yeah. Would you ever phone or No, no. Yeah. Yeah. No laptop, no book? No. if there's a notification, talk to. Yeah. These are pretty cool. Yeah, it's pretty nice. Yeah, it also sort of sits in nicely. I's with the system. They' transparent would you want it to be if it was changing lanes speeding up slowing down? I pretty much want to be saying, hey, this is what's going on so that I kind of know it at all times. And then if I see something where I'm a bit like not entirely sure about that, then I can react to that in advance. I think yeah, out of everything, the autonomous moving, that's like, really cool gives you a bit of a rest from having to sink 100% about driving all the time is less physically demanding, but then just being able to know what's going to happen and being able to react to any situation is still really good to see. when you? Would I use it? I don't. I don't think I'd trust myself to. No, I don't think I would. To be honest. Yeah. Maybe. Maybe if I had more driving experience, like, if I kept driving for for a long time over like years and years, yeah, I'd maybe consider that more more and more and probably more if I was doing longer driving, so say over an hour long for long distances, that's when I'd be more likely to use it. And on like a long drive.. Do you reckon you would still be hands on the wheel and looking out? Yeah. Yeah, definitely. Definitely. Because if I'm not physically able to do that, then. that's the sign for me to get off the road, I think. Yeah, for sure. Yeah. Yeah. And so. Yeah, so I'm guessing that you probably wouldn't want the wheel to move out the way or tuck in. You kind of want to be quick. Yeah, I still want it to be here, Definitely. Yeah, just in case, like, what if a car randomly comes by and I need to like swerve it out the way? Yeah. I just want to be able to do that if I can. Yeah. And this is your car had another sports car right? I was like kind of your fun car car. And I had an autonous mode. How beneficial or how important is this classic looking steering or style of the steering orude? Would you mind if it was a different shape or a kind of unconventional? Um I think I'd be alright. I'd still kind of want the T in the middle with the rounded wheel around the side. So I'd still want it kind of somewhat conventional, but, you know, you've got like these different buttons here. They're're kind of an unconventional shape, so I'd still be interested in changing that sort of field. Part particularly in like they use it interface side of things with the buttons. I think just with the overall ergonomics and everything, I still want that fairly similar and familiar too.. That's me personally. Yeah.. I like the opposition. Definitely, yeah. And with the would prefer to be subtle and less intrusive Or would you to be like noticeable and disruptive? I think it would depend on the severity of what was happening. I think if it's something that's just like a little warning, I'd say subtle, but if there's something like big that could happen, then I'd say more. kind of a severity depending Yeah, that's what I'd say. Yeah. So if there's that cut there's just on the head. Yeah.. Yeah, definitely. Yeah. Yeah, I swear. Yeah, so what do you reckon the maximum distractive level would be? Maximum distraction. I'm trying to think now. Like, like this is the f. I suppose if there's like something really strange happening on the side of the road, I might like have my eyes off for a second or two. It would probably be the most.. Some smaller ones might be like, oh, if I'm checking the back mirror or like looking behind me. Yeah, those are like microseconds where you're not looking out on the road. All right. Sweet,'s that's. No worries. That's that is it. Cool. makes you inside. Oh. Yeah, you know what? TG that your hands over the whole time. Yeah, yeah. That was an interesting Yeah. Yeah. That's definitely the way I do it. Yeah, yeah. Did you want, um about like, how do you want the to kind of pronounce it? themselves? That's what I I Yeah, that's. It's like. Right, yeah. You just. Yeah.. I was looking at something, a lot of the stuff, they're doing it for like, daily comm. Right.

Observation 5
I'll drop those. Yeah. You got ox? Yes, sir. Oh, my God. Jesus hold up. Oh, my God. I' your seat. How did you that? Yeah, your seats are walked in. Godd damn. Yeah.. Yeah, dude. Yeah, it's very different. Even for, like, even for, like, a sports car, it's quiet.. Quite tight. It's kind of nice. That's set you all. I'd probably have my phone. I usually, I mean, I don't have an BMW, so I usually I actually my phone. Yeah. Um, yeah, okay. I'll have that. Medium? We're not listening to Kiss FM. No, can we put a medium? Is there a movie one? Is there Netflix? Yeah. Yeah, I think so. So is it like in autonomous mode is what we're Yeah. Yeah. Oh, Oh, yeah, through. I'm driving my car. I am going through the front wind screen. I' Going through the windscreen. Yeah, okay. Probably playing with this. So let's say, you're driving along on a a highway that you drive often? traffic it's heavy and it's moving slow, you going commute from work. Yep. Your car has an automation system that can drive completely on autopil, and legally you don't need to keep your hands on the wheel or eyes on the road during the spontonous. Yeah. But you must be ready to take over within 10 seconds if you get alerted. Yeah, okay. Yes, sweet. So driving along? Yeah. And thenging an autonomous. I'd probably go down. I'd probably be talking to Karen here. Yo. What do you want to put on the screen? Yeah, I'd probably check emails or something if I was fully locked out. But I probably wouldn't be trying to stay too far off the road at all times and trying not to stay on my phone. I'm probably talking to you.. Did you watch the footy last night? No, man. Have you seen this real? Yeah, have you got? I feel like my passenger would be showing me reels. Yeah, yeah. I just sent me. Yo, did you see this shit? This shit crazy. Yeah, okay. Sockon you wouldn't on your phone or? Yeah, I feel like I would probably, like, especially in a car like this where I have more things on my centre console, I'd probably be using that more. I probably wouldn't want to. really deviate my eyes more than to look down and then look quickly back up and stay focussed. If I was doing my fine, I would probably still try to keep it down and out of the way if I was using it, I'd. would not be on Instagram. If the real let's say it was in or out of the way. would that reckon that would benefit you at all or not. If it was tucked in out of the way, I don't know if it would benefit me because then I would. If I had to quickly, if I got a notification, I had to quickly, like, get off on the string, I'd probably want it to still be in the same position I left it in, if that makes sense, rather than like tucked in or tucked away.. I'd probably, like, most of the time, even if it's like fully Samuel Thomas, I probably wouldn't really know what to do with my hands otherwise. Yeah. I'd feel weird not having, like, at least... Like, I usually, when I'm driving, especially if I'm, like, on the highway or something, I. drive a manual, but I tend to keep one hand on the wheel like this because I'm on that side, but I'd probably be like this, one hand on the wheel? Yeah, I'd probably like, even if it's not, like, on on the wheel, I'd probably do one of these where I'm, like, on the bottom, probably, like, probably not fully gripping it just so it can, I'm not interrupting with the autonomous system. I'm probably just, like keep my hand like lightly touching on the bottom like this. Yeah. That makes sense. like, let's say it'staking or changing lanes, how would you feel with your handing on the wheel in that situation? And it's the wheels moving in itself? I would feel really. I don't know. I don't. I personally, if it's like overtaking and stuff, I probably would feel really weird just letting it, like speed up, overtake someone and do that without like, having my hands at least like on the wheel or like near the wheel. I would I'd probably trust the autonomous system if I had used it for long enough. But especially at first, I probably wouldn't, like, I'd probably override it. If I, if it was like overtaking or someone in front of this was going really slow.. I would probably like take the control back, overtake myself and then let it sit back again.. But if it's autonomous, I'd probably want it to just like, either stay in the lane or pull into the slow lane or something, if that makes sense. rather than... if the wheel didn't. That I would I would honestly probably feel more comfortable. Weirdly, I'd probably feel more comfortable letting the. like steer itself and do that without the wheel turning.. Because I understand it shows me the feedback, but I just feel weird. Because as soon as it starts turning, I would just feel the urge to, like, grab the wheel. It's like the kn touching a wheel and it starts to spin that might feel strange. Yeah. Like, if it's doing minor corrections or it's like following a curve or something like that, I'd be okay with with it turning.. But especially in the sense of like overtaking someone where it's like turning, pulling out, accelerating past, I'd probably feel weird if it was like doing that turnent that aggressive turn across. And if you had a passenger, like you do now.. Do you reckon you would be speaking to the passenger most of the time or would you be gone on your phone? I tend to, whenever I have passengers, I will be talking to them. Like majority of the trip. Depends on what we're doing as well. Like, if it's a trip where it's like you're coming back from the beach or something on that drive back from the Gold Coast in the evening after going to the beach, everyone in the car is probably dead and asleep. So I'm probably just like turning up the radio to myself. If it was an automous mode, I'd probably be down on my phone a bit in between stuff, looking up, looking down, looking up, looking down. But I think it just depends on what is happening at a time and like what led to us in that drive. Would you ever have a nap? Like, let's say you in that situation, close home in heavy traffic.. Are you having a little bows or If I had passengers, no. If I had passgers, I wouldn't trust to just let the autonomous system drive me home.. I probably would never feel comfortable taking a nap. while, in the driver's seat.. I'm sure some people would. Would you feel. Sorry, I don't know. This is like. No, no. Would you feel safe to nap if I was awake and you were still in the driver's seat? Maybe. Because, like, I can technically, like. Yeah, fix it up if it goes crazy? Maybe. If you if you were I would probably have to talk to my passenger. Yeah, and say, look, I'm. And if I try and nap. Would it be cool if I'd nap? Are you good to like watch the car? Yeah, man, I got it. Can you watch the car so we don't crash? Do that That's crazy. That would be a thing is like, oh, dude, just switch over. The fact that The fact that would even be a question when you have an semi-autonomous car would be crazy. But yeah, no, I don't know. I enjoy driving. Yeah. And I enjoy being in control. But when I don't I'm not against having autonomous, especially for like long, boring drives where you're like just sitting on like the highway between like the Gold Coast and Brisane or something like that. But I don't think I would feel fully comfortable falling asleep, even if my passion said it was okay. Maybe if it was like a super long drive, like maybe you're doing a like between here and somewhere in New South Wales, like down south. And then it was like, you've been driving for like two or three hours and he's like, I'll watch the road and watch the wheel and leave it in autonomous mode. Then I'd probably feel comfortable having a sleep, but in general, probably not going to have a sleep. Yeah, yeah. So would you reckon, because let's say you don't ever have a sleep, right? What would be the maximum level of distracted you have to get? Maximum level distracted, I would probably be. Eyes off the road, hands off the wheel in autonomous mode, I would probably be talking to my passenger probably would have the car either playing music or I'd have my phone playing music through the car. Would your laptop or anything? I don't think I would whip my laptop out. I might pull out my phone and scroll on it. So I'd probably be on my phone is probably the most distractor I would be. But I don't think I would bring out a book or a little laptop. Yeah, yeah. His laptop's kind of crazy. Yeah. How would you feel when us to take control when you're completely distracting? So would you feel kind of stressed if it gives you quite a destructive water? Yeah, if it was like a loud, like distinctive, like blinking noise or like it's said to like, take control or it like made me loud and aware of it. I would probably be almost panicked in a way and very. I' I'd be quite stressed about it and I'd probably be throwing my phone down as quickly as possible and looking straight up and just grabbing the wheel instinctively as quickly as possible, as soon as I said that, no matter what I was doing, if I was awake. Yeah., yeah. I think so, yeah. Yeah. And so what dockon wouldnings and things like? Oh. You were like distracted. Would you want a a light sound? I would probably want, like, almost like a.. In my mind, I'm imagining, like a almost like a blink sound, like a big, like blinking sound. Maybe the screen goes from like whatever's on the screen in the car and tells me to take control or whatever within like the next something seconds. Probably, like, definitely want it to, like, override the sound in the car, is probably what I'm thinking. Maybe a light, but I'd probably just more want it to, like, take away whatever's on my dash really quickly and give me a sound. Yeah. I wouldn't reckon the biggest thing you. Yeah, I think for me a sound, like a sound is probably like, because like, realistically, like, it would probably, you'd probably be able to cut through because you're probably listening to music or on your phone or something like that and having that cut and have a sound play. It's like a distinctive sound that you know is for that. That would probably be what I'd want to get me to.. And let's say you in automous mode, right? Where do you reckon you putting your feet? Are you? I am probably a person that would keep my feet in a pretty similar spot. if it's automatic like this, I'd probably still keep my foot here on the left, and I might, at most, I'd probably take my foot off the accelerator, maybe put it flat underneath the brake or something like that. Just keep it out of the way a little bit, but most of the time I'd probably just keep it, like, hovering in front of the accelerator resting against. the steering position of the steering wheel, would that bother you at all? Well, like if it changed or if let's say the leg room, right? Just let's say if you bring your feet right up. And your knees are hitting the wheel there. Yeah. Would it be beneficial to get rid of that or not really in your head? Well, if I was to, I think that's probably something that's maybe keeping me from moving my feet is the fact that like the wheels, the wheels in a certain spot, your feet your legs are pretty close to it usually. Like, if I was to like bring my feet off, it'd probably be different, but most of the time in a car, like, your most relaxed like leg position is almost down where the accelerator in that is because that's like outstretched. Yeah. So I probably I probably don't really need it, but like maybe if it like lifted up slightly, that would be nice. Yeah. For more comfort. I think, yeah. Yeah, cool. And, if this was your MA or you had another sports car. Mm hmm, how important would it be to you that the steering we had like a classic and sporting look rather than like an unconventional shape, like an oval or a rectangle or something like that? I would probably, no matter what shape it was, I would want it to have like that sporty look. If you like went rectangle, I'd probably still want it to keep like maybe lean towards more looking at like an F1 steering wheel, like one of those half steering wheels with like the tops cutoff or something like that all the bottoms like brought up flat and square. But whatever I'd wanted I'd wanted to have like a nice sporty feel to it.. Yeah, like, so you don't reckon that would put you if you have you seen some of the tests ones where they cut off the top Yeah, they cut off the top. the bottom? Yeah. I don't. I'm not against that. Yeah. But. personally, I like, even in a sporty car, I like the classic, like, top of the steering wheel still being there because like, especially if it's like a, even if it is is a sports car, you're still using it in like a casual setting most of the time, like you're still using it on highways and stuff. And a lot of the time I tend to drive with like one hand on the steering wheel and it's one on the top, almost always. It's either one on the top or it's one here on the side or it's like one sitting on the bottom. So I kind of still like to have those touch points rather than it feeling weird where you've got one hand on the side and it feels weird not having two hands on. But I guess that's also a personal preference versus like, probably a safety thing. Yeah. Alright, well, sweet as. Awesome. so you want to swap. Awesome, awesome. I' passing dies right.. The disciples that feet are high.. My old beamer was not right now. Don't put my phone. out. Oh, I did. No,?

APPENDIX F - OBSERVATION TRANSCRIPTS

Observation 6
point there. It's very. I don't really like the rain in the centre of the. Yeah. Because I used to have an E46 Oh, yeah, cool. From like 2000 Yes. But like it was still low like this, but it was like those old 2000 seats lay, I think, leather. soft Yeah. It's Yeah, I know. Strap in, buddy. Oh, yes. I'm about to drive. All right, first thing, we need auto seatbolts. Keep forgetting. Yeah, change the steering. Would you move this seat for? Oh, true. It actually does move. Oh, okay. So do you want me to put it into like normal driving or Okay, if I was going to drive, I' probably, yeah, I'd probably just keep it there. Yeah. If I was actually manually driving. Yeah, yeah. Just so you're manually driving right now? Yep. You could have it right. Yeah. And if you switch over, b on this way. I'd like probably get that way out of the way. Yeah, pushing it back and up? Yeah, because like, if I' even when I put it in cruise control on my car, like, right now, I tend to like bring my feet all away away and like bring my kn up and slouch. So, like, I can definitely, I don't know, like, yeah, I definitely try and get it out of the way., yeah, just so I can move and have a little bit more leg room. And, like, if I was to, like, change, like, probably go on ahead of the questions a bit, but, like, yeah, I reckon, yeah, when I normally drive, and I'm cruising along on cruise control, or not, I do kind of just have my hand down here because I don't want to have like the muscle of like holding the top or whatever. So I'll normally steer from down here. But that's only because I have to steer if I am going to drive normally, like I'll normally grab two hands up top or maybe just one hand. So yeah, I reckon having the bottom, because I like to move my legs and like kind of sit to the side like this sometimes like so like having this like cut that would be like really good. I'm just looking at now. Yeah. Nick, he's feet. Exactly. That's. Yeah, yeah. Yeah, that's how I would sit comfortably. If you're going full comfort, you're going to warm up. And I slouch down and I bring my knees up. Yeah, didn't even think to do that when you. No, when I'm driving, it's like, I don't know, I feel like my feet naturally want to sit lower. But even, like, still, like the first thing I did when I jumped in the passenger seat was I moved the seat all the way back because, like, if I'm lounging, I slouch and pull my feet, like stretch my legs out, sostify as they can go. So, like that would be the alternate. I wouldn't feel comfortable having my feet next to the pedals if it's driving itself because I don't want to touch it. But I do, if I want to stretch my legs out, I'm going to have some room down there so I can actually do that without touching the pedals. It could also changes in my, at least in the passenger seat, maybe I'd probably be similar on the driver's seat. Like, if I'm like talking to the driver, I'd probably be. I'd probably up and leaned over more like this. But then if I'm just like sitting here while he's driving, I'm probably more tend to be like this. Yeah. Yeah.. Yeah Yeah, so it's beneficial for you with the steering one, let's say, tucked away, not, and you could move your string ahead. Yeah. Yeah. And so how would you feel about the steering wheel turning Turning when you driving? Yeah, I definitely, if it, because when you talked about the laptop before, I almost considered like, if I, because I probably would use a laptop. I know it sounds kind of weird, but if I was comfortable on a road that I'd know and like a highway or something like that, I I can see cars ahead before this would probably start turning. I'd probably feel comfortable having my laptop out and I wouldn't want it bumping my laptop or something like that if it had to spin. So yeah, if it was driving itself and it moved, I'd definitely want to push it way back. And I feel like even having the bottom cut out would actually mean that like I'd have some notice before it actually hit something if it was going to like if I had my phone here, I'd see it start to move before it actually hit my fingers or whatever. Yeah, right Yeah, I don't know. But uh I I like Nick was kind of saying like he wouldn't like it, but I feel like I want to know what it's doing, but I would actually be tempted not to grab it when it starts moving. I'd actually pull away and kind of let it do his thing because I don't want to get in the way of like. I would almost be cautious to touch it while it's driving itself because I don't want to like.. Yeah. Yeah, exactly. Because if I overcorrect it, is it going to like turn off completely and then I am fully driving or am I going to slightly correct it? Like, what's the input? I feel like that's why I was saying where I was like, I probably, if it was spinning while I was doing, I'd feel a bit concerned, but I would probably interact with it and interrupt it. Oh, right. So you would be. Was my issue or I'd like have the hand like below it so I wouldn't be.. Oh, okay, yeah, right, yeah. Does that make sense? Kind of. Like, I was saying, like, if I like if I started to see it move and I was kind of in that ready mode, I would actually probably pull away if it started to move, we got to go, yeah. yeah, that's the same reason why I don't want my feet near it, like, at the bottom. Like I don't I't want to be able to stretch out, but not be near the pedals. It would be a different sort of situation, though, if I had to be ready. Like, if that was the law, like, I have to be, like, ready to take control, then I would probably like, have.. because if I if it just had to be like, almost a sign to say, okay, actually take over now, like, not kind of 50-50 Yeah. Yeah. In the 50-50 zone, I'd feel a little bit cautious. Definitely think it depends on the law. Yeah.. Because if the law says you have to be ready, you'd want to. 10 seconds to take control. Oh, yeah. It never actually gives you, like, take control now as as possible. Right. Right. Okay. What it would do is if it would detect like some, you know cones or whatever coming out, I could say, okay, there's a construction ahead. And it just slows down. So it's not a quick take control. It's kind of like a it can't really detect what to do, so you've got to take that. Because of that, would you be kind of inclined to quickly take control or would it be more beneficial because it just gave you kind of a lighter warning? Um. I. I definitely think a lighter warning, like in that situation that you just described the kind on the road, if it gave me enough notice, like 10, maybe even 15 seconds, I would be more inclined to think, like, look ahead first and see why is it telling me this. Oh, yeah, I could like, I'd probably look up from what I'm doing or like stop scrolling or like watching my movie. If it's if it came up on the screen, I was like watching a movie, I'm like, oh yeah, okay, I can see that. And then maybe if the string wheel started to come out towards me, I'd be like, oh, okay, yep, it's natural for me to take over. It's just kind of in that moment of like, if I'm like busy in what I'm doing and it instantly tells me that to take over, there'd be that moment of like panic and fear, like, oh, I actually don't know what you're doing right now. You haven't given me enough information to like take over properly. Like, because I've tuned out and I've fully trusted like the machine to do it and it's going oh, I'm out of my comfort now. You need to do over, but I actually don't know what it's doing. So, yeah, some sort of information warning, but then also maybe telling me where to look, because like in that situation with the cones, like it's saying, just keep your head up, look at this sort of thing. This is something that I don't know how to m navigate, you might have to do it.. Right. So quite a clear level of feedback and saying, what it thinks is detected, where people think what kind of. Yeah. Yeah, just to probably, like, like, direct instructions. Like, I' not saying like, okay, it's over to you now. It's like Yeah, yeah, yeah. It's like kind of saying, okay, this is this situation, then kind of briefing me on what I need to do when I do takeover.. What would be the maximum level of distracted you think you get? So laptop, right? I'd probably say that would be probably the most amount of barriers I would put in front of myself to be able to take over yet. I wouldn't say I'd do that all the time, but if I really needed to, I probably would. Yeah. What do you reckon if you doing if you got the warning and you had the laptop?? If it gave me that delayed warning, I'd probably keep it there, but just put my hands back on the wheel... If anything, I might shut it. Because, like, I wouldn't'.. Like, it depends on what it would do after that. Like, if it was like, just, I'll quickly navigate through these cones and then you'll go back into autorive mode, I'd probably just pause what I was doing and pull my hands on the wheel navigate through and go, okay, cool, take back over. And I'll go back to what I was doing. If it was like in stop- start traffic, would it navigate, would it be able to stop and start? Okay, cool. Well, then in that sort of situation, then, yeah, I definitely probably wouldn't put my stuff away. The only time I would do that is if I was going to have to drive manually for a little while then I'd probably go, oh, okay, give me a second. I'll put my laptop away and I'd maybe put my phone back and then actually sit up and maybe move my seat if I had to go back into a manual drive mode, but if I knew it was only going to be for a quick little bit, then I'd probably just have my hands on the steering wheel... Or the other distraction I was thinking of when you were speaking is, like, probably food. Yeah. Food was the other thing I was thinking. If I didn't have to drive, yeah, I would eat so much more. Like I would actually, like. and like put a, like, if there was a table, if there was a table on the bloody steering wheel, like, and it moved through that, I was like, oh, I would eat so much more because I wouldn't have to, like, one hand eating, like put the burger down to get the drink. like, yeah. Imagine not having to navigate eating work like a Macas burger. Oh, exactly. While you're trying to drive, like one-handed. I cutery. I could eat sushi, bro. I could eat sushi while I'm driving, bro. Dude, there's nothing like being on a road trip with like a burger and you're trying to like one hand over the wheel and you're like, fuck. Yeah. Yeah, so that would probably, that one would actually probably be, I'd say higher than a laptop because I would have to like put my food down and that would be a little bit harder. Yeah. So, yeah. And so, let's say you were eating you eating some food. Oh, okay, yeah. Yeah, yeah. What sort of visual cues do you reckon would be best for you to take control? So you about having the wheel pop out? Yeah, definitely., just any sort of cues, or, vibrations, I'd definitely say probably first audio. Yeah. Or actually probably first. maybe vibrational or something like that. Yeah. But if it was doing that constantly, then I'd get a bit annoyed. If that was the first queue. But I think Audible is probably the biggest one. And maybe if it saw that I was, if it knew I was looking at something in particular, maybe like a screen, but it's hard for it to probably know that. I think the main one would be that like a steering wheel coming out and like coming into my space would probably be the biggest one to, okay, you're taking over soon.. What about lights? Do you reckon that would be a good morning? Yeah, yeah, actually, that would be.. Like, if I had adjusted the lights and turned them off for a specific reason, like turning them back on, would definitely like let me know that the situation is changing. Yeah. What about, let's just say, like, instead of a countdown, right, let's say it's a red light pops up and then it gets like brighter the longer it goes, would that be kind of a more beneficial way rather than just sort of flashing or like a progressive warning? Yeah, if it did have some sort of uh like scale to it, I guess that would make. Yeah, just.. I feel like a flashing wouldn't really indicate, like indicate urgency. It would only have one level of urgency of like, okay, I need to pay attention, but like, maybe a scale of like, okay, it's getting increasingly more urgent. kind of sc yeah, yeah. But just another thing that you kind of, um with the food, I just had a thought that like, the or the food or with the laptop is like if it did need me to pay like proper attention and take over manually, like quite seriously, having some sort of, like in this middle console, like, if I was to put stuff down to take over, I would probably have to find somebody to put what I'm holding. So just having maybe something open up and say like, okay, put your stuff away. Like that would be okay. I can quickly chuck it in there and make sure that like I am free hands free.. That would probably be a sign as well. Yeah. Yeah, because a few people that like on their phones. And I told they, and they just like their phones back or something? Yeah. I would probably like, if I was like on my phone and it gave me that warning, I would probably like go straight for like this sort of like recessed area and just throw it in there. Yeah. Or like just like put it in the cup holder like this or something. Yeah. But I't, I didn't even know that was how you meant to put it in there. But but yeah, even If you're in a rush, you're probably just going to go like that. Exactly, yeah. Sort it out later. That's fine. I try to do it. Like, even when I get in the car first, having some way to put my stuff down to start of the car, that's probably the auto spot I'd put my phone back into. Yeah. So, and when you're alone... would you be doing anything different? Hey, what are you doing in the car? Are they? No, I'm. Rose's alone in the autonomous vehicle. Whoa. If I was alone, would you just be having a math? I guess it be on your laptop, right? Yeah, or I'd maybe just like put the music louder or something like that, because I don't have to worry about listening to anyone. Yeah. Yeah. I feel like you'd feel less pressure about doing more, like, not crazy, but like doing more like hands off things. Yeah. But in saying that, even though I' feel less uncomfortable doing hands off things, I'd probably feel more, more concerned taking a nap. Oh, 100%, yeah. I would.. Like, I'd be happy to do more like unaware of the road things. By your own, if that makes sense. Because like, I know when I'm in the car by myself, I tend to like do things a bit less more distracting. Yep. And I feel like if I was going to take a nap by myself, the two conditions I would probably put it under is if I really know the road well.. And I knew that there wasn't many Potential potential, yeah, for me to take over. And two, if I did have a nap, because I don't have a passenger, I'd probably turn all the warnings up to the max just to make sure that like if something happened, I was going to be able to hear it like or acknowledge it in some way.. But, like, also, I wouldn't. Because if I had somebody else in the car, I probably wouldn't want all the warnings to be super loud either, because if it was something kind of medium level, my passenger might pick it up so like, I don't need to have in the middle of a conversation. Yo, take over. Okay, sorry, that's hold this conversation. I'. Yeah. But when you said nap, when there was someone else in the car, I would feel so comfortable taking a nap. Like, even in traffic, like I'd probably like, oh, yeah, let me just chill for a bit. nap too. Yeah. Yeah. That'd be the big. We'd be die together, bros. It'd be fine. That's what I mean. I hate to be responsible.. Yeah, true. That's why I was like. No, that's good, but I'm me at least For me, at least that's my limit. Yeah, fair. I guess you're I wouldn't want to be responsible. So I'd probably, but plus, like, if I have a passenger, I'm already like not wanting to be as distractive as like my phone and stuff. Yeah. But then that's the inverse with like an automous vehicle is like, if I was to have a nap, I would need someone else to be there to have a nap. Yeah, yeah. Because I personally just couldn't. Yeah. I couldn't fall asleep even let the car take me over That's spot. Yeah. But that's me. I't. Awesome. No worries at all, man. Happy to help. That's a cool project. Have you got some good feedback from us? Oh, couple of. It's in Syria.. seems to kind of, I don't know, I' know whether I hate or like.

Observation 7
You want me to drive first? Well, yeah. That's the car's driving, isn't it? Yeah. Two. four. Oh, Jesus, it's. What's this?'s that middle? I don't like it. That's. This is potentially the best seat I've ever sat in. Oh, you really? Yep. Yes, I can't reach that. the pedals. Yeah, yeah, You can move the seat. change the wheel on the seat to how you root you driving. Okay. So there's some electric. Oh, beautiful. Yeah. And then you're gonna change the wheel with this, like in here. Yeah. You're gonna have a good time trying to get in here after me. You can make the seat squeeze you. What? Sorry, actually. That's just that.. What do you mean squeezy? Like the bucket. You can make it more buckety, or less buckety.? Yeah. Yeah, wow. It's very nice. Alright. So, really. Mm hmm. Let's pretend you're driving right now. Yeah. How would you position your hands, your feet, just like this? Kind of like that, maybe sometimes like that. Depending on how I feel. feeling or how much control I would say. Like if I'm, you know, turning a corner, probably two hands, if I'm just like going down a street that I've been down in Brazilian times, I''m probably going to sit here like. Yeah. I am. So let's say, you're driving on a highway. And you doing a commute from work? Yep. It's a clear day, good visibility, and your car has an automation system that can drive completely on autopilot. And legally, when it's in this mode, you don't need to keep your hands on a wheel or eyes on the road. So you can legally use your phone read to book. Use your laptop. Yeah. And so but you must be ready to take over within 10 seconds when' asking you. Okay.. So for example, if there's like roadworks on the head, like text a cone or something like that, gives you're wanting to like take over. So, sweet. So let's say your driving line right now.. And then bang, you switch on autonomous boat. Am I touching it? What? Let's say, let's see you just touching. Okay. Yeah, beautiful. And then let's see you're anous now.. What do reckon you'd be doing?, I'd probably be daydreaming. I' typically daydream when I'm driving anyways.. Yeah, probably just like, I don't know, having like a, I'm a little bit crazy. I like have conversations with people in my head. So I' probably just do the same thing thing and like pretend I'm having a conversation or if I am on a phone call just like get really engrossed because I use a lot of my hands sometimes when I'm talking so probably a bit more of that but I'm a bit of a paranoid person sometimes so I probably wouldn't like get out a book or anything like that. Phone?. No, I'm a bit of a stickler for the rules. I don't like getting my phone.. I don't like that. It feels like it shouldn't be, you know. No, I, um. I would be like, oh, I guess I could. And maybe once I got comfortable doing it and I realised that, like, it wasn't going to get me in trouble, I might grab out my phone, but just to, like check like a message or like maybe check my directions or something but I wouldn't go crazy on it, you know? Okay. So what do you reckon the maximum level of distraction would be like what's say would you have a nap? Would you like, God, no. Would you be looking through your bag? Would you reckon would be the maximum level? Uh, I'd probably like, maybe like a cure list of songs or something like that. Yeah. You know, like sitting there and I'd be like, all right, like, I want this song, this song, this song, but something that I could go you know, like, I could immediately, like, drop my phone and you know, grab it. And I'm still kind of looking in that general direction. But. I don't know, I maybe grab something from behind, like, here.. And so how would you feel when you're told now you' control? Do you think you would stress a bit? Yes. I would so stress. I would probably, like, you know, I'd feel it in my body, definitely. Yeah. What do you reckon would be ways to make that easier or more comfortable? For example, like a gradual warning or some sort of vibration or what do you think would help you out? I would say a bit more of a warning, a gradual turnover, but also not doing something that's overly distracting in the first place. Yeah, okay. So I wouldn't be able to, like overly focus on anything else if I'm then assumed, like having to take over controls. Yes. Again. Because the thing is with this automation level, it actually doesn't need you to take over instantly. So for example, the only time, like, it can break, like very suddenly and things like that, but only can tells you to take over when it's, like, uncertain about the road. So in that case, it has the opportunity to give you those gradual laws, right? So if you knew this, do you think you would get pretty distracted or would you still be quite alert? I think I would probably. I might get a little bit more distracted then. Yeah. But. I think I would not appreciate it'cause then I would get more stressed when you, you know, like if I the more distracted I let myself get, the more. I guess, antsy, I would get the moment I had to take over again, you know? Yeah. So, when it tells you, okay, now you need to take over, what some cues do you think would be most beneficial? Um. Like a vibration, some lights, flashing.. I assume this car, by the looks of it has the little like speedometer headup display. I look at that quite a lot because it's kind of on the road anyways. The heads-up display would be an interesting one to put like a little graphic or something on there.. And like an audio, probably. I don't think I'd like any, like, hugely loud noises or anything like. Not a huge fan of those. Maybe vibrations, probably not vibrations, probably nothing like that's going to jolt me, you know. Yep. But yeah. Yes. Yeah. Would you ever have a nap? No. I don't know.ap in vehicles anyways, so. Yeah, yeah. So, how transparent would you like the system to be? So let's say it's driving along an autonomous mode and good. And it's about to take over a car in front of you. Would you want it to tell you what it's going to do? Or would you be happy with it just doing it?. I think I'd like it to if it's going to do anything that's like, wrong, remotely different from what I would do, I'd probably say, yeah. But if it's just like, oh, you're following the map and it, like, I don't know, does a little term or something like that, I'd probably be okay with it just doing it. But yeah, if it's going to try and like, change lanes, overtake cars, speed up. that you' indicate a form. Let's you for that. Like if it's just a little stop it lie. Yeah, yeah, then that's. No, yeah. Okay. I think I'd find that annoying if it was, like, we're stopping now. I thank you. We're going now. Okay, cool. And your positioning, right? Would you move your feet at all if you were an autonomous mode? Would you, like, bring your feet up? Oh, you out? I mean. In this sort of car is quite tight, so I probably wouldn't really. I might, like, cross my foot underneath it, but because I typically have my feet really quick. close to the steering wheelc I'm a little short. I don't have a huge amount of space between anything. Yeah. But if I was like sitting in the passenger seat, I'd have like my feet up cross-legged. True.. So.. But I can't do that with a steering wheel here.. And this weird thing in the middle. It's. It's not enough. You can't cross your legs. Yeah, no, it's too narrow. Yeah, your leg. It's great, though. You don't need to cross your legs. Yes, I do. positioning the steering wheel. Do you think it would be beneficial to you for it to like to away to give you more or? Potentially. I mean, if you're going on like a long, long drive and it's probably going to be in the semi-autonomous mode the most of the way, then I'd be like, yeah, like if. Yeah, if you're going, like, two hours on the highway, if you're going up to like the sunny coast or something like that, then yeah, I'd pop my feet up. I reckon if it's like a really long drive, I'd give it a bit. I'd like, maybe pull out my phone, maybe read a book, if it's, like going for a long way. Yeah. But yeah, it could like, tuck away to like, just push back a little. Let's you were reading a book. and it gave you that. I would kind of want to put it, like, next to me...Cause I don't really want to be, like, putting it in around in case, like, something dramatically changes. Oh, yeah, like this. In the middle, maybe. But I would probably say, like, right here, because then it's easy for me to go, whoop doop instead of having to try and turn it all. less mot motion. Yeah, cool. And if this was your BMW MA, or if you had a sports car, like this, how important is it to you for the steering wheel to be like a conventional shape? Would you mind if it was like a rectangle or it was an oval or kind of really like that round? I think round is universal for a steering wheel.. I think if it was a rectangle, it would feel weird to use. But, like, also when you're turning, it makes sense to be able to like, you know, glide it through your fingers and have that nice circle shape, whereas a rectangle or anything like that would not not give you the same effect. Yeah.. Do you been doing? I. Thanks for that one. That's okay.. We used to swap around closely to again? What? I'm sure the steering wheel moved when you opened the door. That's cool. Alright, I'm gonna move the seat back so you can actually get in the car. Thank you.

APPENDIX F - OBSERVATION TRANSCRIPTS

Observation 8
Mm hmm.. Okay. You 10.. Yeah. So just get into a position that you're driving. Yeah. Yeah. How'd you position your hair? Is it so? I like one arm on the console, one on the door, probably, and then, like, up more active driving.. So when you're driving, let's say you're driving now, in the wheel, and then you stitch it to automous mode. just click the button and some way.. Oh, my God. Oh. It actually did it. Like long distances I drive like that. Like one hand on the wheel. And so let's say you have autom mode when you're on there, have your position yourself. Probably like that, or like same one hand on the wheel. Yeah. And then I'd, like, probably move my foot out of the way. I tend to do that in my car anyway, with like the auto cruise, I like put it on its side. Yep. But then you can still, like, you know, grab it, get back to the pedals really quickly. Yeah. And what sort of things do you reckon you do? Would you go on your phone, you in the phone? I would watch the road. You't the road. Yeah.. Like, maybe like change music and stuff. Yeah. Nothing kind of unusual. No, I think I'd probably be more willing to be like deeper into the music selection or something, but. Even if, like, let's you drove this every day. Yeah. And you had a long commit to work. Yeah. You're a communist mode, you reckon you'd still just be watching? Yeah. Yeah? Yeah. Yeah. All right, sweet. I'm like a terrible passenger. Yeah. Um, so I like, even when I'm the passenger, I'll watch the road. Yeah. You know, be like pressing the brake in the passenger seat. Yeah, yeah, yeah. No, I'm kind of like, hey, I don't know. I just.. Yeah, always got to wash the road. Um. Yes, sweet. So when you put your hands? Probably probably on my legs. Or, like, just on the arm right. Yeah. Do you get motion sick at all? No. No, you don't. Yeah, okay, sure. normally a lot of people like just looking at the road when you get motion. the choice on your laptop. No. No. Yeah. I like, I don't think I could switch off and like trust that the car would do the right team. Yeah. Yeah, okay, so how would you feel about, let's say, when you're driving and it changes lanes? Yeah. How would you feel about the real. turning when it does that? That would be bother you? I don't think so. I think I would rather have the wheel turn than not turn and the car turned. Yeah. Yeah, okay, so the maximum level of distraction would make me just be like changing the music on your phone. Yeah. Yeah, I think I'd be willing to like change it on my phone rather than on the screen. Yeah. But it still wouldn't be more than like, pick my phone up, change it and put it back down.. Or even, like, um changing navigation or stuff, I'd do that. Let's say the Centre console had like Netflix or YouTube on it, would you use that or no? I didn't think so. No? No? Yeah, yeah, cool. Um. Yeah, okay, so this next question, how would you feel when you're asked to take control when you're completely distracted? You don't really get completely distracted, I'm getting guessing.. I just take the wheel, put my foot back up.. Yeah.. Yes, so, when you get asked to take control, what sort of warnings would you like to see? I think like what Hayley said on the heads up, like a visible, like a very visible flash and then probably like a chime and also a wheel shake. Yep... Yeah. Like, my my car has the like, distance cruise control, and when it starts breaking, it like shutters the wheel.. as like a warning. Yeah. What? I have a ranger. Yeah,. So, do you reckon it would be that beneficial if it gave you, like, a visual countdown or if it' warning? Or dock could just said, take over? No, I think a countdown would be good, but also for it to like disengage as soon as you have control. Yeah.... And then how transparent would you want the system to be if it was changing lanes? Um. You know, like, have you ever seen, I assume you have like the Waymos? Yeah. Have the line like that? Something like that.. I was thinking that would be kind of cool if like on the head of display. Yep. Shju's sort of where it's going to go. Yeah, that would be super good. I'd like... Yeah, I'd want to see what it's doing rather than it just like swerving or something. Yeah, yeah. Yeah, and so, I'm guessing, actually, no, okay, I won't guess. But when you're in autonomous mode, how would you feel about where the wheel is? Would that bother you at all? Me being in the way? Honestly, I think it would I think it would be nice if it did, like, push forward or pick up a little bit. Not.. fold away, but somewhere that you can still easily reach it and then it goes back to like a normal driving position. Because that's like a comfy driving position, but on like a long drive, I probably would like to put my leg up or something like that. And then it's sort of in the way. So yeah, let's say it kind of pushed up and a little bit out of the way. Yeah. But let's say it asks you to temporarily take control. Would you be sweet with moving, like using the wheel when it's in. Yeah. just like breach adjust. Yeah. Yeah. So, the leg room isn't super important to you, but it would be nice. Yeah.. Yeah, like, it's it's pretty good. Like, this is a pretty comfy car. Um, but it would be good to have, like, the height. Yeah.. Yeah. And when you had a passenger in the car. Yeah, would you be talking to them most of the time? Yeah, usually. Yeah. Yeah, yeah. And so if you were alone, would you be doing anything different? Not really. I'd just be listening to music most of the time. Yeah.. Yeah. All right, so if this is your MA, that's starting similar, how important to you is it to have the conventional steering? Um, I feel like I could get used to a different shape as long as you didn't have to, like, do full rotations of the wheel.. But yeah, like a yoke or something would be fine, I think. Yeah. Especially because I tend to like adjust the wheel so that I can see the whole screen, you know, like line the top of the wheel up with the hood. So if that was then clear, that would be nice. Yeah. how often do you reckon you think you use the autom mode? All the time. Yeah. All the time. I'm a cruise control lover. Yeah. Yeah. Alright, well, that's a wrap. Sweeters. What?. Yeah, it's nice. It's. Just like get real deep bucket. I don't like getting out of it. I don't it's. Yeah.. All right, well, uh.. Good night. You guys doing me some good insights. Thanks for that. Appreciate it. All right. See ya.. I. Now, let me just start this.

Observation 9
No, no, you could. You could start from closed. There's a blocking here.. Oh. I don't remember that. What is that? wood. Yeah, I don't think that's a file to the car. It wasn't in here last time I was here. Where was it? It was just on the floor. just put that put that there. Interesting. It might be a chalk for, like, the car's wheel or something. Oh, it is too. Is it? Interesting. What would you do? If the car was, like, driving itself. Yeah. So. I'll you guys. Okay, yeah, thank you. So make yourself comfortable, change the seat, change the wheel,. How you going to put on. All right, so imagine you're on a wide, well marked high highway that you're driving often. Traffic is heavy and moving slow, and you're on your commute from work. It's a clear day confusibility, and your car has an automation system that control drive completely on autopilot when turned on. And legally, you don't need to keep your hands on the wheel or eyes on the road during this autonomous mode. But you must be ready to take over within 10 seconds when alerted. This is for things like roadworks and whatnot when it's a bit unquitting. Alright, so pretend you're driving right now, where we're joking you to be standing in position, Tall people are in this car before. It's a shuffle forward. It's a little bit. Yeah, you can. There is. I can change this, but the key needs to be in the car. I think it's just the key. Or it might have. I' glad See, like, all the little parametric designs, like. Yeah. It's like a tiny. you all the same. It is, I think, yeah. It passes. It should just. if we lock and then unlock. Yeah. That's not working at all. Alright. Here's what it is. We will go off what we can. It might just need to be turned on properly.. That's all good.. I mean, I would probably just be driving like this anyway. I tend to drive, like.. Yeah. Just, like, because I drive a lot. So it's either like that or it's like this. Yeah. Because I'm just, when I drive to and from Sunshine Coast, it's so long. Coast? Yeah. Yeah, true. I drive like an hour and a half every time I'm here, hour 40 sometimes. And so it's like, generally, if I can hold this general like this, it's just like, yeah. Yeah. Well, let's say you're on that drive, Coast and you've just switched on autonomous mode.. What do you reckon you'd be doing if there was an? I'd probably still be looking forward. I'd be looking like forwards, not necessarily too carefully, but just making sure that I'm not going to go 110 into, like a pole. Yeah. Like, I don't know if I'd trust it fully. Yeah. What do you think? I'd be sceptical. Sceptical. Yeah. Looking at my rearview, like checking my surroundings. Would you be grabbing your phone, your laptop out, reading the book, no map? you be doing any of that, you I might. It depends on how much I trusted the tech. Assuming that I did trust the computer and the senses and everything to, like, guide it. I might be a little bit more, like, on my phone. I don't think I could ever read a book. Do you reckon? Like, that's. I'd be because you get like, you're like, you're in that imaginary fantasy world of like reading through the story, right? So it's like, I couldn't do that because I'd be too immersed in that. Yeah. But like maybe, like I don't know, playing something like mind numbing on have a little like phone holder just, like doom scroll, but my eyes have to stay close you know Well, I mean, like, I like something, something that doesn't like, take total focus, but like something that I can just, oh, shit, I've arrived because I've just doommed scrolled for an hour and a half. That'd be so good. never have a nap? Dockon you ever would? I can't sleep when most transport. I'd have to be pretty tired and I'd Hmm. Because sometimes when I will go. sometimes when I drive and you're in for a bit. You get a bit. Yeah, I know what you mean. Yeah, I know what you mean there. Do you want me to answer these questions as well or when I'm in the chat? I just time in. I got more. Feel Would you fall asleep at the wheel? Like, if I wouldn't. I would want to be aware at all the times. I'm surprised. Every single person I've had say no, they fall asleep, which is pretty interesting. I thought a lot of people wouldn't. I don't think I could. No, neither. So, what would be your like, so your maximum level of distraction would be doing a scrolling on your phone? I mean, no, my maximum level of distraction would probably be being really invested in a book. Like, because my eyes are focussed on letters and small things and not at all focussed up there. Whereas I can definitely have like my phone positioned somewhere like here and just be like, still visually able to see in front of me. So I guess if my eyesight is like like closer, then that's more out of focus, if you know what I mean. It's sort of about that focal point. Yeah. Yeah. So you were asked, you got distracted and you asked. to take control.. How do you reckon you'd feel? If I was distracted by something. I said you were really invested in that. Okay.. And you need to take control right now. Like, oh, dude, that' cause so much anxiety and panic. I'd probably, you know that feeling of adrenaline? I reckon that would just instigate that like a second. If it made that loud, like red alert type beeping noise, you'd be like, instant, yeah. Throw the book. It's it out the window. Probably at my passenger. Not, not as not like not like as an aggressive thing, but just like, take this. You know, like when you, I don't know if you've ever, like, you grab your mas and then like, you're driving off and like, like the person behind you is trying to get through you like, wait, hold my drink for a sec because I'm eating my chips. The was mentioning eating when he in the car.. It's definitely eating. Yeah. Eating's like one of the ones, hey. distracted Yeah. Dude, that's a good one. I'd be like a messy burger. And it's like, quick, grab the wheel and you're like, fuck, my saucy hands. I can't hold. Wipe it on the passenger and then, yeah., in this situation, warnings would you ideally want to receive? So, vibration, lights? I wouldn't want vibration because that would give me the sense, like through the wheel, I wouldn't want vibration because that'll give me the sense that something is like, on the road causing the car to lose control. lightsights, possibly, but it would be like, you'd have to be pretty particular because I also this might just be in my designer brain, but you wouldn't want to set like a bunch of flashing lights at someone just in case something like epilepsy were to happen. Not that people with epilepsy should be driving, but I know some people probably do.. I don't know. They'd probably be.. I think sound, just sound. Yeah. Sounds like the safe one. Yeah. Yeah. So do you reckon it would be beneficial to give some sort of built-up warning or like a visual countdown or something like that? Assuming that you need to get their attention or need them to be on this junior wheel within sort of 10 seconds. automation system it actually gives the driver 10 seconds to take that much so it doesn't, it won't ever get you to try to take it over instantly. So there's that little kind of, it's a bit different to some of the automation now where it's like quick take control. So it gives you, it has like 10 seconds, right? So would you kind of want it to be the gradual warning? Or would you kind of like it to just say, take over, take over and take over? Hmm. You know how, like, when you get a phone call from Skype, it would go, like that? And it would sort of keep going like that. Yeah. What's the name of that thing where in music, it sounds like it's gradually getting louder, but it's actually just repeating the same cycle every time. You know what I'm talking about? Yeah. It's a lot in like, like rave music. Like, it gives off the sense that it's speeding up and getting louder, but it's actually just the same thing repeating over and over and over again. It's just like interpreting it as that. I'd like that. It's because the same way that Skype goes, like, it repeats that and every time it sort of feels. I know that it might not be necessarily the same thing, but it feels like that it's sort of like, answer me. Yeah. Do it now. Yeah. Yeah. I like it in here. I could sleep in here, actually. Yeah, you know what? I'd take it back. This chair is like, especially with the bucket seat, I feel so locked in. I feel secure. What are your thoughts on the like that little knob in the middle of the seat? This? No, like. Oh, I like it. It's in the way for me. I mean. It digs into my skin. No, it's I. You're the only one I like. I like it. Yeah. I like it because it makes me feel secure in the seat. Like, I feel like I can corner at like, 80 and I'm not going to like, fly that way. Yeah, too. So, how transparent would you want the system to be, for example, if the Nicole's about to change lanes or slow down? Would you want a notification? Would you want it to kind of show you a route where it's going to go? Would you not mind it all? It just what's it doing? In this automated system, would there be like a digital screen or like some sort of platform of showing how it's reading the world? Possibly. Like Teslas. And the Teslas. and things like that on theos and stuff. Yeah. Yeah, let's say there is. Well, I'd like it to sort of show the pathway that it's planning on taking. Like, it's it's line of. I don't know. Yeah. If you ever do like mountain biking or motorbike riding or like even like actual car racing, like that, they talk about like the visualisation of the way that you want to drive. In video games, it's like they show it. It's that racing line and like the line that you want to take and just thinking about that before you do it always makes you feel more safe because you're like, all right, I have a plan and you can like follow that plan. I think that's like that reassuring feeling. I'd probably want a sound notification as well.. Rather than like it just movingving and I'm not aware. Is that your phone? Yeah, that's my phone.. I just say, like, yeah, I'm about to turn left or would you want to just go like everything? Yeah, just a bing. A bing. Yeah. The distinctive bing. Yeah. There's definitely like a music theory to this as well, making sure that all the bings are like a part of the same set. You know what I mean? nice bings that all go together well. Yeah. Yeah.. Like Tesla's bings, because that's the car that I normally drive back and forth from Sunshine Coast to here. The bing is always like, it's not the one with all the cool autopilot, but like just the bass model. But it's got like a nice set of bings. nice I haven't.. I remember you like too close to it's like a little, ding. Yep. y, yep, yep. All right, so to the steering wheel. How do you feel about the position of the steering wheel when you're an autonous mode? Like, would I want it to be lower or higher or out of the way? Does it bother you at all? Or would you be sweet with how it is? I think personally, I'd like to still have it there. I would I agree with you. Because that gives me something to grab onto and take control if I want it. Like, now I'm in control type of thing. wouldn't be worth tucking in the steering wheel just for that extra? No, I'd rather have it there. I feel like the way that I generally have the steering wheel just personally is I like my chest to be more in line with like the top of the steering wheel, which I know is not as safe, but that's just because when I'm driving, I like to sort of just like have my head closer to my body because I'm driving for so long so I can rest my arms like this or I can like sort of do like that or like that and I can still sort of have that control. I think that quick grab is really important to me, having it within a very close reaching distance so that you can be like, oh, fuck. I don't want to like crash, yeah. Right. Right now, it's like a little bit high.. It's this button, I think that turns it down, but it's got no power.. And I don't want to press the start button because I'm scared it's going to start the end and then it'll going to be in trouble.. Don't press the button. give you the disclaimer. Do not start the car. So when you're with the passenger, dockon you just be speaking to them the majority of the time? Yeah. Yeah. And when you are alone, you'd just be on your phone sometimes, but mainly watching the road. I'd probably be just like listening to the radio and watching the road, possibly if in this theory of having like a screen, I'd throw something on Netflix that would was like background. I don't know. Something like super light, I probably wouldn't watch something where I have to pay attention. No, like mad plot stories, but like, maybe like the big Bang Theory episode two, you know? Yeah, something that we've all watched like 700 times so that it's not like brainpower. It's just like, yeah. Yeah, it's just like entertainment. Yeah, yeah yeah. If this was your BMW, or if you had another sports car, power to you, is the shape of the steeringw. Would you want it to look traditional and feel a bit more traditional or are you a bit open minded to having a rectangle or something different? So, if I had a sports car similar to this, I'd probably like to have something a bit different than the traditional, I think. I like the traditional steering wheel, and I'm not saying that I want to go far away from this traditional steering wheel, but in my opinion, this steering wheel's too boring. Like, just make it a little bit more square, not super angular, but, like, a little bit more interesting. Well, compared to the seats, like the seats are crazy. And then that's a pretty traditional one, yeah. Like, there are definitely sports car steering wheels that are a bit more like, whoa. Yeah. Yeah. The current positioning of the airbag is like, in line with where my head's going to hit. Down hit it mode. Assuming that I have some sort of cruise control as well, or is it fully replacing the cruise control? No, let's say it's I mean normal manual driving? Or autonomous, then I'd probably be using it like the second I get onto the highway. Yeah. Yeah. If it's replacedacing my cruise controller it'd be like that. But the issue is I use cruise control at like on the Sunshine Coast, there's like not as much traffic in the middle of the night. And like, if I'm in an area that's like a 60 or a 70 zone, I'll use my cruise control then as well. But I probably wouldn't want there to be autonomous in those areas because it's a bit more like suburban or like city a bit more urban, I guess. But any time I was on the highway, I'd be happy with full autonomy. Yeah. Not much to do on the highway. No. I want to just for. Cool. Appreciate it. No.. Yeah, I'm as well I. Yeah,

APPENDIX F - OBSERVATION TRANSCRIPTS

Observation 10
Oh, yeah, it doesn't like doing school. But I just don't want to have to pay attention to the school, man. Yeah. Oh my God, this is so far back. Yeah, right? And you can't move because it's electric. Whose legs is? Hey, how about. Let me just ask Alex.. Jesse. Yeah, that's. I don't... In we pop. You're the passenger princess now. We can charge it.. Yeah. I feel like the battery's dead, but we can just charge it. Yeah, we Anyway. Okay. Anyway, it's not. Kubl. No, that's not a problem. It doesn't bother me too much. All right. So, I would say move the scene, how you would That's okay. touch the pedals.. Well, let's pretend you can. So, let's say you driving. What's the hand and stuff? If I'm just going straight, like, on a highway, I'd go, like this, usually. But if I'm, like, in a suburban area, I'd be here so that I can turn. and then we can both hands.. let's switch over to autonous mode.. What are you doing? I'd probably go on my phone... and put on a show. Yeah. Um. Yeah, I think my phone would be the biggest part. Yeah. I wouldn't I wouldn't sleep... I wouldn't, I don't think. I don't know if I could. I don't think my brain would be able to shut off. Yeah, no. Um. Unless it's late at night. Yeah. There is a chance. What if there's like an option to put on like Netflix or YouTube? use that? I'd probably use that. Yeah. Yeah, yeah. Would it bother you, like I say you were on a long drive and you had like a a video up on your console? Would it bother you looking over that direction? for a long period of time? Or not really? I feel like it's, like that good spot. Yeah. Because you can still sort of look forward. But then again, like, your head is constantly at that angle. I think mine would get really tired. Yeah, I've seen them and they have like some in the middle. Yeah. I't. It would straighten up. Yeah.. Yeah. It'd be cool to have those projector things so that you can sort of look at in front of you and it's like projected under the glass of it. Yeah. Yeah. I thought of that too. It's so sick. And you could change the like transparency on it. So you can keep seeing through it, kind of. You could pay attention to the road and just sort of in the background, see it. That's. I like that. Something here. Yeah. I' Or, I would just stick my phone there.. Behind the little strap.. Yeah. So, yeah. So lon if you' making this commute daily, you'd just your video on. You wouldn't book about your laptop? Possibly a laptop. depends how long the my route is. So you' hour. Are you guys trying to find I'd probably go on my laptop. How to charge the battery? No,. Okay. Yeah, get a little bit of. It would be worth having something to better accommodate a laptop, like a Like a table or anything like that? Yeah, because if I'm having it on my lap and just looking at it from down here. Yeah. That'll strain the neck a bit. Say something that you can put it on. what dock is kind of threshold for you using that laptop would you use the laptop for a 30 minute drive? Probably not. I think an hour or more for me. Yeah. And when you get out the morning, let's say you're using your laptop. Can you get a warning? What do you gonna do? Let's say it's just on my lap. on your lap. Okay. I would probably like, shut it straight away and just grab the wheel. Yeah. And just, like, pay attention to this first. A lot kinder than I am to the passenger.UGHTER Throw my laptop at their head. Yeah. We hold this. So what do you reckon would be your ideal set of warnings to keep you to takeover? Definitely sound.. This is a ten second morning, isn't it? A 10 second morning. So it gives you a while. Yeah. So do you want like a kind of sound or continuous or gradual? I would say gradual. Yeah. Because, yeah, if you have this sort of blaring sound when it's not necessarily, like, necessary. Yeah, yeah. It just causes. a lot of paddock for the driver. So that gradual, yeah. Play some Skrillex or something. I need a dubstep sound effect.. You know what? I need to look at? Smudges, because everything on his like. Yeah. Yeah. Well, the cleaning, it's probably us to be honest, yeah. Yeah, what about lights? How you feel about the light flash or flashing light? I would say if flashing light would be helpful. Yeah. Um. I'm just trying to think where. would it be better? you're looking at your phone. Yeah. You probably want something. Yeah. I'm looking like here. Like a gentle light? Gentle light. Like.. Or would it happen? Because in my moment, it's like the flashing that would annoy me. It may be like a gentle light, yeah. gentle kind of. Yeah. Yeah. Yeah. I don't think it could ever be like like.. What? Yeah. It did get, like, disoriented. Yeah. I think just like a ding. Like, yeah. I like that. That's cool. Is that sound? Like, no, just like, no, that theory of like. Yeah. No, it's on record. It's recorded. It's recorded.. No, I like I like the theory of like. Yeah. Yeah, peripherals. It like say there were like some lights up where your feet are. Yeah. Maybe. I'd be looking down. Yeah, and you can kind of. Yeah. Yeah. Well, passengers. In the Tesla, there's like a blue light strip that runs around the front and you can change the colours of that. But I feel like you could do a similar thing around the sort of. Yeah, where you're supposed to be looking at.. So if you're looking through this windshield having like a similar sort of glow a glow to it or something. Yeah. Sort of like guide your eyes, look this way. And, uh... Yeah, how transparent would you want the system could be? So I just what was saying, having some sort of 3D model that shows you the the direction. Yeah. Would something like that be pretty beneficial or would you be some the kind of thing? I'd probably want the same. Yeah. Yeah, like showing the car. and the surroundings. Would you want to tell you what's? I' change? Yeah, I would. It doesn't have to be like intense, but just a, yeah, an indication of some sort. Yeah. And I know the seat positioning isn't like the way you had it, but let's say it was. How did you feel about the positioning of the steering when you were an automous model? Does that bother it being.. Touching. It does.. For some reason, this, yeah. I have, like, quite long legs. So I'd probably want to be able to move that out of the way to fully relax. Would you be okay with that with getting out of the way to give you more weight? So it would definitely work it to you, or would you having it in that position to give you a piece of mind. I think I would be okay with it. being out of the way, but nothing dramatic where it fully goes away, maybe just a simple tilt will be helpful. What if you just, like, cut that and then just had, like like a.. Yeah, rather we'll just like have enough space under it. Yeah, I think the issue is the bottom of it. Yeah. Like, anything from here above, I have no issue with the steering wheel being that it is just that part. So leg room is the biggest thing. Like, when your knees are up. That's on the Tesla one as well. They literally just like, instead of having a around it, they just made it flat on the bottom of it. And I'm pretty sure it's exactly what you're talking about because, like, it's the same where I think with a lot of people, your legs go like bang against the steering wheel. Yeah. That's right. really annoying. Yeah, like if that's removed and this is just in this space, I have no reason to go in this space, so I don't need it for sure. That was interesting. When I was doing Nick, he said that it didn't bother him. because he's a taller. Yeah. And then when he sat in the passenger, I could see him his knees were like right off just like that. Yeah. pretty interesting. I mean, maybe if he's so used to riding motorbikes, he might just be used to always being, like, knees bent. Yeah. Yeah. Yeah. That's so weird, though. Because I like stretching out. Yeah. I like doing anything people.. Yeah, so when you have a pass up, do you reckon you'd just be speaking to that most of the time? Not most of the time. I'm a pretty, like, quiet driver. Yeah. Um, I mean, it depends who it is, obviously, but, yeah.. I'd speak to them, for sure. You're like, if it was Jasper in the car, no words were be said. if you were. Like, as opposed to, like.. As opposed, I guess. you like to just being on your phone. Yeah, I'd just go on my phone, watch a show. Yeah. The cheeky nose pic. No. Do trying to think of weird things I've seen people do while I'm driving back home. There's definitely the odd bloke, the odd bloke going. It's not sure things that you have done. You're just trying to pass. So, how often do you reckon you'd use your commonist mode if you had it? Um.. I'd use it if I'm not in suburban areas. So like, for example, when I drive to Warw, I live in Newmarket and drive to Chermsside. A lot of it is just straight road, but just lots of lights. So it's just stop and go, stop and go. So I would probably use it down that stretch. My family lives in the Sunshine Coast, so and I visit them like once a month. So yeah, that highway stretch. Yeah, I guess like simple commutes or points and commutes. Yeah. So it kind of commutes you to do pretty often? Yeah. Yeah. Yeah. Yeah. Um Yeah, and would it bother you a lot if these warnings were like super destructiveive? So if there were like loud warnings, would that bother you a lot? That probably would, if it's not necessarily a crucial or critical situation..Cause you when you're driving, you want to be calm, as possible, or not always on edge and sound loud sounds would make me on edge. someone mentioned having like a, I guess variable warning, like, if it's an important case, it's to stop really. then be more subtle. Yeah, yeah, I agree. And if this is your car, you had another sports car with autonous mode, how important is it to you? The shape of the wheel? I'd say, like, pretty important. You like the conventional. Well, I think similar to what Jasper said, like, still being familiar, but having that special something shape, just to make it a bit more sporty and. I like the uniqueness of it. Yeah. I like that's Yeah. Yeah. These must be, like, not buttons, but, like, because they don't touch sensitive. a lot of people don't. I'm not a big fan of it, either. I prefer having that little, like.. Tactile button, yeah., well, that's a wrap. Cool. Thanks. Thanks, guys. No problem. Appreciate it. Appreciate the insight. This is a fun project, you got. Yeah. It's pretty cool.

APPENDIX G - INTERVIEW TRANSCRIPT

Interview
go back and. Okay, I think that's good. You were saying, how are you, bro? Good, good, really good. Thank you. Happy to help. Just let me know. Can I help you for you? Yeah, so I just want to pretty much, what I want to do is just get an overview and kind of insights into what your specialty is. So Raff was saying, you're doing your PhD in like human machine interface with automated vehicles. Yeah, yeah. So could you give me a quick rundown of just what you're doing in your research? You mean my background of PT or everything about my experience on Ulomated Reaper? Everything would be great. Okay. So, yeah, so my PhD is mainly focussing on designing you call HMI, human machine interfaces for automat Rico. I think it's similar like your business topic. It's a semi-autonic driving. We call level 3. Sometimes I do with level 4 as well. And so I saw your information sheets There are a couple of questions and I didn't prepare the story, but my is not for traditional modality is some normal modality using humans with dip system, sort of new modality for indire design. But yeah, back in the topic, my experience, I think I have background of software engineering and then I quit my job, I start researching on automatic driving field from about 20 and I take my master in HCI as well and then I do some research in the institution, also using a real automated driving vehicle on the open road in overseas, mainly about the behaviours of everything. And then I went to HMI design company for a very short period of time, seeing how the user researcher, what are they doing and coverage with some manufacturinguring like the MW Wo, Mercedes sort of thing. And then now, I amm doing my PD within the similar topic. But to a normal. Yeah, so you mentioned you're working in like the vestibular system at the moment? Yeah. So what is that? Interesting. So in the short word, so you know traditional modality, input, output like, we show, right? Audio, hapttique that you mentioned, some of them are vibrations. But I couldn't find a paper at the moment, but if you saw a whole framework, there are many different type of modality in the interaction view. So one or the thing I'm investigating is kind of using vehiclesodynamic, which is the subt deceleration of the vehicle. Try to nudge the driver to keep them, you know, awake, shift their attention back on the road, because I think we can cover this topic later. But yeah, in level three, I think the main challenge, you know, it's very cheeky road for the driver. They not only allow and engage to, you know, doing non- drivingving related task, praying phone, meetinging, listening, listening to me to everything. We never don't what job we will do. But at the meantime, they're also responsible for takeover take over control the car, right? When the car recall requests RTI, requests to intervene from the recall, which is that what you said, the alarm and everything. So there were a tricky thing between these two roll. how to manage these olive rolls and, you know. Yeah. The thing was, the system is like, yeah, my topic is mainly using sub decaration. So if you can imagine, for example, you are you are the passenger, right? And you're I'm not sure your girlfriend, your partner might drive in the car. You might fuel the car, if the driver released the brake or release the paddle, the gas paddle, you might feel a little bit you know? It's very hard to describe, but that's come from the humans for ster system. That's what I' kind of look at. Yeah, I guess it's like.. Yeah, true. Yes, balance, yeah. It's about balance force, everything you can be slang in any way, yeah. What got you into looking at the vestibular system for the takeover request? I think this way, I think it's an normal way to solve or start to feel the gap of solving a challenge for level three or above or the minute driving. Because there are many limitations for traditional modernities. Right. So the normal modalities, other specific ones that we found were better than others? Like,. Or is it just a weird combination? If my point not will, it depend on what those mortality are designed for and what task, what goal you want to reach. So, for example, the BBB sound, the alert sound, is for emergency we call emergenc situation of takeover requests. But actually, there were many different types of takeover control. There were planned and planned if you in level three, if you were out of the ODD operation domain designed domain, if you're out of domain, like you exit the heightway, you need to take control. That's planned, right? Because you know you will extend you have to take control because there were many different type of takeover control. There will know which one is the best or bad one, to be honest. It depends on what you want to do. Like in case of the I saw your topic is about staringly. Yes. Or you also can see the other. Yeah, so I'll be designing like a steering wheel, but I think a lot of the issues I found with the level three autonomous is that takeover request. and I'm'm also looking at like what I can do with the steering wheel while it's in autonomous mode. For example, like, do I tuck it away? Do I move it, you know? So, yeah, I'm pretty much just trying to understand what some like modes I can use to give take over a quick request and try to understand what considerations I need to have when designing the steering order. Why staring with? Oh, that that was the brief. That was the brief I was given in. So it was zoned the steering wheel. Because I don't know if you've seen like some of the Teslas and whatnot, have like those yokes steering wheels that are like, you know, squared off at the bottom and things like that. So I guess there are some companies that are being a bit innovative with their steering wheel design. Yeah. Yeah, I guess I've done a little bit of research and the feedback hasn't been overly great with like those sort of steering wheels. Yeah, but I have a question with your HMI. How important is like driver trust? So like telling the driver what the car is doing while it's in autonomous mode. Are you talking about the topic of trust? First of all, indeed, trust is a super important topic in higher level of automations. If you overtrrust the car, that means the driver might do some activity that are not allowed it or not encouraged. For example, sleep. Actually, in M3, many research researcher then they totally not agree allowed driver slip during level three of automatic driving. But in real world, the company, the automan company, they advertise, the driver can sleep or do whatever they want. So they can buy the car, right? So for overtch, I think, so you have to keep not overch and not to untrust the car, right? So that's the best bad thing of overchust, right? You can't do everything. You have to take control. You still have responsibility. Even a car can do something for you in some unplanted situation. But if you unchust a car, why you need that, right? You always touch the steering wheel. It doesn't make sense. It' not just a car. But interesting is some research or in real world people or young people easy to get chance when they sit in an automated vehicle. They would trust a vehicle just a couple minutes later because they can't wolf so some w, right? Yeah. Yeah. So regarding trust, I think,, I'm not sure what you trying to pick my brain from, what you try to get out of, right? But that's my understanding of trust. It is the foundation in my understanding of everything you perceive it might affect your behaviour during automatic mode. mode or even tickleware which is a man driving mode. Yeah. Cool. And also, I was looking and I saw you've done some like real world, you know, simulators and test tracks and things like that. Test track, yeah. Test track. Open road as well, yeah. So what are some interesting things you discovered about human behaviour in automated vehicles? Like, what were the sort of habits people would do?. We still on analysis phrase, so I can't give you a outcomees or sort of thing, but in period research, what people usually would do it in a car, the most, if you look at the paper from Nocticam University, I could remember which year. So they put travel in the simulationulator. Not sure. Yeah. And they try to investigate what actually travel will do in a car. The most the top thing is just look around and do nothing. And then it's playing forms, screwing the fo. Indeed, there might be bias, right? Yeah. But that's what they found. Screwing f, read books, watching videos sort of thing. And also some of them eating sleep as well. Some drivers sleep because they were doing a longudental study, which is put the driver in the simulator for a week. Yeah. You go there every week. So, yeah. Yeah, I would encourage you to find some, yeah, there were much of paper cover them. rather than my past study because that's not my study what it's about. But in my study, emotionally, because we have younger driver group and older driver group, so younger driver, they usually they might they easier to get tiredre fatigue for younger driver, but for older driver, or we call M experienced driver, they kind of just enjoy on looking around the situation around them. They're not feeling tired or some of them. I think that's one of the interesting things. If you put different people in the automated driving car, their behaviour might be different. But they're also because I'm not sure, maybe older driver, they're very stucking on the scenarioario of driving the vehicle because they already drive for a long time. So they can't easier to accept or trust the vehicle when they are they're already in the driving out the driving car. Yeah. When so in a level three situation, do you think I want your opinion on this, When you have the steering wheel, what would you what do you think would be some of the considerations I should have when making it? As in, would it be good to integrate some of those, you know, there's queues into the steering wheel? Do you think it's worth tuckinging away? Yeah, like, what are seenior, like, the I know it's a big kind of question, but what sort of things do you think I should look out for in that level three situation? Okay. From a user perspective, if I am a driver in a car, have a staring view in level three or high higher, why hire have steering wheel need? I don't need to drive. I only need steering wheel when take over crest, right? So, if I am a user, I would say, can I have more space? Get a steering us smaller? Or can the steeringu have. whatever indicator or any cues, whatever visual, haptic cues to tell me what I should do when I take over requests. When I need to take overc the vehicle, but not only on the steering wheel, but in a designer point of view, I'm not sure I've not had that much experience on steering wheel, but I think one of the good examples is I'm not sure that you saw Cadillac. The Cadillac, there's doing wheel have an AmBM like on top. No, I have seen that. Let me find like.. Can I use the cat box here? Yeah, of course. Where do you see? So, I think this is one of the super good example in a decide for a few. But they are, if I remember correctly, they are for level three, level, level two, A does. So they have sort of light on the top. So. just have an indicator, oh, I should touch the ther viewer, I think. I think it's a very good example. But level three, I haven't considered a thing because I'm doing all the modality, right? So in a designer perspective, I would consider, again, which situation I am designing for. I mean, yeah, for example. Yeah, it would be designing, I think, well, because what I've done already is I did some like observation tests in a car. And I was kind of asking people what sort of things they'd like to do. Would they would their laptop out? Would they go on their phone? Would they like sit there in the wheels? Yeah, I I think I'm just trying to engage what what behaviour is people would do so I can try to accommodate for that. That's sort of what I'm trying to design for it. So, am I understanding correctly, you are designing for tackle with requests or other thing? Because into the challenges of level three automatic driving is not only takeover. So if you saw the standard from ISO, right, there are different phrases before stabily take over control of the vehicle. So, for example, so the, the ling, is a request to intervene. After request interven is the driver needs to understanding what happened, what they need to do, right? Before they put their hands on the stand wheel and their foot on the pedals. And then take all the control control of the vehicle. And after that, it's not the end, the driver needs to, you know, for example, does the driver need to turn off to avoid an obstacle or the driver needs to stable the car because it's what situation now, right? So from take over the car car to a safe record end situation, the driver only to do something safe safe, safe, behaviour until the kite is safe. And also, before request to intervene, there is a very long transactions we call pre-transictions. That's what I am researching for. That one is really important for level three of automation because because in research in activity, we have kind of topical attention management, which is let me find whether I have the grass to show to you. King West. be a sack, hopefully, the c might have.. I'll die at top. Come on, come on. 8 o' call. I know this is very, this graph might be a little bit checky to look, but as you saw, the duck line on the the top, because is the tension demand for manu driving. But for level three automated driving, before request to intervene, driver might do anything. The tension level is very low. If you have a ticketary crash, right, your attention need to suddenly go up to the attention demand for taking over the car. Usually, level two is easier because the driver have to touch the steering wheel every 10, 50 seconds, right? I'm not sure it depends on the automotive. So in level two is hand-off, right? Yeah. But level three is I off. So level two, the driver always monitoring the situation. So they have a specific level of odd situation awareness record. So but level three is a little little bit different because the GM might do more no gyring relative tasks than before. And their attention is lower than ever. That's the reason why the pre-transaction phrase is really important. That's the reason back to the topic, what you are designing for, which situation you're designing for you. You're trying to designing, maintaining a proper level, which is a key challenge for analy, or only for this emergency or plan or un planeted tech over that moment, what we are deciding for. I think that's a really a key question for the design purpose, in my point of view. Okay, because you have I was expecting to design for both, really, but so most of your research has been in getting that attention back up to on demand. Yes, yes. I'm I'm not doing how to let them take over control the car. Because of course, alarmed voice, everything is because in that situation you have to, but but your voice cannot too high, right? You can't create too much surprise to the driver. That might also affect the driving behaviour. It's a safety perspective. There's anything to you. Is a bad balance you need to have between, yeah, not scaring the driver too much and getting their attention? That's what I'm doing, right? So my music was stiplicute to keep attention in a little bit higher level of demand, attention demand, Atention level, in the pre-transition phrase. So the when the takeover come, driver will not too surprised or, you know, unless they know what to do. I think it seems like can be similar designed in the same wheel, but it depends on what information you're trying to provide to the driver. And we also have framework I'm happy to share to you. Is there HMI framework for designing automatic vehicle? So if you look at this graph, there are five type of HMI defined by ISO. So for A, HMI, which is automation HMI or automated HMI, which is providing information of the mole of automation. Are you in ADASS? Are you in number one or level three, what you are allowed to use it to do sort of automation HMI automation information. And VHMI is the vehicle HMI vehicle interaction, which is, are you trying to provide like speed? Anything? Or whatever. An IHMI is an informative HMI, which is like some entertainment from an IVIS, right? So back on the staring review, I'm not an expert, but it depends on what situation you try to solve, right? What challeng do you try to solve and what type of information you want to give to the driver. So the text, audio, Pepic is like or like a parton, right? And light is binary. No. But yeah, it depends what you're trying to design for. Yeah. And, um So the attention when it's an automation mode, your research with the vestibular system, does that keep their attention constantly slightly higher? Is that the goal, just so they're a bit closer to when they need to take over? Okay. And would you, have you looked at like building building it up slowly for when it's predicting to take over? Or was it, so for example, if I'm in an automotive vehicle and in 10 seconds, be taken a replia comes, would it be helpful to build up your attention? So by the time you get to when you need to take over, you're already at a higher attention? Yes, yes. Just the mingle. True. Very true. Yeah, so having that kind of smooth transition, have you found out to be better? I guess. Theoreical theoretical, yes. Because from maintaining situation awareness or support situation awareness. So there are many different types. There are a couple of benefits. One, if the car. have emer emergency takeover request, the driver will not surprise to surprise one benefit, because if two surprises, as I mentioned, the behaviour will change iniety. And second, benefit is so as you said, they can understanding the situation, so that they can shorten the tickle over time. Takele control of time. So they are faster to take over the RICico. It's the main, one of the key magic enrol safety. So if you shot a take over the car, then you see safer. Right? And yeah. I think that's the two main benefits. There were much more, but I couldn't remember. Yeah, that's fine. So do you reckon I just thought of this now, if the steering wheel went fully out of sight while you're in autonomous mode, do you think that would decrease the driver's attention span? Or. Like, do you think that would... Okay, sorry. Do your research. You're keeping them at a slightly heightened attention span. And if you were to remove the steerring wheel, do you think that would decrease their attention span overall? Or do you reckon that won't really the factor in it? Definitely, I hope so, right? Yeah. Of course, but in my research, we, yeah, actually, we have take all requests in our research. But I haven't started analysis, analysed them, but that's, of course, the goal because the goal der of a good HMI design for takeover requests is to drive a faster knowing about the situation, which is higher situation awareness, and then have a safe driving behaviour, right? Faster, put their hands on the steering whe, faster, put their foot on the paddles, they need, and then have safer behaviour after they started to control the vehicle. Yeah. Or anything to see, but yes, of course, that's the goal. Yeah, yeah, cool cool. I'm just looking at the time, so it is 448. Do you mind if I ask you just one more question? Oh, of course. You feel for you to ask him. You just take your time. Yeah, easy it. So to wrap up, what do you think are the key things I need to consider when designing for this level three system? So one of them I've got here is make considerations for the core request intervene. So consider their attention spam. Are there some other considerations you think I should have when designing for a level three automative steering wheel? Actually, I'm very curious about what information you're trying to communicate with the driver. What type of information you try to communicate with. Light is only one of the type, right? Yeah. And um Also, very important is maybe a little bit out of topic is whether the user know what they should do on what they should not to do. We should bring in a higher-level other topic, which is training and learning and also more awareness, whether they know what they should do. If they don't know what they should do or what is correct or not, even you design a steering, you're passing the wrong information today. And also kind of think about a mental model, what it designer, how is the match between designer, system, and user? I think you can not sure whether you heard of these terms, mental models. I think that's also very important. From Norman, of course you will know. Yeah. Okay, perfect. Well, thank you so much for doing this. This has been a great help. If I have any more questions down the line, is it right if I email you? Of course, yeah. Yeah. When I sell the email, if I time I'm able to reply to you as well. Sometimes I will in the alpha lab or be L. Yeah.. Awesome. All right. Thank you so much for your time. That was great. Good day. Yes, you too. Bye-bye.