



A Concept and Vision for Mercedes EQ

Reimagining our Time Spent in Sustainable Luxury Cars in 2035

Thesis General Information

DISCLAIMER

This Master Thesis is written in for completion of the MSc Integrated Product Design program at the faculty of Industrial Design Engineering (IDE) at Delft Technical University (Delft, Netherlands).

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Preface

Since I was a little boy, I've been interested in, and excited about making things; from drawing up the necessary materials for a homemade bow and arrow and 'crafting' it, to wrenching on racing bicycles and motorcycles. Alongside my love for illustrating (imaginary) moving objects, during my time in Delft at the faculty of Industrial Engineering I've come to learn that the field of automotive design and engineering provides a beautiful yet delicate combination of these aspects and more.

However, with rapidly changing demographics, the increasing urge for sustainable mobility and pressure on conventional car design and use, it seems like the challenge of designing a car needs a more delicate approach than this young car designer/dreamer initially was thinking off.

The preliminary design brief for this thesis seemed to provide a fitting challenge to test myself as a designer in delivering a balanced, coherent and brand-fitting story and concept for all stakeholders involved. In the end, it has also provided an amazing time with awesome people and a motivation to set to more challenges alike. Have fun reading!

This thesis would not have been the same without the help of many wonderful people that supported and guided me for the past half year. First of all I would like to thank my chair Elmer van Grondelle and my mentor Susie Brand-de Groot. Despite your absurdly full agendas you always managed to make time for me. The atmosphere in our meetings was always nice and you provided me with a critical view, sharp comments but also kind and motivating words. Your expertises and kindness are greatly valued and both of your expertises never failed to impress me. I also would like to thank Wouter Kets for his help, even in a period when not officially working for the TU.

I can not understate the value of the person that I talked to most frequently, namely Jan Fischer, my coach from Mercedes. Thank you for all the support, awesome guidance and stories (whether

they were on- or off-topic). The meetings, also with David, were never without a good laugh. That brings me to another hero that helped me during this project, David Schulz. Thank you so much for all the help, from project work and help with Blender to corporate obligations and paperwork stuff. I would like to thank the whole Schulz family for their amazing hospitality when I visited Germany. Furthermore I would like to thank Sagir Alyu for participating in the ViP workshop.

I also would like to thank all the people from the Mercedes Forschung und Entwicklung team and the people from PHI Cae, especially Blender-guru and interior expert Karola Hoffman. You have been of great help.

Acknowledgements

My research and analyses have definitely benefited from the expertises of Costanza Milano, Pepijn van Houdt and Ruby Schaap (Reframing Company). It is easy to get lost on your lonely designer island when you are using this design method and your fresh insights were most welcome.

Finally I would like to thank the amazing people from my close surroundings; my kind roommates who participated in the user test, Bo who lent me her car and Michiel and my parents who dissected some terror sentences whilst checking the report text.

Thank you all for your support!

Executive Summary

As new technologies will allow for a new kind of driving there is room for implementing innovative interior architecture in future luxury cars. The main goal for this master thesis was to find out what a user truly needs in a Mercedes EQ interior for a level 4 autonomous driving vehicle in a context around the year 2035. Furthermore, the design brief specified a sustainability frame as a key part of the design scope.

Problem

One might think it is easy to imagine a vehicle that operates fully autonomously and in which a user is totally irresponsible for driving the vehicle. But before we arrive at this point, we will see cars transitioning from the way they are now through a stage in which a user is partly responsible for driving yet can partly disengage driving obligations in specific situations. Also, with the automotive industry being under increasing pressure to become sustainable and classic status obtaining features such as big engines mismatching this goal, Mercedes stated the desire to have the user gain status through being sustainable in a luxury vehicle.

Analysis

To deliver a fresh insight to the industry and client it was chosen to use the Vision in Design-method. This method was fitting for envisioning a well-argued future context and to map likely behaviour of the Mercedes driver but also other people involved in this future context. Different attitudes in luxury automobiling were found and it was decided that the attitude of obtaining status by 'being a paragon of sustainable automobiling' would be the segment in which we would aim to position Mercedes EQ to subsequently pull the Mercedes-Benz brand as a whole into this direction. Furthermore, to make the concept Mercedes-fitting, an extensive analysis of the brand was executed to integrate a clear and expected link to specific elements of Mercedes' heritage in the design.

Vision

Following the newly formulated strategy, a design vision was created. This vision covers a mission statement that aims to have Mercedes EQ users be a 'paragon of sustainable luxury automobiling' and to provide a 'car interior in which the user can optimally be, considering everyday and real situations'. Multiple moods to cover these everyday and real situations were summed up, and it was found that a cosy old train coupe lounge served as a fitting interaction analogy for the desired interactions. In this analogy and through extensive brainstorming and sketching, a table and/or desk surface was found to be a key element in the interior around which the rest of the architecture could follow.

Design

Extensive research and ergonomic reviews lead to a tangible design basis.

Two separately adjustable desk surfaces for the front passengers were integrated for these users to work or place objects on. The middle console sweeps backwards from these surfaces to provide structural support to both the desks and an integrated saloon table around which all passengers can lounge. Room to securely place and store objects was integrated in the dash and middle console.

As the driver still needs to 'optimally be' whilst actively driving, which will occur more than half of the time spent in the car, a proper advanced steering wheel was integrated. This device neatly folds away into the dash, interchanging with the desk surfaces coming from underneath for a nice interchanging of driving obligations and the option to immerse in other activities.

As it was found that swivelling and rotating chairs are not valued enough by the user for the extra room and means they require, an asymmetrical seating concept was designed. This design allows the user to comfortably drive, sit, lounge, take a nap and posture oneself for multiple settings whilst maintaining 'openness' to the rest of the cabin.

A screen was integrated for displaying instruments when necessary, MBUX features and to serve as an extension for the user's smart devices.

The designed elements are styled in simple and elegant shapes to have the design not become outdated rapidly, and aims to propagate a 'visually light' (in terms of weight) but also cosy and durable appearance. Sculptural and flowy lines are integrated to reference nature in the design, yet in a Mercedes-esque fashion.

Added customer benefit by integrating not only a trunk but also a front trunk lead to sedan like proportions around which an exterior impression followed. This exterior took design cues from the EQ Vision, EQXX concept and styling sketches. It further propagates the values embodied in the interior.

Evaluation

The design tells an honest story in which the need to rush for users is decreased. The integrated elements are, also with the help of industry experts, well-argued and in a research based future context. They can be further detailed following the classic design for sustainability principles. The ideas were valued so much by Mercedes that, during this thesis, their research and development team put effort in helping with developing the proposition.

Report Structural Guide

Different project parts are separated and marked by the structural visual (see figure 1). It provides an overview of the whole thesis process. The part and contained chapters are highlighted.

Furthermore, co-creation sessions and findings directly according to industry expert advice are marked with the following symbols:

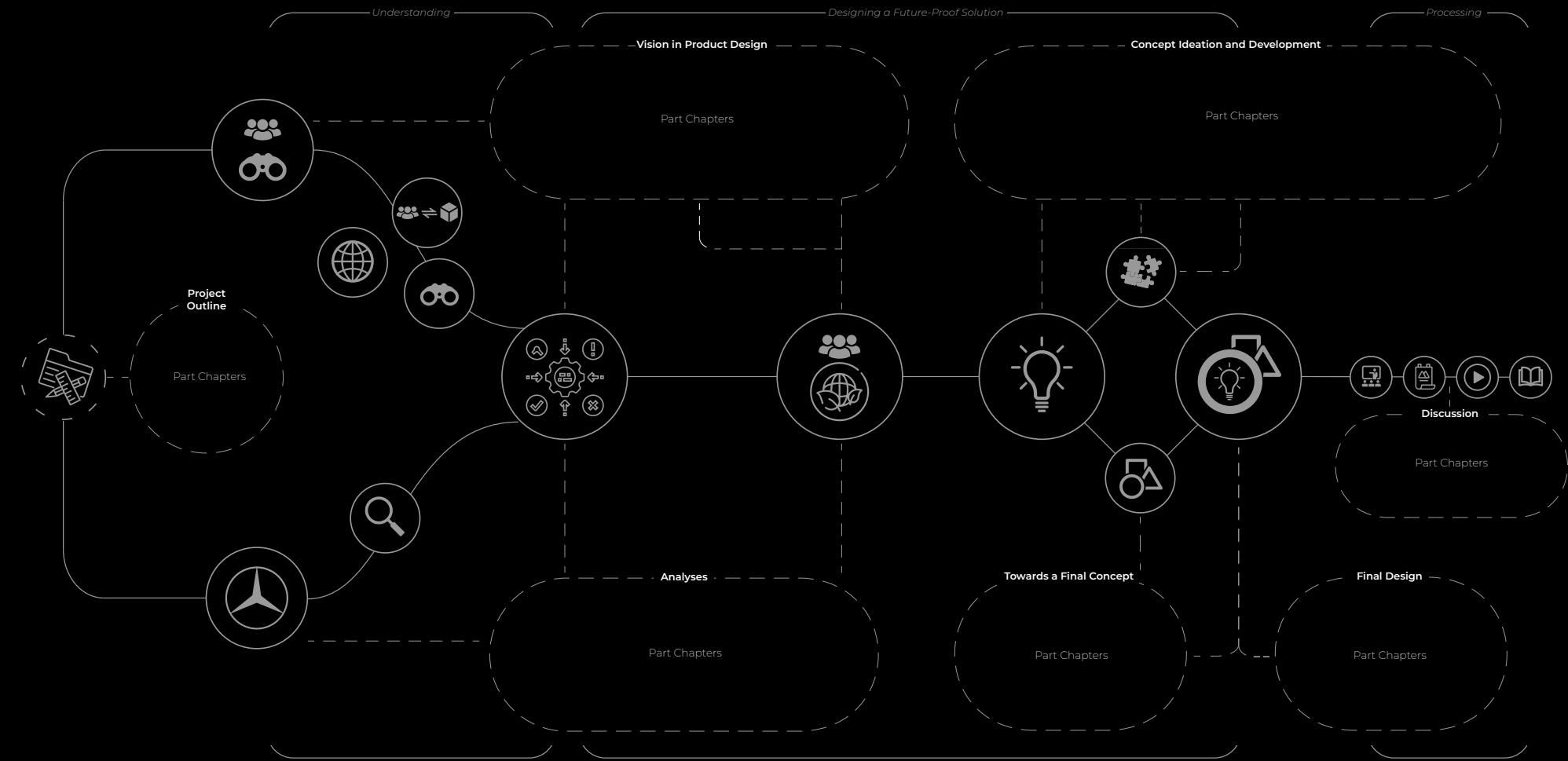





Figure 1 | Thesis Structure Overview

-  **Co-Creation Marker**
-  **Expert Interview Marker**
-  **See Appendix Marker**

Autonomous Driving Levels

Autonomous driving levels categorised and specified

Different levels of autonomous driving have been classified by the Society of Automotive Engineers (SAE) (Synopsis Automotive, 2020, Mobility Insider, 2020). They range from 0 (fully manual) to 5 (fully autonomous). Also adopted by the U.S. Department of Transportation, these levels are used worldwide. In short, they are categorised as follows:



Level 0: No Automation

Manual control. The human performs all driving tasks.

Level 1: Driver Assistance

The vehicle features a single automated system (e.g. monitoring speed through cruise control).

Level 2: Partial Automation

The vehicle can perform steering and acceleration. The human still monitors all tasks and can take control at any time.

Level 2+: Advanced Partial Automation

Vehicle systems at times can essentially be driving, but the driver still needs to monitor the vehicle.

Level 3: Conditional Automation

Environmental detection capabilities. The vehicle can perform most driving tasks, but human override is still required. In specific situations the driver can disengage the wheel (e.g. vehicle takes over in a traffic jam) (level 3 is considered to be the entry point of autonomous driving)

Level 4: High Automation

The vehicle performs all driving tasks under specific circumstances. Geofencing is required. Human override is still an option.

Level 5: Full Automation

The vehicle performs all driving tasks under all conditions. Zero human attention or interaction is required.

Glossary Terms & Abbreviations

CMF

Colour, material & finish (often in the context of a design or product)

EVs

Common abbreviation for electric vehicles

Kalokagathia Luxury

Luxury combined with the Greek concept of kalokagathia—loosely translated as “what is beautiful and good”—in this case for both people and the planet.

Mercedes EQ

Electric sub-brand of Mercedes-Benz AG

Mercedes-Benz Forschung und Entwicklung

Research and development department of Mercedes-Benz

Miko

Middle console of a car's interior

MBUX

Mercedes Benz's digital assistant/user interface

UI

User interface

USP

Unique selling point

UX





User experience

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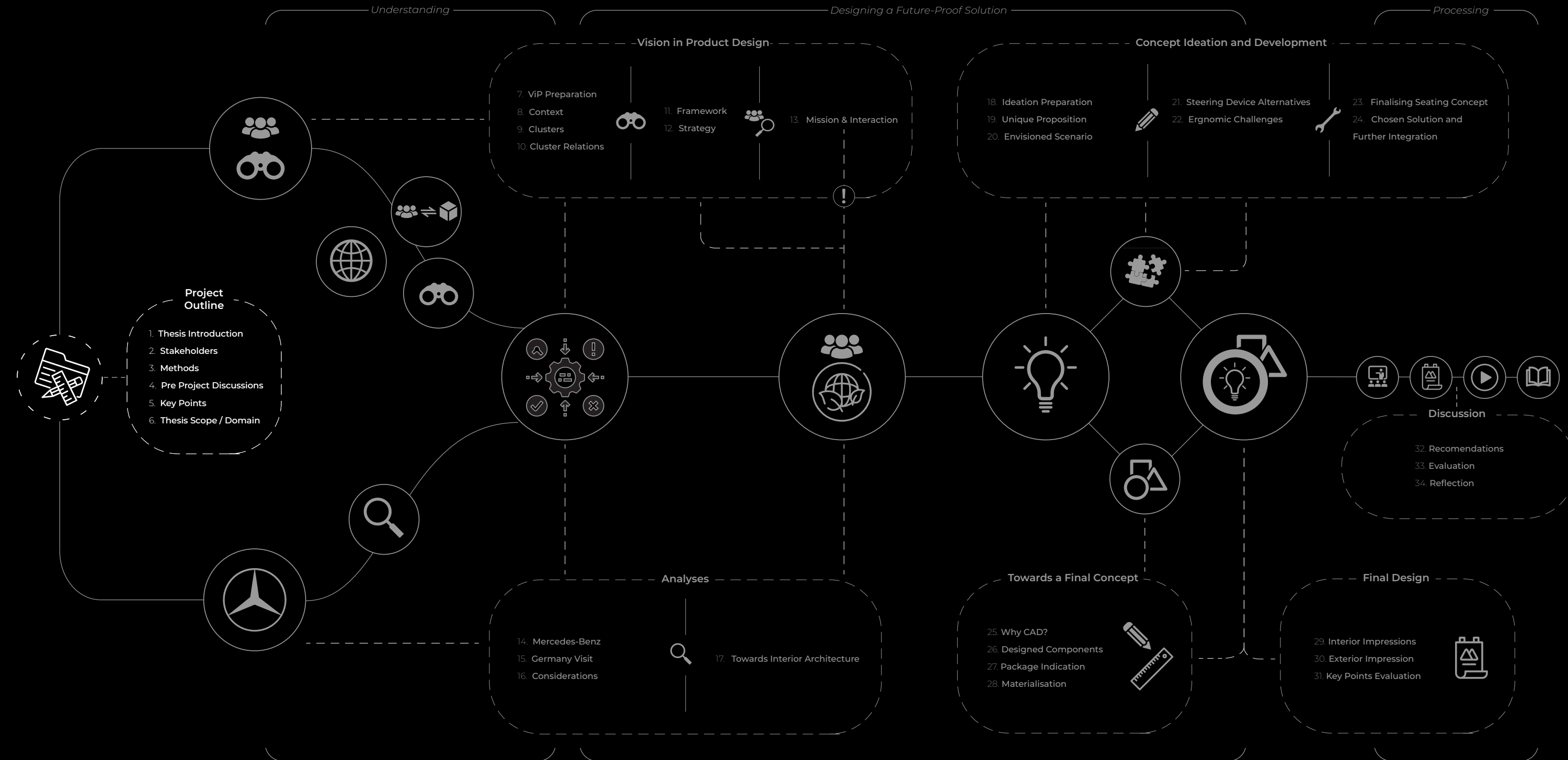
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PART I PROJECT OUTLINE

Key Takeaways

-  **Key point I:** 'why is design integrated' over 'how is design integrated'?
-  **Key point II:** (how) is it Mercedes specific, and is this story not directly sellable to other car brands/competitors?
-  **Key point III:** is the story inspiring yet realistic?
-  **Key point IV:** are decisions in line with sustainable and durable design guidelines and principles?

Thesis Scope / Domain
 -A new way of sustainable luxury automobiling
 for the 2035 Mercedes-Benz EQ driver-



1 Thesis Introduction

1.1 Design Context

Currently we are in the middle of a shifting mobility paradigm. With increasing numbers of electric cars and the introduction of new technologies that enable autonomous driving on more and more sophisticated levels, automobile companies are constantly pushing, developing and presenting ideas for this new paradigm.

New driving possibilities result in interesting design opportunities. Therefore, we must first understand this new way of driving and how we should want people to spend their time in vehicles that can operate on an autonomous level 4 or higher. Consequently, the way we arrange and use our cars is likely to drastically change (see figure 2). Together with the ever increasing demand for more sustainable and durable design in the whole field of mobility, there is an equal demand for creative solutions.

With luxury and customer centeredness as Mercedes-Benz's main focus points, the company is looking for innovative interior design for their new electric car packages/platforms. Furthermore, they state the aim to take less from the environment whilst giving more to the customer.



Figure 2 | Mercedes Interior Concept Studies

Such ambitions can already be seen through projects such as the movie inspired AVTR Mission (see figure 2, bottom right) and the new all electric EQS, as well as its new factory, 'factory 56', in Sindelfingen which operates CO2 neutrally. Mercedes puts effort into its commitment to push the development of sustainable and revolutionary car design.

Design Opportunity

In the future, new technologies enable autonomous driving on more and more sophisticated levels.




The core challenge of this project was to find out what the user truly wants and needs in a future-proof level 3.5 - 4 autonomous car interior. Cars are increasing in complexity, and with the car becoming more and more of a living/working space (from place to ride in to place to reside in), the question of how we want to spend our time in them and what the car should provide is very topical. Next to this there is the ever pressing urge to design for greener and more sustainable mobility, also for luxury brand Mercedes-Benz. So, with a new way of driving comes a new way of cabin arrangement, and considering Mercedes earlier stated goals, we were obliged to consider new directions regarding design, configuration, storytelling, production, distribution, maintenance and the recycling of a luxury car.

Research findings have resulted in a future vision and appropriate design spearpoints. In the 'design' part of the project, these findings were embodied in tangible design solutions.

Core Challenge

Find out what the user truly wants and needs in a future-proof level 3.5 - 4 autonomous car interior.

Criteria

-  **Mercedes-Benz specific**
-  **Within a sustainability framework**
-  **Luxury segment focussed**

1.2 Project Strategy

This report consists of numerous parts, but roughly a discover/define part and a develop/deliver part can be distinguished (more on this in chapter three, figure 4). In the discover/define part we have considered a worldwide context and domain in which (amongst others) the Vision In Design Method (VIP) has been implemented to research the shifting definition of the luxury car and how it will be used by an envisioned future Mercedes Benz EQ driver. The subsequently found key behaviour/interaction//mission statement has been leading in the further generation and development of the concept.

Furthermore, additional analyses regarding the brand, user, (the future idea of) luxury and the necessary components for a durable and future-proof interior package that is fitting for the brand Mercedes/the Mercedes customer were executed. Through extensive idea generation, development and discussions, a final concept was drawn up. This final design is communicated through sketches and impressions.

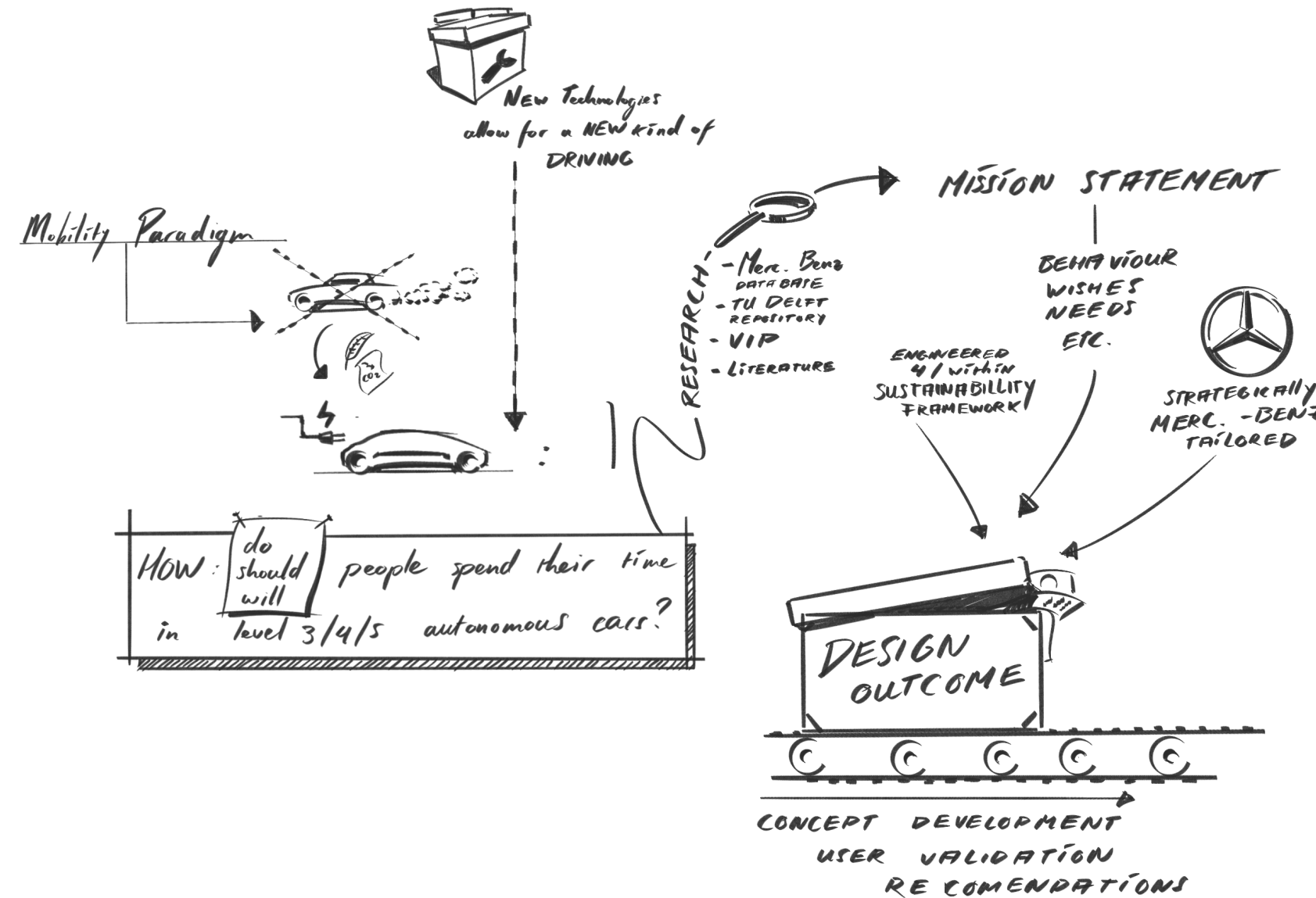


Figure 3 | Schematic Thesis Approach

2.1 Project Stakeholders

TU Delft - Faculty of Industrial Design Engineering

This project has mainly been executed to test whether I've reached an appropriate level of knowledge and skills as a designer and to show that I'm worthy of the title engineer, graduated at Delft, University of Technology. The project and knowledge gained within it, excluding confidential information, will be available in the Delft repository.

TU Delft - supervisory team

The role of the TU Delft supervisory team is to provide overall guidance throughout the project. They have helped me through various consultancies in the form of coach meetings. Furthermore, they assess my through the, by the University, layed out structure and demands that the graduation thesis needs to meet.

Design Context

The design context that I was tasked to operate in made the user an important stakeholder, as in car design and for Mercedes-Benz customer centeredness and benefits are essential.

World

In Design nowadays, the world we live in is automatically a stakeholder. Resources are depletable, and energy and space are limited. A designer is obliged to not only take this into account, but thoroughly consider this. Especially with a sustainably oriented design brief we were tasked with.

Mercedes-Benz AG, more specifically, Mercedes Benz: Forschung und Entwicklung

Mercedes-Benz is next to the University, a supervising party. Furthermore, they have provided the specific design brief. The company is part of Mercedes-Benz AG and responsible for the global business of Mercedes-Benz cars and Mercedes-Benz vans. Mercedes-Benz AG counts over 170.000 employees worldwide, with Its headquarters located in Stuttgart, Baden-Württemberg, Germany. The project was executed with close cooperation of the Forschung und Entwicklung team. They have provided me with the assignment, guidance, resources and feedback.

Me

Lastly, I myself am a stakeholder in this project. The project has allowed me to test myself on my compliances, include aspects of my personal vision, work on my skills and gives me the opportunity to conclude 7 years of education in Delft. It also has provided me with the unique opportunity to experience what it is like to work in the automotive industry. It has been an enormous learning opportunity and a process of developing myself as a designer, colleague and person.

2 Stakeholders

3 Methods

3.1 Project & Methods | Chosen Methods Motivation

In this thesis, multiple methods and approaches have been implemented in order to realise the final concept. The aim of using this variety of versatile approaches was to provide fresh/new/unique and different external advice from me as a student to the established Mercedes Benz company. The following section is a short description and motivation for the methods that were mainly used.

3.2 Double Diamond Design Approach

The double diamond design approach is widely regarded as a natural design approach to follow. Mainly, it structures, divides and provides an overview of steps to undertake in order to come up with a well-founded design and argumentation (story). As described earlier, it is structured into four phases, divided over two periods: the discover / define phase, and subsequently the develop / deliver phase. Later described methods and steps logically fit within this overarching framework and shall be marked accordingly (see figure 4).

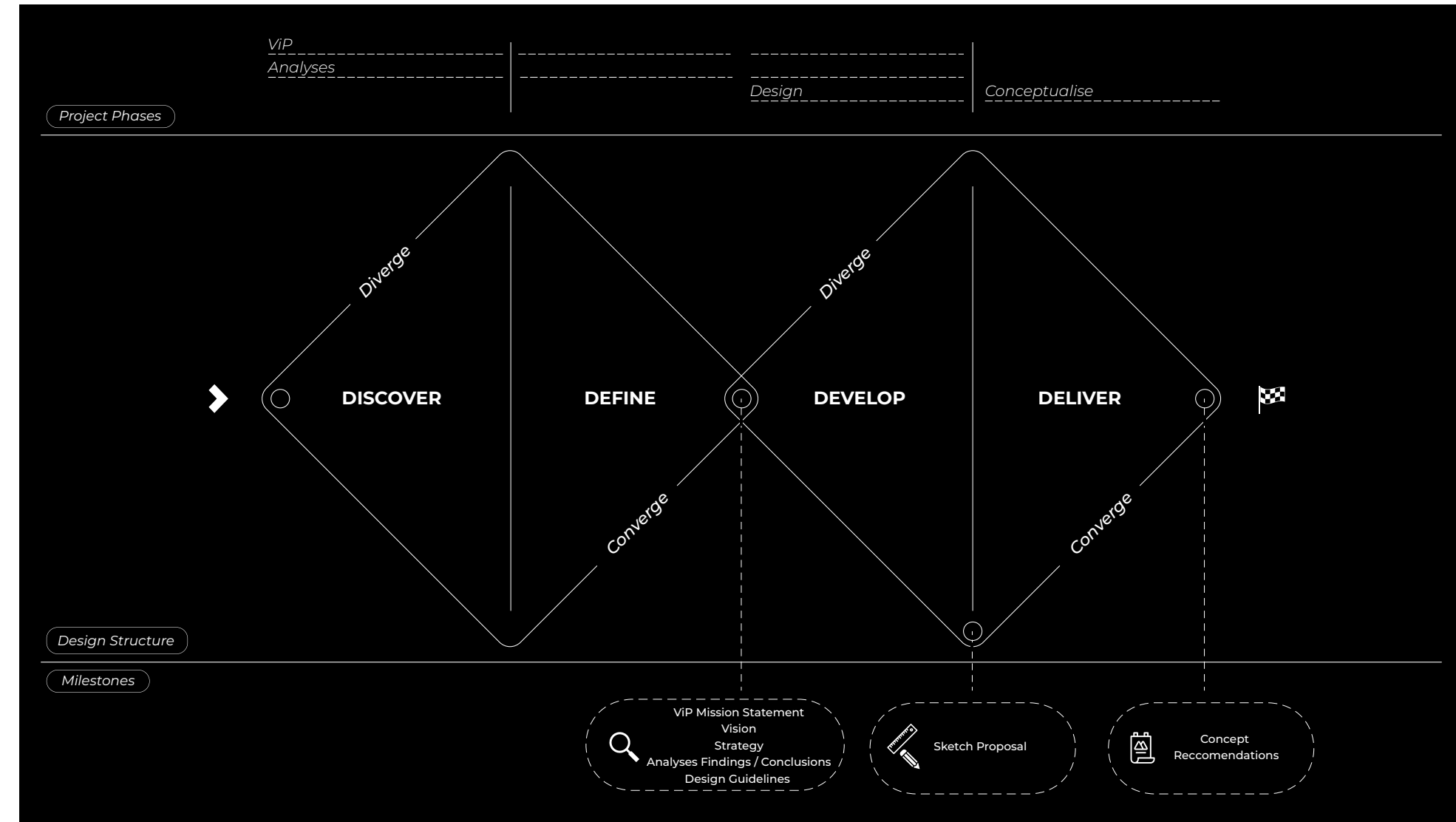


Figure 4 | Double Diamond Design Process with Milestones Highlighted

3.3 TU Delft Methods

In 7 years of studying at the faculty of industrial design engineering a broad variety of practical knowledge and methods has been obtained, alongside experience and a network of people to consult. Many of these tools and methods used during this thesis can be found in the Delft Design Guide (Daalhuizen, Van Boeijen, 2013).



Figure 5 | Delft Design Guide, Daalhuizen, Van Boeijen, 2013.

3.4 Vision in Product Design

ViP (Hekkert, Van Dijk, 2014) is a method developed at TU Delft that forces you to examine the ideas underlying your design in great detail, before coming to a manifestation: What exactly is it that you want people to understand, experience or do? The greatest advantages of this specific method (ViP Vision in Design, 2014) are:

- Future oriented - a designer's job is to look for possibilities and possible futures, instead of solving everyday problems.
- Interaction centred - products are a means to accomplish or develop appropriate interactions and relationships.
- Context driven - the appropriateness of any interaction conceived by a designer is determined by the context for which it has been designed.



Figure 6 | ViP Vision in Design, Hekkert, Van Dijk, 2014.

For a future oriented and human centred project such as this, ViP provided the opportunity to truly start from a human perspective in a research based elaborately constructed likely future context. Amongst motivations to implement ViP were earlier familiarity with the method and the unlikelihood to (successfully) compete with an automotive research department from a technology-based approach. ViP is also very suitable for the sustainable frame in which we design: we find a 'raison d'être' for what will be designed, prior to designing.

4 Pre-Project Discussions

4.1 Design that Makes Sense

As seen in the industry and field of work, there is a broad scale of possibilities for implementing sustainable solutions in luxury. Therefore, the aim is to first find a unique proposition, and then see how this proposition takes form within a sustainability framework. It is tempting to do a deep dive into technologies and materials, but with newly arising technical possibilities, a justified (new) geometry is firstly more interesting. Here we arrive at our first **key point** (Key Point I): 'why should it be there' over 'in which form should it be there'.

Note how designing for durability and longevity in the interior is extra important, as, currently, the lifespan of interiors is often the limiting factor in a car's longevity (Read, 2019. The News Wheel, 2019).

4.2 What is 'Sustainable'?

This paragraph is included to avoid confusion regarding the definition of sustainable design. The idea or misconception exists, that a domain of 'sustainable luxury automobiling' covers the idea of actively putting effort in contributing to a greener earth. This is certainly sustainable behaviour, but sustainability essentially means:

Sustainable

*The ability to be **maintained** at a **certain rate** or **level**, **avoidance** of the **depletion** of **natural resources** in order to **maintain** an **ecological balance** (Oxford Languages, 2021).*

4.3 Designing in the Automotive Industry

As was emphasised during the Automotive Minor (BSc Minor, TU Delft - Faculty of Industrial Design Engineering) and the Strategic Automotive course (MSc Elective, TU Delft - Faculty of Industrial Design Engineering), it is essential in car design that you understand the brand you're designing for, and the (strategic) position it's in. This can subsequently be related to all (both tangible and intangible) design aspects, especially considering that the premium/luxury car segment is under heavy attack, as their USP's are more and more easily copied (Van Grondelle, November 2021). During the thesis, one of the key points has constantly been to find something that is uncopyable for other brands. This is why the brand heritage of Mercedes has strongly been kept in mind, and related to the (new) brand values (more on this in chapter 12 and 14). Findings and conclusions have been tested against the **key point 2** (Key Point II): "Is this Mercedes, and is this same story not directly sellable to other car brands/competitors?".

4.5 Inspire to Undertake

Interior design is challenging as car package complexity largely dictates the room you can design in. Systems and technology along with safety requirements make it so that the physical properties are in the current context relatively fixed. This allows the designer to work mostly on the "skin" around these technologies that the user sees and interacts with. This means that there are two 'conventional' ways to continue the thesis; a more 'visionary', in which a glance should communicate the essence of the idea, and a more 'practical' in which a more realistic and fixed arrangement/scenario offers the basis (Fischer, November 2021). For me, it's the challenge to find the right balance between the two and here we arrive at **key point 3** (Key Point III): create a coherent story that's both inspiring and realistic, to evoke the enthusiasm to set to the challenge of realising the design.

4.6 Designer Gut | Personal Vision

It is important to be aware of the brand you are designing for and as it were put on German glasses and gloves. However, the Master Thesis especially, provides the ultimate opportunity to also integrate your personal beliefs and responsibilities as a designer. By taking a critical, realistic and productive attitude I aim to take effective design to its essence, and for valuable design that works and lasts. This ultimately also supports the sustainability framework in which it was tasked to design. The project aim has been to deliver a complete and well-argued concept impression including an exterior impression for a whole package exploration that speaks to the imagination.

5 Key Points

5.1 Key Points Summed Up

To ensure the added value for the stakeholders involved, the earlier mentioned key points were formulated. They are reflected upon during the project and assessed in the final part.



Key point I: 'why is it here' over 'how is it here' (in which 'it' can refer to multiple aspects; from findings and conclusions to physical architecture)?



Key point II: (how) is it Mercedes specific, and is this story not directly sellable to other car brands/competitors?



Key point III: is the story inspiring yet realistic, and does it evoke the enthusiasm to set to the challenge of realising the design?



Key point IV: (originating from the initial design brief) are decisions in line with sustainable and durable design guidelines and principles?



6

Thesis Domain

6.1 Domain

The scope/domain for this graduation thesis is as follows:

- A new way of sustainable luxury automobiling for the 2035 Mercedes-Benz EQ driver -

PART II Vision in Product Design

Key Takeaways

Strategy

- Mercedes EQ as a sub-brand is used to pull the idea of the brand 'Mercedes' as a whole to a brand which its users are a paragon of sustainable luxury automobiling.
- The new drivetrain/package will provide our canvas, on this canvas we use layers to address user problems, create a user experience, and hint back to our heritage; in other words, we create a unique brand proposition and brand story.

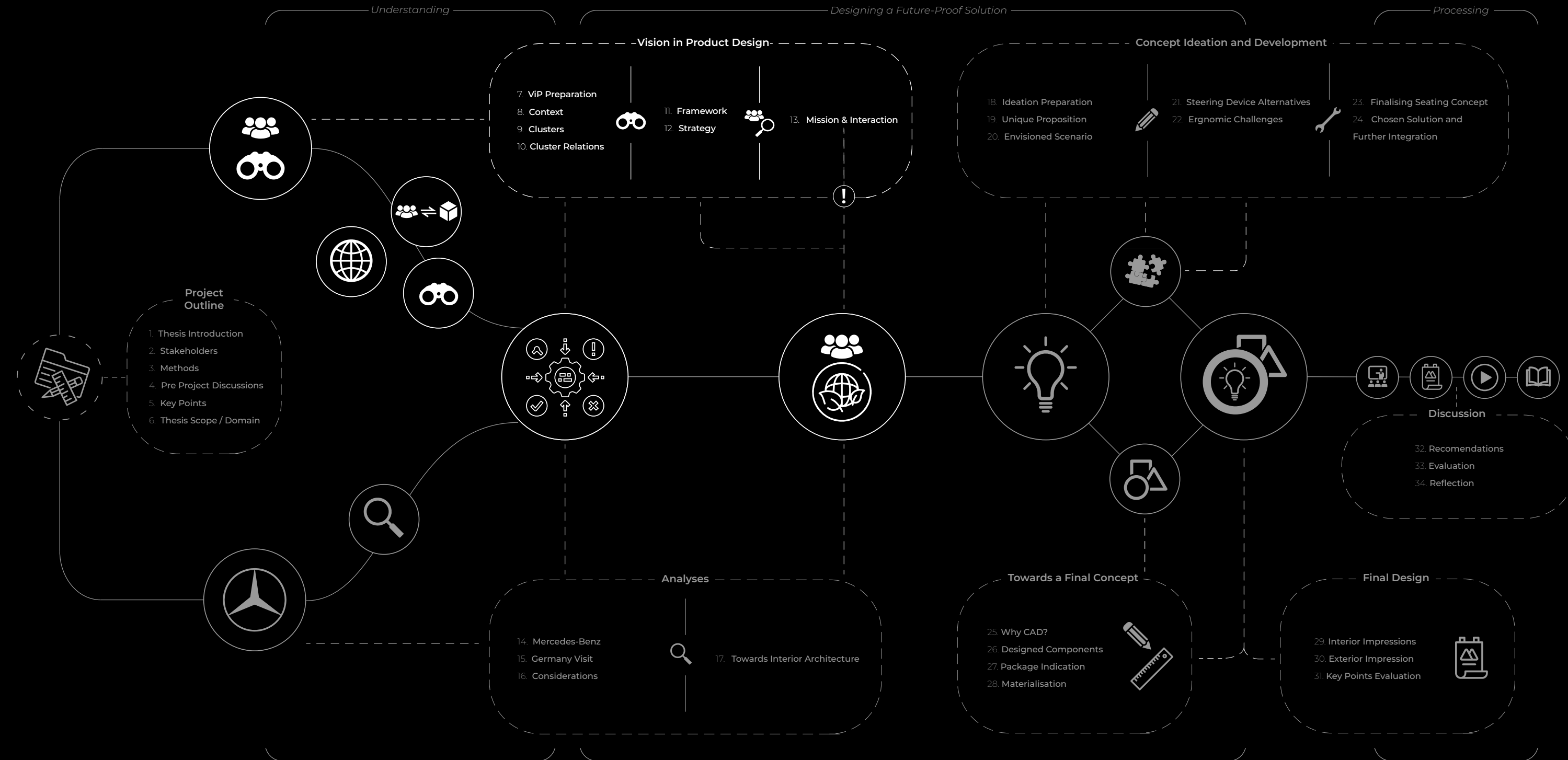
Mission Statement

In 2035, we want Mercedes EQS drivers to:

be a paragon of sustainable luxury automobiling

and we want to provide:

a car interior in which the user can optimally be, considering everyday and real situations



7 ViP Preparation

7.1 Methods Description (Elaborated)

The Vision in Design method can be subdivided into two parts, which themselves can subsequently be subdivided again. In the deconstruction phase 'that what already exists' is analysed, starting at a product level and moving through an interaction level up to a context level (see figure 7). After that, extensive research is executed to set a well-argued, likely, future context. In sessions, this context is structured and together with the client, using the generated structures (see figure 8), an appropriate strategy is formulated. This strategy is summarised in the Mission Statement, which subsequently is a leading element during the idea generation for the desired human-product interaction. Following appropriate formulated qualities for the desired interaction, and by considering other findings from the ViP research and/or external findings, further concept development is executed.

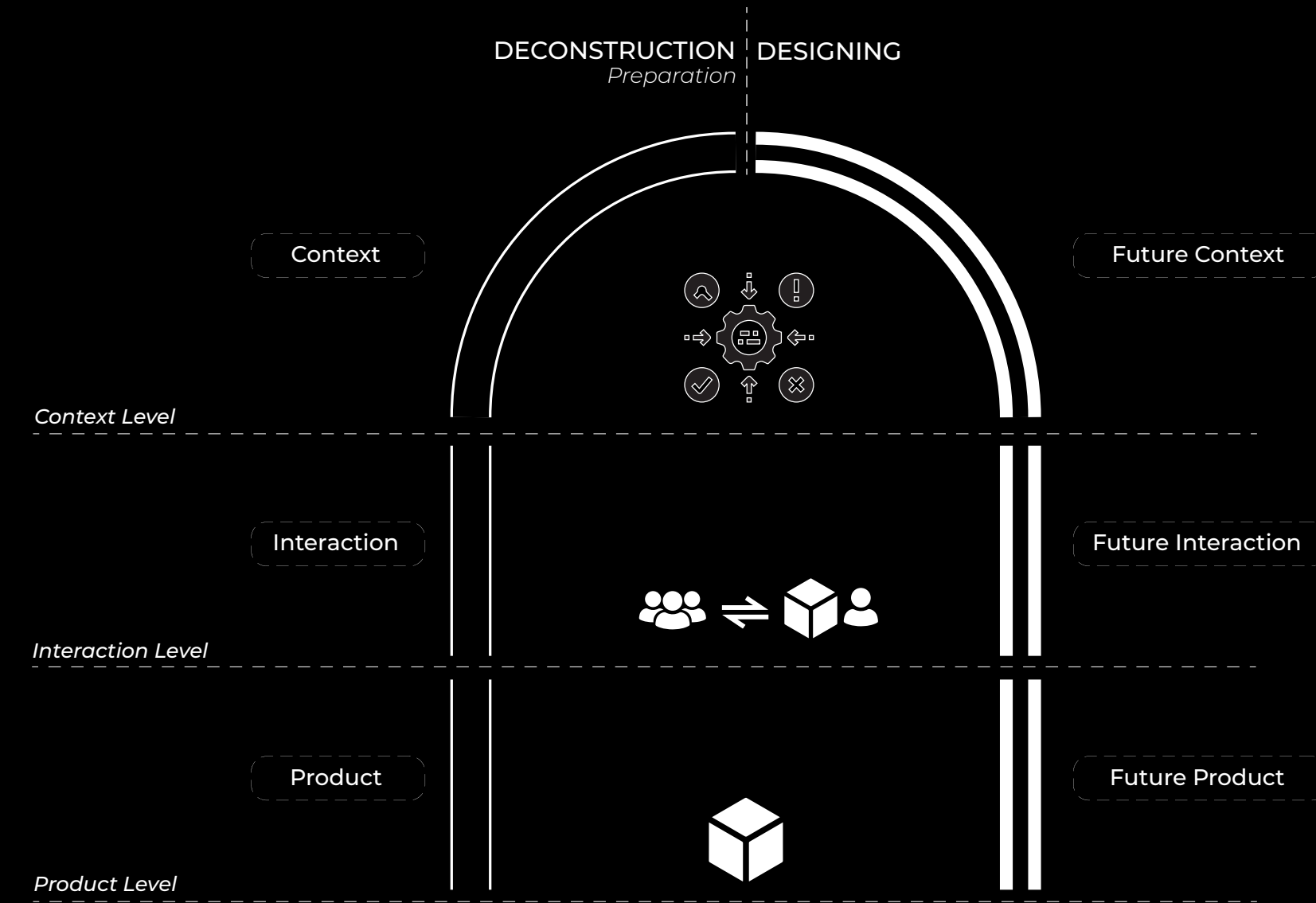


Figure 7 | ViP Design Process Structure

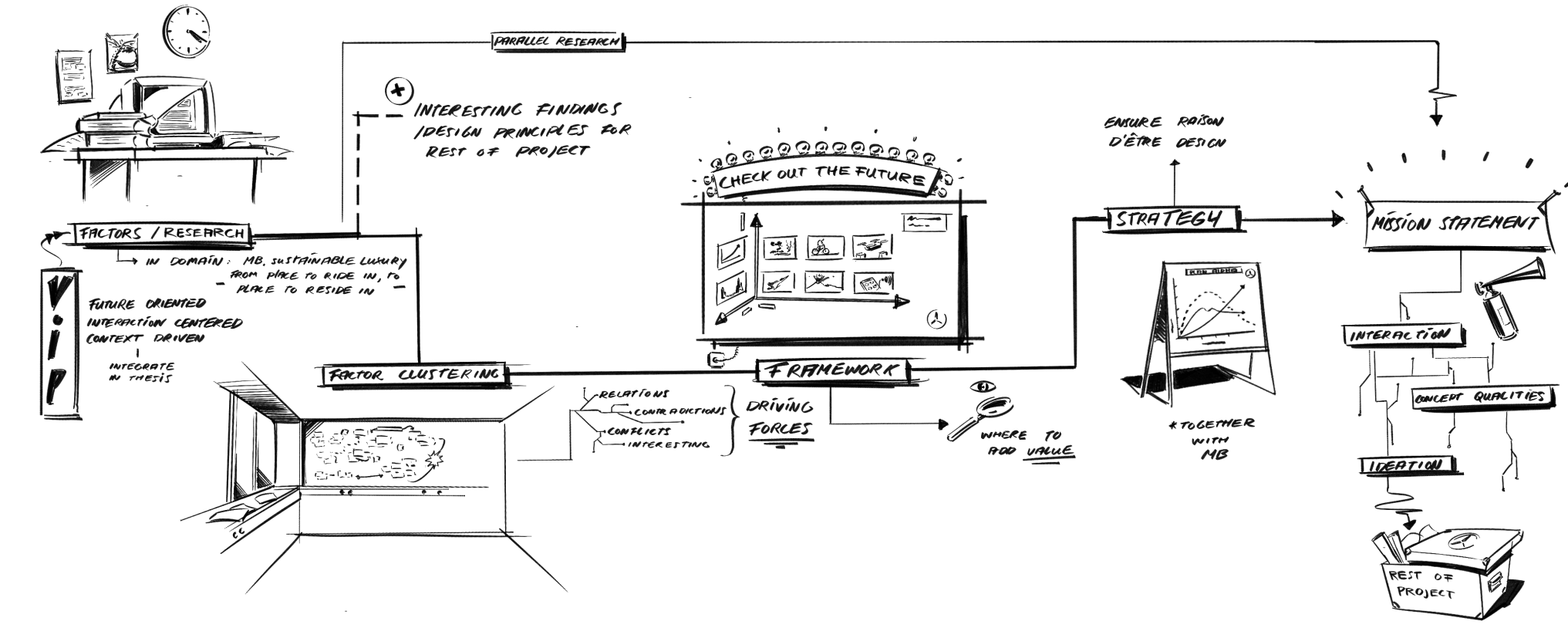


Figure 8 | ViP Design Activities Structure

7.3 Regarding the Deconstruction Phase

For this project, it was chosen to initially focus relatively little on the deconstruction phase. This was done in order to keep as much of an open mind as possible and be minimally influenced by what's already done in the automotive sector. On the other hand, knowing what is around is essential, to not deliver double-work or present something that has been around for some time already. Deconstruction work is featured more extensively in part III. Some highlights of what was found and is good to know prior to the ViP process, are:

- Brand analysis (see chapter 14)
- On a product level, the industry is extremely technology driven.
- This is very much due to a context in which disruptive technology is redefining mobility and driving.
- On an interaction level, there is little to no distinction between (luxury/premium) car brands, but also compared to other car brands.
- Mercedes has stated the aim to move from the premium segment to the luxury segment.

8 Context

8.1 Context Factors



Working with VIP gave me the opportunity to provide a unique insight. I was very unlikely to, with a conventional design approach, present something truly new to Mercedes-Benz with all its extensive resources.

- From over 60 different sources, over 150 context factors were gathered (see figure 9 and appendix A).
- > In the domain “Sustainable luxury - from place to ride in to place to reside in for Mercedes-Benz”.
- These context factors consist of trends, developments, states and (design) principles.
- After clustering the factors and finding the driving forces behind these factors, we can construct a framework for the future.
- This way we draw up a likely vision for the future in which we identify user (or target) behaviours, for which we can create or to which we can adjust our strategy accordingly.



Figure 9 | Context Factors

8.2 Regarding Car Ownership and Autonomous Driving in 2035

Many studies that present an optimistic view about car sharing and autonomous driving in the future base their assumptions on the fact that level 5 autonomous technology will be very much ready for implementation in an urban context by 2030. In a low disruption scenario however, we might assume that this will not be the case until 2040 or even 2050 (Fischer, 2021. Gao, Kaas, Mohr & Wee, 2018. KPMG International, 2020. Van Grondelle, 2021). With predictions also pointing towards increasing personal vehicle sales in the future (2030, 2040) (Furber, Maurer & Gao, 2020, Litman, 2022) and the design brief being in the domain of luxurious cars, it is therefore chosen to consider an automobile that is still sold or leased to a private owner.

8.3 About Considering a Target Group



During the gathering of context factors, it is important to consider and extract these factors from the domain related to the people involved in that domain. The question whether to pick and prioritise factors that apply to the somewhat (on average) older Mercedes-Benz buyer (Kunst, 2022), is a delicate matter. On one hand is this a necessity with a well established brand and the additional expectations of a long existing customer base. On the other hand, there are a few factors to take into account to, just as much, consider factors that are applicable for another/a larger group of people.

- Average age of Mercedes buyers is decreasing, especially in Asia (Schulz, 2021).
- In the future context we are researching, the Mercedes buyer group is likely to consist largely of Millennials, supplemented by Generation X and Generation Z (Attwood, 2021. Auli, 2019).
- Obtaining status is an essential part of luxury (Harma, 2019. Martinez, 2018), and this status is collected through the feeling of acknowledgement or approval by one's surroundings (see appendix A). Therefore, the values of this surrounding need to be considered thoroughly.

Additionally, a conversation with Pepijn van Houdt from Reframing Studio led to an interesting consideration, summarised in the words below.

“It is hard to prioritise one or the other (target group), but it seems logical that if you can argue which target group is most likely to be (still be or become) the largest one for the scope you are operating in as a brand, that you pick that one. As the automotive sector is highly competitive, it is also likely that if you don't 100% design for your target group, another brand fits their needs and desires better. If, when taking this in mind, it is still hard to choose, it would be interesting to research differences between the two target groups; what would one like or prefer, but for the other group be a reason not to buy the car.

Having said this, it seems also more logical/relevant to, in a world that is rapidly changing (in the areas of innovation and its implementation), choose or prioritise the target group that is more likely to grow in the future and also is more willing to adapt/form this future. There is also increasing social pressure for changing design in the automotive sector (mainly sustainability). If you design a car more conservatively for an older generation that is likely to get smaller in the future, you are risking a design that could rapidly become outdated. Next to this you are also lagging in development for the generations afterwards.” (Van Houdt, Reframing Studio, September 2021)

9 Clusters

9.1 Clustering

After gathering and critically reviewing the final selection of context factors it was time to start searching for relations between these factors. In the end we could define nine clusters that describe the findings in the future context. There is overlap in which clusters contain what factors, but this is only logical, as most factors are very much in relation to each other (for the full cluster document and of which factors each cluster consists of, see appendix B).

9.2 Clusters (in Random Order)

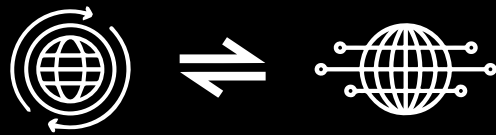
The following pages cover in-depth descriptions of the formulated context clusters.



Figure 10 | The Process of Clustering Factors

CLUSTER I

THE BLENDING OF EVERYTHING/ALL OUR WORLDS AND ACTIVITIES INTERTWINE



As boundaries between the physical and digital worlds in all aspects of our lives continue to dissolve, more and more tasks and activities will continuously keep intertwining with each other. These overlaps can enrich experiences but also weaken them.



People are willingly and unwillingly connected almost everywhere and all the time, so stimuli (or distractions) are hard to avoid. Sometimes this is, for example, a necessity for work, but it is also increasingly harder for a growing number of people to avoid stress or control their time spent online due to psychological reasons. By increasingly seamlessly integrating these technologies in cars, these effects are further amplified.



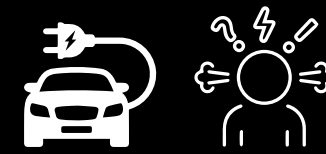
Negative effects, such as a shortened attention span, from a 'technology always on environment' on people's behaviour are very real, but the extent of these effects remains unclear until now.. Finally, our behaviour online might not match our identities offline, but they can also result in altered behaviour in the physical world.

CLUSTER II

THE FUTURE IS INSECURE / ENVIRONMENTAL FACTORS



Due to demographic, sociological, economic/financial and environmental shifts/factors accelerated by disruptive technologies, the future for many people seems (or feels) insecure. Where should one focus its limited resources (money, time) on and what kind of world will we live in or are we leaving behind?



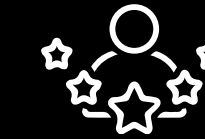
This can also be seen in the mobility sector and when purchasing a personal luxurious vehicle. Uncertainties arise; should I even buy a car, and if so, which one? How long will it take before it becomes outdated or something newer/better is brought to the market? How often will I use the car, for what purposes, and where, in rapidly changing environments and with arising mobility alternatives? As it will still take a long time till all cars are (fully) autonomous, will driving and parking in my context not be too demanding, as driving is still perfunctory in essence? With rapidly increasing numbers of EVs and, with car free city centres on the rise, will even EVs remain welcome there?



With pressure from lots of different directions it seems like every action needs to be well thought through as the consequences are likely of significance



With people's senses being vividly stimulated via a broad spectrum of media, they (have) become somewhat spoiled in the way the brain receives stimuli. Also, with the increased convenience of everything and the high rate of new products in people's lives, there are some who argue that people's senses have become somewhat numbed. How far brands need to go to create special or memorable experiences (meaningful connections and/or memories) shows how increasingly hard it has become to facilitate the appropriate circumstances for creating these.



In luxury however, the expectations of customers do increase. When aiming to provide a rich experience of high (perceived) quality, one must not forget that the making of powerful memories is essential to people's mental health.



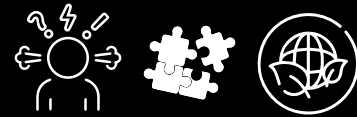
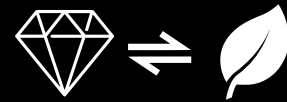
Buying a luxury car should be a very personal affair and the perceived quality is likely to increase if the car is made one's own and allows for connections on a deeper level to the user and the user's surroundings. It must be taken into account that people can't force or know what the value of an experience will be until it becomes a memory, and it can be taken into account that stronger memories come from strong emotional, more demanding or rewarding experiences. These are essential for our state of happiness.

CLUSTER III

WE'RE ONLY HUMAN/WE NEED POWERFUL AND MEANINGFUL CONNECTIONS OR MEMORIES

CLUSTER IV

MY SURROUNDINGS FORM ME / I'M SUBJECTED
TO MY ENVIRONMENT/BRANDS AND
GOVERNMENTS DECIDE



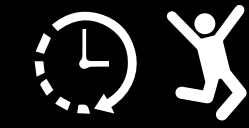
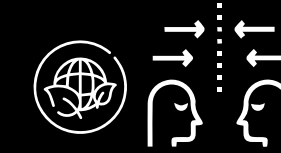
With rapidly changing direct environments and surroundings but also living circumstances, the ability to continuously move with these changing environments and surroundings becomes a necessity. In this change, brands and governments have substantial power and influence.

Also, companies and people are redefining the exclusive idea of luxury into something more like the ancient Greek concept of kalokagathia—loosely translated as “what is beautiful and good”—both for people and the planet, in this case. With changing surroundings and legislation on which the conventional way of premium/luxurious automobiling experience depends, consumers are also forced to adapt. Will, as the convenience of cars in these contexts is threatened, the full luxury potential of level 3.5+ autonomous cars be driven out of city contexts?

Moreover, these developments tie in with the feeling of little to no control over our independent (consumer) behaviour and how it becomes increasingly harder to make an estimation of which actions are, to what extent, good or bad. These feelings are directly conflicting to basic human needs for contribution, being in control and feeling significant.

CLUSTER V

I CAN/SHALL/SHOULD BE THE VERY BEST
VERSION OF ME



People are increasingly presented and confronted with what is good and what is bad, but also with other people who are doing/feeling good. Therefore, there is a social pressure on the importance of this attitude/lifestyle. It is not only great to feel good because of how you feel and feeling good being hip, feeling/doing/being good also provides an excellent showing-off opportunity. People also reward brands that are good (or less bad) for the environment. A brand's actions should, however, match their stated intentions; non-authenticity is not appreciated.

It doesn't stop with being and showing off your physical and mental health alone; this is also the case when people excel and keep learning throughout their whole life. Growing numbers of people have the luxury that they prioritise self-development, feeling good and being recognised for these achievements. The importance of a healthy mental state is not only acknowledged on an individual level, but more and more institutionally. A reinstated focus on the here and now can be seen (value the moment/memory in the making, don't spend all your time online).

In mobility, people want to be the best versions of themselves by also using their time efficiently, or to their liking. This doesn't mean that they want to be working or learning every available moment but it rather means that people like to be in control of what they want to do. Navigating through a congested city centre is definitely a waste of time, but a joyful attention-demanding yet mind clearing ride can be life enhancing. The opportunity to have a video meeting is great, but willingly choosing to take travelling as a moment for yourself and away from screens allows one to feel at ease. In this personal interior space, people will need to have the freedom to be in control and immerse in activities.

CLUSTER VI

ESCAPING MODERN DAY'S HECTIC SOCIETY IS A MENTAL HEALTH NECESSITY



In modern day's hectic society, escaping from the daily grind and our ever blending and intertwining of work, activities and life, is a mental health necessity. Especially with a global pandemic stimulating confinement to- and working from home, emotional and lifestyle problems are becoming more prevalent. Luxury can and should offer an option for this necessary escape.



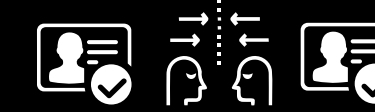
Though, with high demanding and specific luxury consumers and each individual having different needs for achieving a stable emotional state, there is no 'one solution fits all'. Spaces and moments to break up the day will be essential and micro moments shall need to be specifically tailored. There needs to be an increasing focus on how exactly emotions occur and how to facilitate these moments of escape.



A personal interior space can literally provide a physical escape to the real world but the seamless integration of technologies in mobility solutions again can provide undesired stimuli or distractions. Even when enabling 'do not disturb' modes or consciously going offline, people can very well experience a fear of missing out. It will remain a delicate question on how to facilitate the opportunity for the user to truly have the car interior as a means of escape.

CLUSTER VII

FOLLOW THE CROWD... OR NOT/COMMUNITIES VS. CHASMS/DISTINGUISHING YOURSELF OR CONFIRMATION OF IDENTITY BECOMES INCREASINGLY HARDER



As people spend more and more time online, they are constantly exposed to other people's actions and behaviour. It is in human nature to compare ourselves to others and to do what others do as people are risk averse and want to feel part of a collective, but it subsequently results in that it becomes harder to confirm one's identity and distinguish oneself.



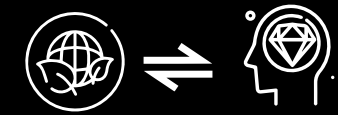
A car remains a possible means to express someone's identity, but with less distinction between cars, car manufacturers and car segments themselves this expression of identity via the car you buy and drive becomes increasingly harder. Furthermore, cars and car interiors are also not the easiest to (radically) customise, and it is unlikely that the likely/typical Mercedes customer will have the desire to customise a car themselves. However, differentiation from the factory or third parties could provide a great opportunity for distinguishing yourself (feeling special/unique) within the luxury segment.



With hyper competition everywhere it will remain clear that individuals will be responsible for their own development. Moreover, the increasing exposure to data creates not only communities but also chasms, in both the digital world and the physical world as one's actions, again in both worlds, will seldom go unnoticed/uncommented on. In conclusion; people want what others want (it is fine if we all have the same iPhone for example) but as long as they can distinguish themselves on a sufficient level in other ways. It must be said that in high-end luxury however, the customer will always demand a special outstanding service or product.

CLUSTER VIII

PEOPLE ARE CONVENIENCE ADDICTED AND
DOPAMINE JUNKIES / AND WE EMPOWER
BRANDS



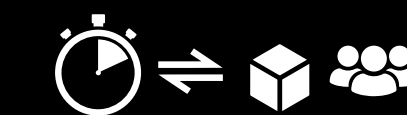
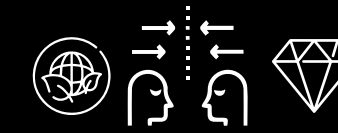
People like to stand out, get positive reactions and feel valuable, but preferably, they need to be able to do this whilst feeling guilt-free. This creates a great opportunity for brands to approach consumers. When people are presented with the right information at the right time, actions/purchases are easily justified (even though sometimes people inherently know that for some reasons their actions are not totally desirable).

With demands being met increasingly rapidly, they are easy targets in a world where everything is connected and convenience driven. In mobility, it isn't any different. In seconds it is possible to take a shared 'green' electric scooter, order a meal via the interface of one's car or compensate for an aeroplane ticket with a rainforest fee.

It results in somewhat of a cycle or spiral, in which consumers are easily targeted and people further empower those brands, by giving them more room and data/information to implement. Herein, consumers are not always sure of the intentions of brands, so brands need to clearly and transparently communicate their mission/intentions and how they implement information of consumers.

CLUSTER IX

THE RISE OF THE LITTLE PRINCESS, PRINCESSES
AND STATUS SEEKERS



In essence, luxury remains something that allows us to feel special and unique. In changing contexts, the way how we achieve these feelings subsequently also changes. Moreover, in the physical world, the days of showing off at the car park or showing off your big engine in the city are somewhat numbered, but there is still a sense of status in personally owning things. Actions in both the physical and digital world seldom go unnoticed/uncommented on. So, as mobility is largely tailored to the masses (public transport, sharing services), a personal luxury car has to fit in with the new idea of luxury (what's beautiful and good, cluster "my surroundings form me") for it to be a status symbol.

It is also apparent that people are becoming increasingly demanding, especially in a segment in which it is/consumers find it justifiable to expect something special for them for the high prices they pay. There is an increasing demand for more personalization and micro-moments/experiences, specifically tailored to the individual. This is partially why traditional luxury has shifted to a broader spectrum in which premium, fast fashion and niche sport brands, but also special collaborations between brands play a major role.

Finally, the interaction of shorter development times with a higher rate of renewed products, and with the demand to stand out and feel special and unique and oversaturated markets, the line between a 'too novel' or 'too familiar' product, becomes finer and finer.

10 Cluster Relations: Towards a Context

10.2 Context

So, clusters and their relations within the established work so far, set a context. It is important to mention that this context is the foundation for the framework from which we ultimately will derive a strategy. Besides, it functions to gather all findings which we on themselves can keep in mind whilst designing. In conclusion: we consider the context as a whole but also specific elements from within.

10.1 Cluster Relations

The found relations between the clusters and thus the factors are visualised in the image (see figure 11). In short, we can distinguish:

Plateau (left upper structure)

This plateau shows how our (institutional) environment is heavily influencing our existence and over which the individual has little control.

Vicious circle (middle)

A vicious circle in which human behaviour puts us in a position where effects of all the other clusters are amplified/strengthened.

Foundation (bottom area)

There is an increasing need to facilitate basic human needs in order to maintain a healthy mental state.

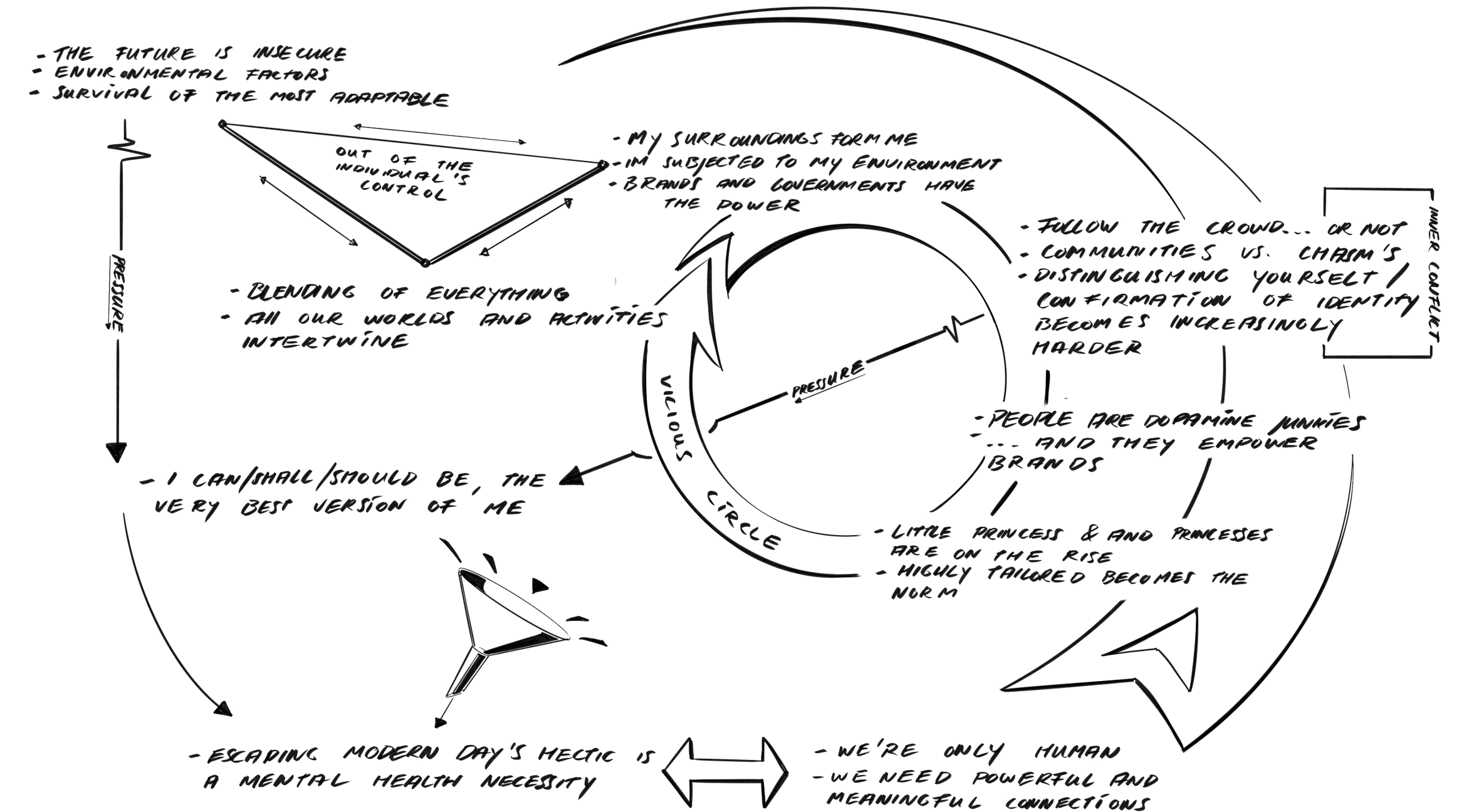


Figure 11 | Context Cluster Relations

11 ViP Framework

11.1 ViP Framework



As mentioned earlier, the constructed framework gives us a very likely view of the future context's driving forces (behind found behaviour) in the set domain. Within this framework we find behaviour or attitudes of people that we can, somewhere in our product/service, stimulate, counter or in another way design for. Depending on the strategy, coming from this framework, the formulated mission statement will capture our design targets.



Figure 12 | Brainstorming on Framework Axes

11.2 Framework Axes

Two axes were established for a relatively simple framework, in which all clusters logically fitted. After long deliberation, also with help from experienced ViP method users (Reframing Studio, TU Delft - Faculty of Industrial Design Engineering), on two spectra, the following behaviour was found:

Certain / Trusted vs. Serendipitous

A strong *inner desire* for what is **certain, assured** and is **trusted** versus a *need* for **serendipitous** experiences.

Kalokagathia Luxury Esteem vs. Distinguishing Prestige

Obtaining status through **kalokagathia luxury** (loosely translated as "what is beautiful and good" - both for people and the planet, in this case) versus obtaining status through what is more **conventionally** perceived as **distinguishing prestige**.

The framework can be seen in figure 13.

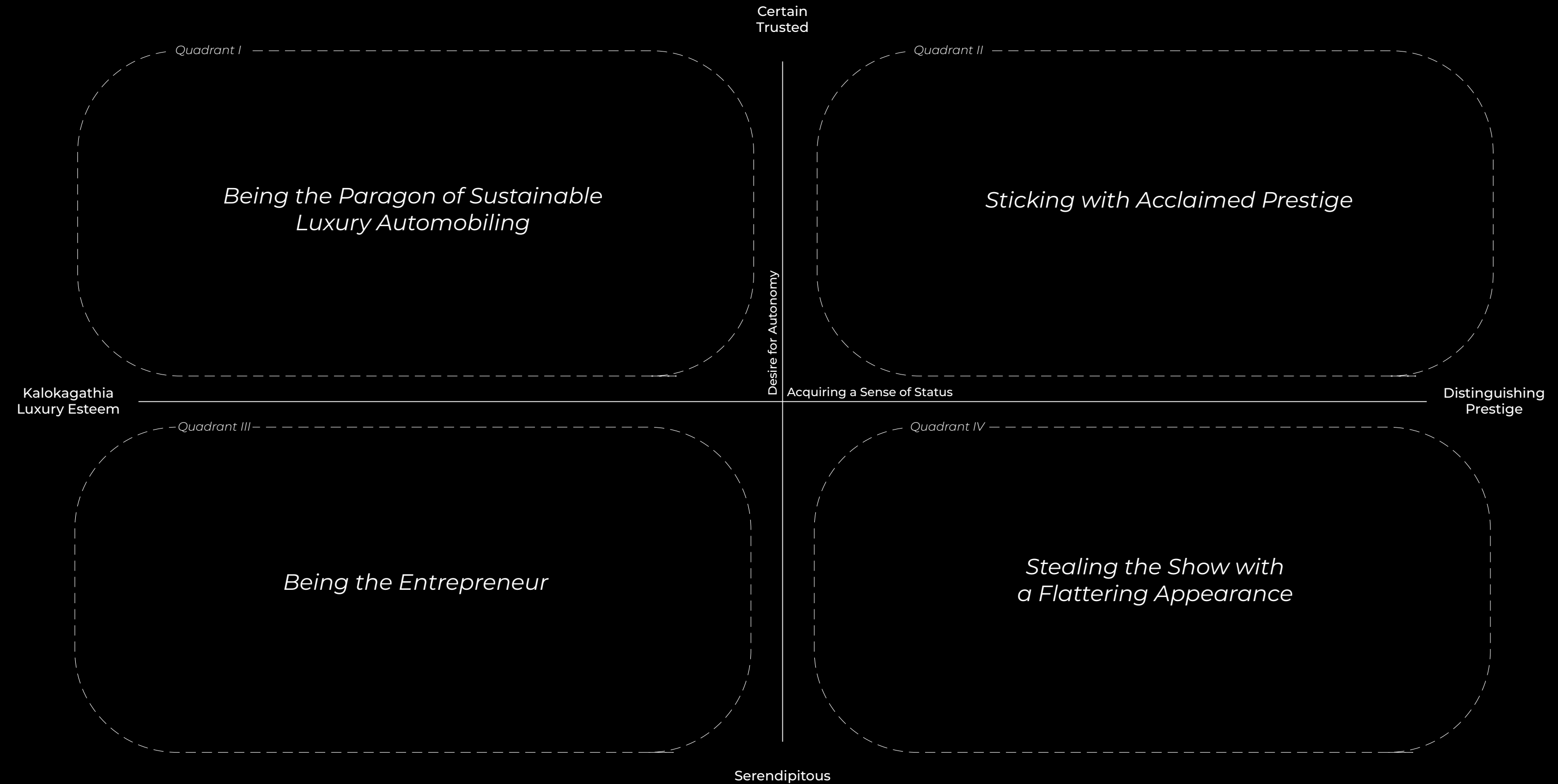


Figure 13 | Framework with Attitudes per Quadrant

12 Formulating a Strategy

12.1 Towards a Strategy



The next step was to use the framework to generate a strategy. This was done together with Jan Fischer, Sagir Aliyu and David Schulz, and also with contributions from both supervisors; Elmer van Grondelle and Susie Brand-De Groot. First, we reviewed the clusters and made sure everybody understood the established framework. Secondly we reviewed the clusters placed within the framework and the four quadrants with the fitting formulated attitudes matching these quadrants. Afterwards, the people from Mercedes were asked to place/locate their own, but also other brands, in the framework. This largely matched the earlier created framework in which Mercedes and other relevant brands were placed together with the supervisory team from Delft prior to the workshop. Mercedes' brand identity and image as well as the Mercedes driver, second hand driver and non-driver were included in the thought process. Considering the context, saturation of a quadrant and the necessity of a unique brand story/proposition, a mission statement draft and strategy were formulated.

Workshop Activities

1. Reviewing the **clusters**; is the context understood
2. Understanding the **driving forces** and the **framework**
3. Reviewing **clusters within the framework**, defining and reviewing **attitudes**
4. Placing **Mercedes** within the framework
5. Considering **brand identity, brand image, driver, second-hand driver and non-driver**
6. Brainstorm, discuss **potential strategy**
7. Consider **other brands** and their strategies
8. Consider **unique story/proposition** and how easily this story is copied
9. Consider time and the **saturation** of quadrants
10. Towards a mission **statement** (brainstorming)

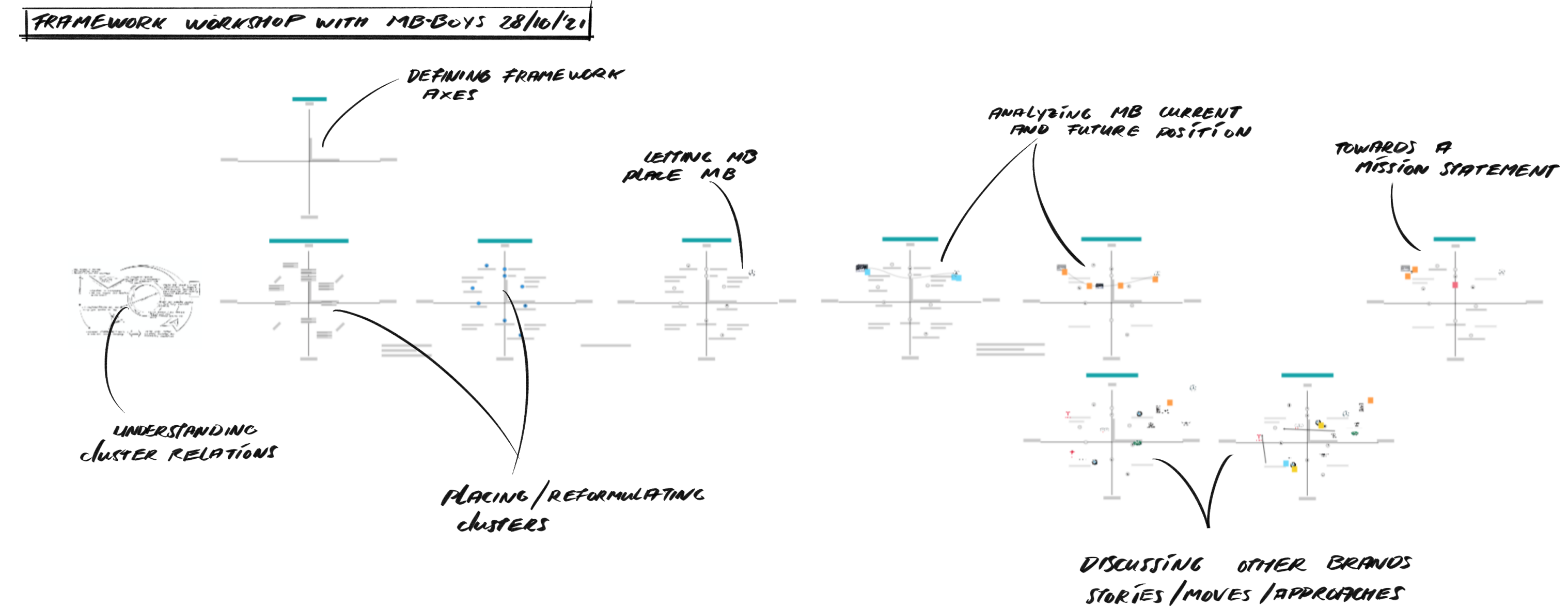


Figure 14 | Workshop Activities / Towards a Strategy

12.2 Concluding the Framework: Specifying a Strategy

The conclusions of the strategy workshop, containing Mercedes Benz wishes and the advised strategy, can be summarised as follows.

It was decided that:

- Mercedes EQ is used as a sub-brand to pull the idea of the brand 'Mercedes' as a whole from Q2 to Q1 in the coming years. This is a big leap, but it is deliberately done through the introduced sub brand.
- The new drivetrain/package will provide our canvas, on this canvas we use layers to address user problems, create a user experience, and hint back to our heritage; with other words, we create a unique brand proposition and brand story to successfully move towards and into Q1 (this process has already begun with the introduction of the Mercedes EQS).
- By asking; what are the properties and why should we do it that way (also as earlier formulated in the key points, see Key Point 1).

With the following sidenotes:

- We can and should address/solve real and valid problems that contribute to a positive amplified sound of the consumers, by effectively designing but also implementing the right way of communication (strategy) at the right time.
- We will prioritise comfort, (=flexibility) and beauty, not 0-60 time, which ultimately ties in with the behaviour found in Q1.

(together with Aliyu, Fischer, Schulz, November 2021)



Figure 15 | Mercedes Sub-brands, Categorized

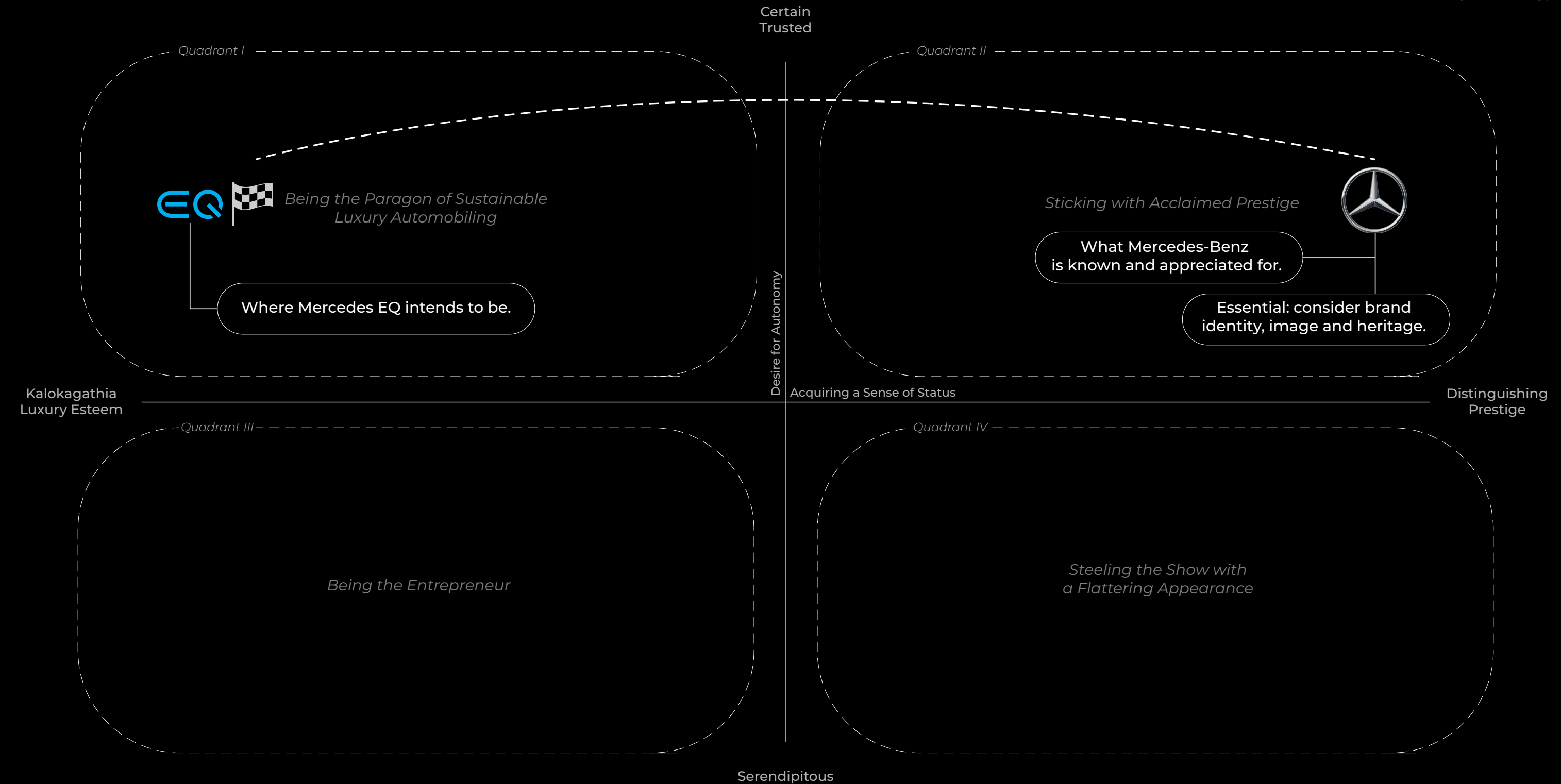


Figure 16 | Framework: the Finish Icon marks the Target Location

13 Mission & Interaction Analogy

13.1 Mission Statement

As mentioned earlier, when designing, we can take a lot of relevant and/or interesting findings out of the gathered factors. However, the core mission statement in boils down to the following and will be leading in further idea generation:

In the domain of sustainable luxury automobiling, for Mercedes-Benz, 2035, we want Mercedes EQ riders to:

be a paragon of sustainable luxury automobiling

and we want to provide:

a car interior in which the user can optimally be, considering everyday and real situations

13.2 Integrating a Designer's Vision

Concrete elements to consider in order to better design within the sustainability frame, after the formulated VIP process and strategy, are:

- The aim to counteract "the blending of everything": don't use video or technology driven solutions where you don't need them.
- Counteract the trends that decouple the user from nature; ambient lighting and screens can be a nice addition (when riding in the night or city for example, projecting a starry night, or better: enhancing); but a projection of woods/forest all on screen is phoney and not appreciated by the target group (see appendix A). It distances the user from the real world.
- Counteract the idea of "more luxury = more screens" (Hoffman, Phi CAE, November 2021).
- In a world where products and goods are renewed in increasingly faster cycles, emphasise designing for longevity.

13.3 Interaction Analogy

A fitting product example serving as an interaction analogy was found: a lounge coupe found in old trains. This lounge could facilitate the needs for multiple everyday moods and activities that occur whilst commuting or travelling. The idea incorporates the option to socially interact with your company, but also (for example at the bar) meet new people and have serendipitous experiences. There should be a place to withdraw yourself and to do your own thing: from reading a book and working to zoning out whilst enjoying music (in chapter 18, these moods are re-written to core-activities). Finally, one of the essences of a lounge is to relax; considering Mercedes Benz brand values not an unimportant aspect (more parallels and comparisons between the mission statement analogy and the envisioned concept direction later, in chapter 20).

Note: a user can be a good-humoured, well rested and excited person, but everyday situations also cover a tired and exhausted individual. In all such very real and occurring situations, the interior should still be a place to optimally deal with/be in this state of mind.



Figure 17 | VIP Analogy Visualised

PART III Deconstruction Analyses and Findings

Key Takeaways

Mercedes | Brand

Mercedes is a brand that strongly builds upon its **heritage**. A **clear link** to this **heritage** is expected by Mercedes-Benz buyers. Furthermore, a **unique proposition** is **essential** as **luxury/premium features** are copied increasingly rapidly with short product to market times.

User Research

Rotating seats are not appreciated well enough and offer too little customer benefits for the extra room that is required for their implementation.

Progressive Luxury and New Ideas regarding Status

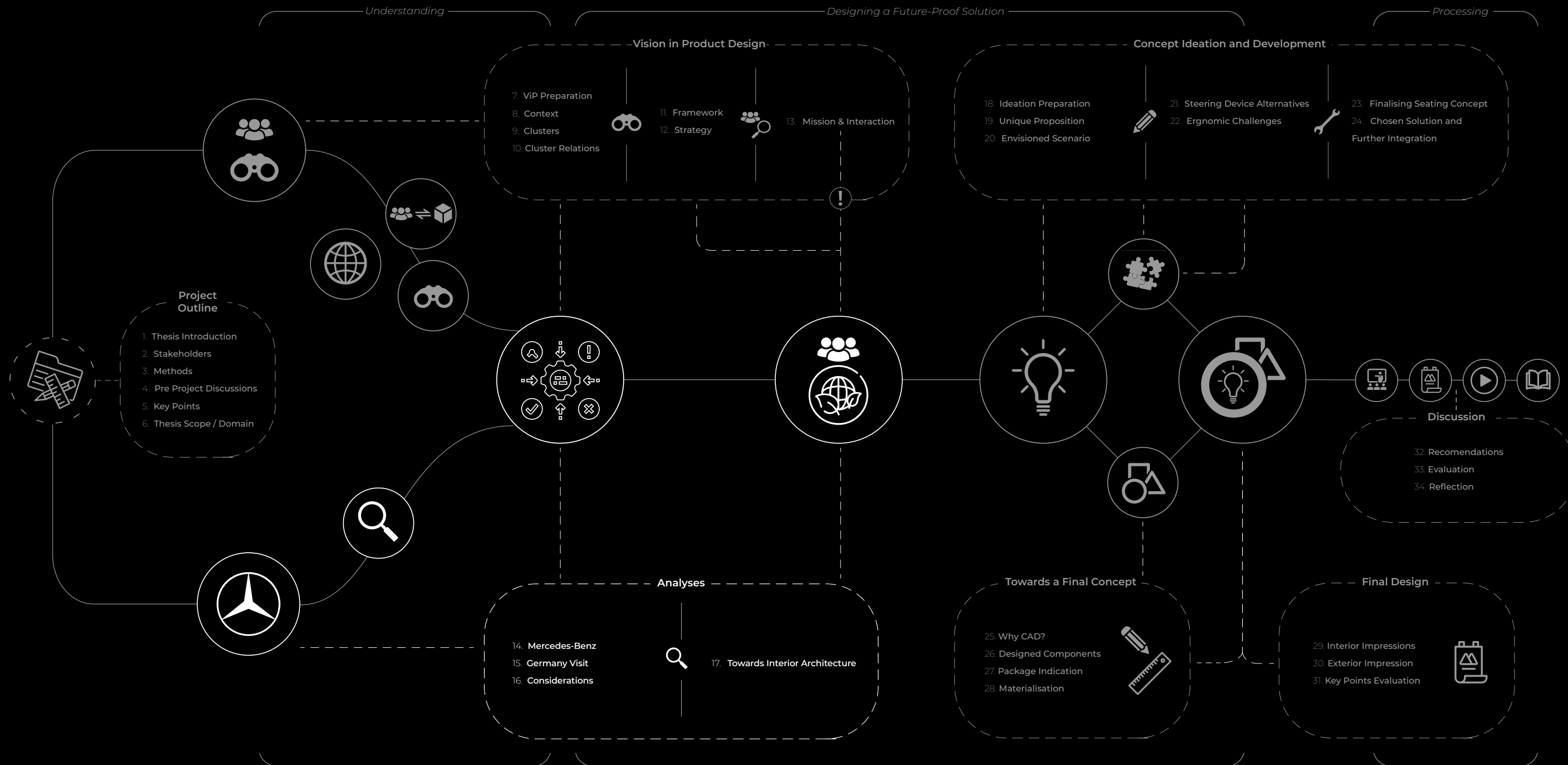
In sustainable luxury, **classical status obtaining elements** like performance achieved by a big combustion engine, need to be **substituted**.

The Daimler Solution

German / **Mercedes-esque design radiates quality and durability**. Proper and stately tangible design is essential for a Mercedes.

Car Ownership in the Future

In **2035**, a **luxury car** is likely to still be a **personal expense** (Boston Consulting Group, 2019. Litman, 2022).



14 Mercedes-Benz

14.1 Brand Identity



Figure 18 | Brand Image Overview

14.2 Brand Image

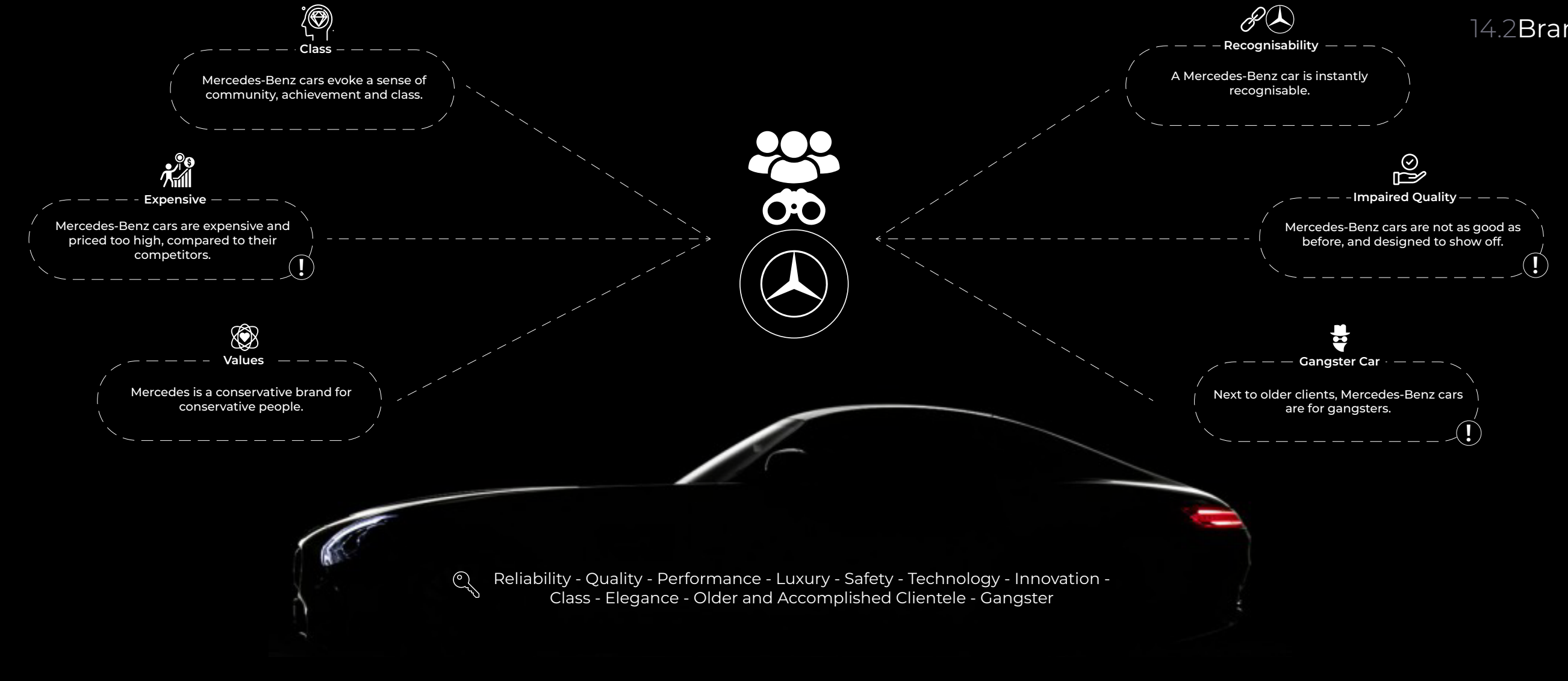


Figure 19 | Brand Image Overview

14.3 Concluding the Brand Image and Brand Identity

When designing the interior's and car's architecture we can consider the following aspects found by analysing the brand identity and image.

Regarding the brand image

- According to the formulated statement and goals (chapter 12 and 13), the new design can aim to adjust the sub-brand image (EQ) accordingly.
- We can aim to amplify positive established brand image characteristics.
- We can aim to correct or adjust negative associations with Mercedes Benz (EQ).
- We can try to solve conflicting aspects between sub-brand image and brand identity (in the visual marked with an exclamation icon).

Regarding the brand identity

- According to the formulated statement and goals (chapter 12 and 13), the new design can aim to adjust the sub-brand identity accordingly.
- The new design should match with, embody and amplify the desired aspects of the sub-brand identity.
- We can try to solve conflicting aspects between sub-brand image and brand identity (in the visual marked with an exclamation icon).

These considerations ultimately help us to accomplish Key point III.

14.4 Brand Strategy

When analysing Mercedes we can clearly see that the brand follows both a model range strategy and a generational strategy. Extracting a lot of brand and customer value from their rich DNA and history, different Mercedes models at a time are easily recognizable, and the same goes for models over time that implement incremental design changes introduced with new generations (see figure 20). This needs to be strongly taken into account when designing new Mercedes cars, as the typical Mercedes customer expects a clear link to what they appreciate and are somewhat familiar with. Furthermore, strong characteristics or personality traits seen in cars are also distinguishable through the specific use of colour and trim options and Mercedes' sub brands. Take for example an aggressive, sporty and fierce AMG and compare it to an elegant and classic S-class.

A Mercedes should be instantly recognisable.



Figure 20 | Mercedes S-Klasse Evolution

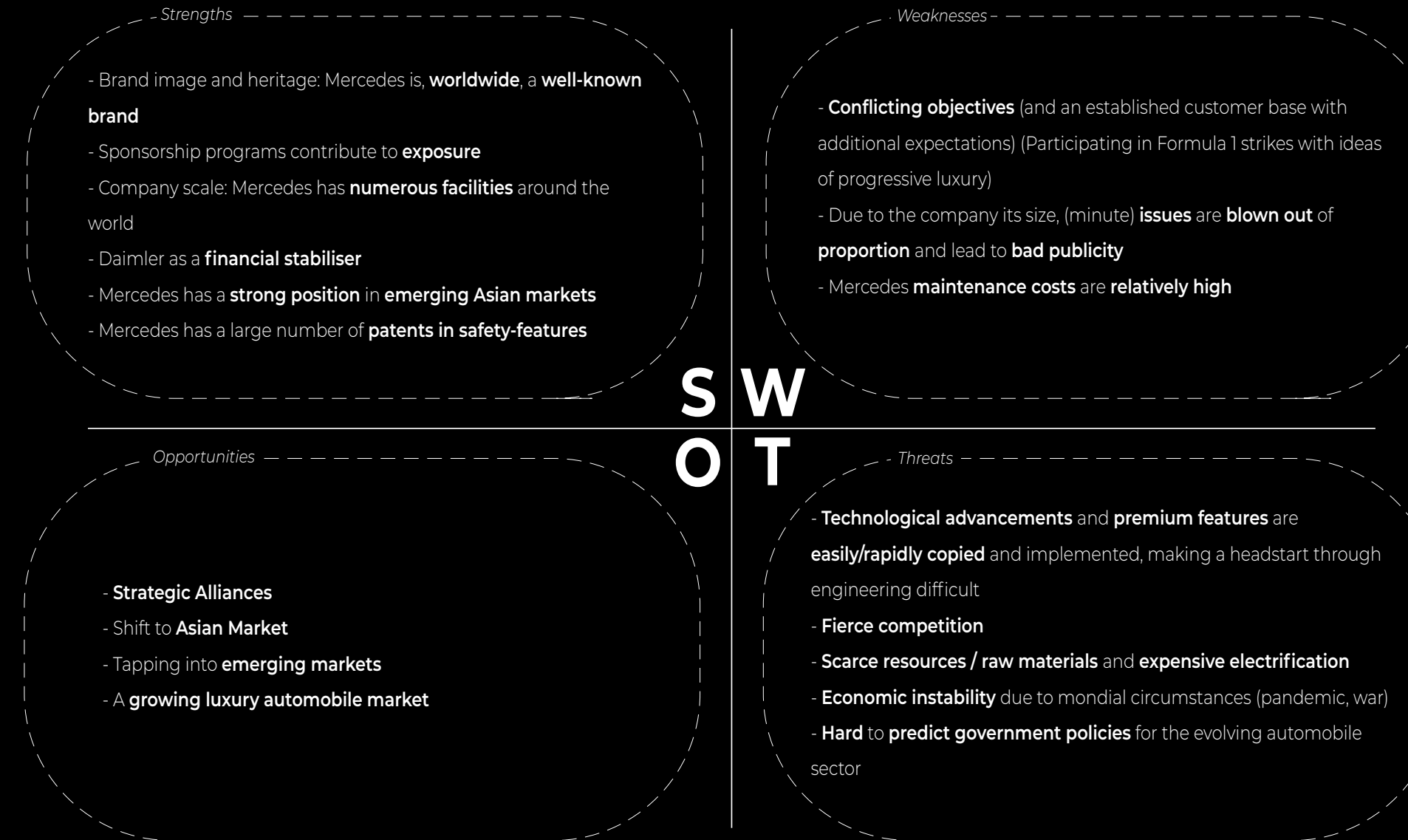


Figure 21 | Highlights of different SWOT-Analyses

15.5 SWOT | in the Premium / Luxury Segment

From multiple sources (Business Swot Analysis, 2022. MBA Skool Team, 2021. MBA Projects, 2020. Momin, 2021), interesting elements from different SWOT analyses, in the scope of the project, have been analysed. These elements are taken into consideration in the further design process.

15 Germany Visit Findings

15.1 The Daimler Solution

During my visit in Germany, Karola Hoffmann (from Phi Creative Advanced Engineering) mentioned that 'the more expensive the model (car), the more screens on the dashboard' (Hoffmann, Phi CAE, November 2021).

As it is cost efficient to put everything on one screen, it is possible to design a premium UI in which distinctive solutions fitting MB could mean; decoupling UI elements and reintroducing stand alone features, tactile buttons and well machined parts of the interior.

Furthermore, during the visit, David (Schulz, Hochschule Reutlingen) and Sascha (Blome, Forschung und Entwicklung) at one point mentioned 'the Daimler solution'. We concluded that, for a design to be categorised like this, it should be well-engineered, aesthetically pleasing, durable and Mercedes/German-esque. This is the reason why we subsequently concluded that plastic folding tables coming out of the Miiko, however might be surprisingly strong (as David said), are not a 'Daimler Solution'. It is very much in the word 'surprisingly', creating a mismatch with a design that radiates the Mercedes/German-esque 'Gründlichkeit'.

The Daimler Solution

The *Daimler Solution* covers design that is well-engineered, aesthetically pleasing, durable and Mercedes-/German-esque.

15.2 Sindelfingen | Plant Visit | DNA

German characteristics of both employer and employee make for a spotless Sindelfingen, where workers take pride in the high quality products they develop and deliver; this can also be seen in the brands' history: Mercedes has always provided good working conditions and listened to the interests of workers: good working times, salary, breaks and food/canteens (see figure 22). It is very much reflected in all you see in Sindelfingen, from the customer centre to the plant. Consequently, you can get a better understanding of where, historically speaking, their good car design reputation comes from. Engineering/performance and human centred design (safety) have always gone hand in hand.

15.3 Museum Visit

Thoughts and observations from the museum visit (Stuttgart, November 2021) are shown in the image in figure 23.



Figure 22 | Museum Piece about Employee Welfare



Figure 23 | Museum Study Highlights

16 Considerations

16.1 Multiple Seats | Buyer's Value

A conclusion drawn together with Mercedes Benz Forschung & Entwicklung: The average number of people in a Mercedes Benz S-class when driving is 1.2 (Fischer, December 2021). One could use this number to substantiate the choice of using the room in a car for the experience of one or two people only. Especially since room for facilities in a car (interior) (even a big car) is scarce.

However, as when making the purchase, the option to transport more people is of essence (Mercedes-Benz Database, 2022), this idea is altered. Four or possibly five (see figure 24) people should have the Mercedes Benz experience when they commute in the car. When the need to prioritise presents itself, we can consider prioritising the front passengers over the rear ones, and ultimately the driver (as this user is essential/responsible for driving) over the other passengers.



Figure 24 | 2022 S-Class Optional +1 Rear Seat

16.2 Progressive Luxury and New Ideas regarding Status

Status and luxury are, in the car world, traditionally obtained by exclusiveness, performance, comfort and beauty/jewellery (see appendix A).

Where performance used to be defined by speed (which sub brand AMG still exploits by making great and powerful combustion engines), in electric driving it is partly shifting to practical range and freedom/comfort (range (alongside range depending on cruising speed) and charging times/facilities). Striving for superior electrical performance, together with a unique proposition in interior layout, Mercedes EQ could successfully enter Q1 (see chapter 12).

The Mercedes museum (see figure 25) even has a piece in the museum that indicates that the speedometer is a status communicator; the challenge for us is to highlight other status communicators in the design.

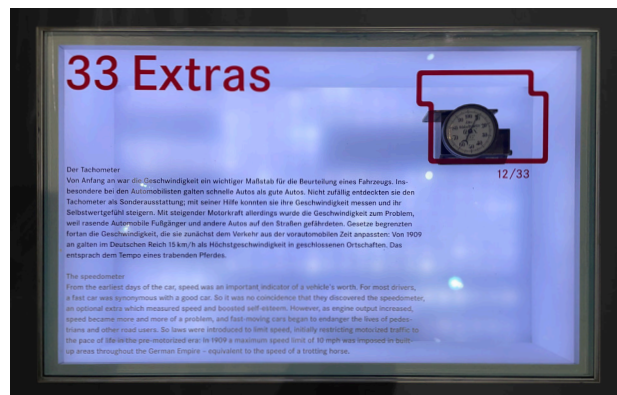


Figure 25 | Museum Piece Coupling Status to Performance to Speedometer

The idea of status through a large bonnet and engine (the so-called prestige length) is culturally embedded (Bonnemayers, 2021). it is important to achieve a distinguishing silhouette (beauty and exclusiveness; from proportions to detailing), to radiate a stately prestige purely by shape. However in our case, it does not make sense to execute backwards engineering like is done in the Maybach Vision 6 (see figure 26).

The desire to be a paragon of sustainable luxury (Mission Statement) should be at the core of the new Mercedes EQ sub brand (see chapter 12). So logically, architectural elements need to communicate this to the context surrounding the user and product, to be successful status obtainers for the owner.



Figure 26 | Rolls-Royce Vision (left) & Maybach Vision 6 (right): Obtaining Prestige Length by Repurposing Bonnet as Stowage Area

16.3 Car Ownership in the Future

Shared mobility services with cars is something that is already happening (for example through service constructions like Greenwheels), and it is only likely to increase in the future. The ViP research however provided us with the insight that in the luxury/premium segment, it is likely that around 2035 such an expense is still a personal one. In short, this is partly due to the personal and highly intimate nature of such luxury expenses together with the large sense of status in personally owning such objects (Boston Consulting Group, 2019. Litman, 2022).

16.4 Leisure is Luxury

In the museum, the first Mercedes station wagon was displayed, which coupled the idea of luxury to leisure. The idea was emphasised through this 1985 Mercedes 300TD t-model station wagon, which was filled with 'a day at the beach' accessories (see figure 27). It shows that being able to transport dear ones and accessories for leisure offers the possibility for luxurious and memorable experiences.

This motivates us to consider an optional implementation of a +1 seat in the rear (see figure 24), whilst also optimising trunk space. Especially when this is related to the Mercedes Benz driver; from transporting your golf clubs to one's muddy fancy ski gear.



Figure 27 | Mercedes W123T Station Wagon Displayed in the Museum

17 Towards Interior Architecture

17.1 From Mood, to Requirements, to Design

From the mission statement analogy, personas and extensive discussions prior, different moods or situations could be imagined in which a user has specific needs. They provided inspiration in the sketching phase and allowed for the imagining of different scenarios or configurations in the car. These scenarios or situations have provided the configurations for the executed user research, but were also taken into account when ideating and designing later in the process. They finally helped to ensure that what was necessary to achieve the mission statement was taken into account, and that the final design addresses real user problems and adds real user benefits (Key Point 1, strategy chapter 12).

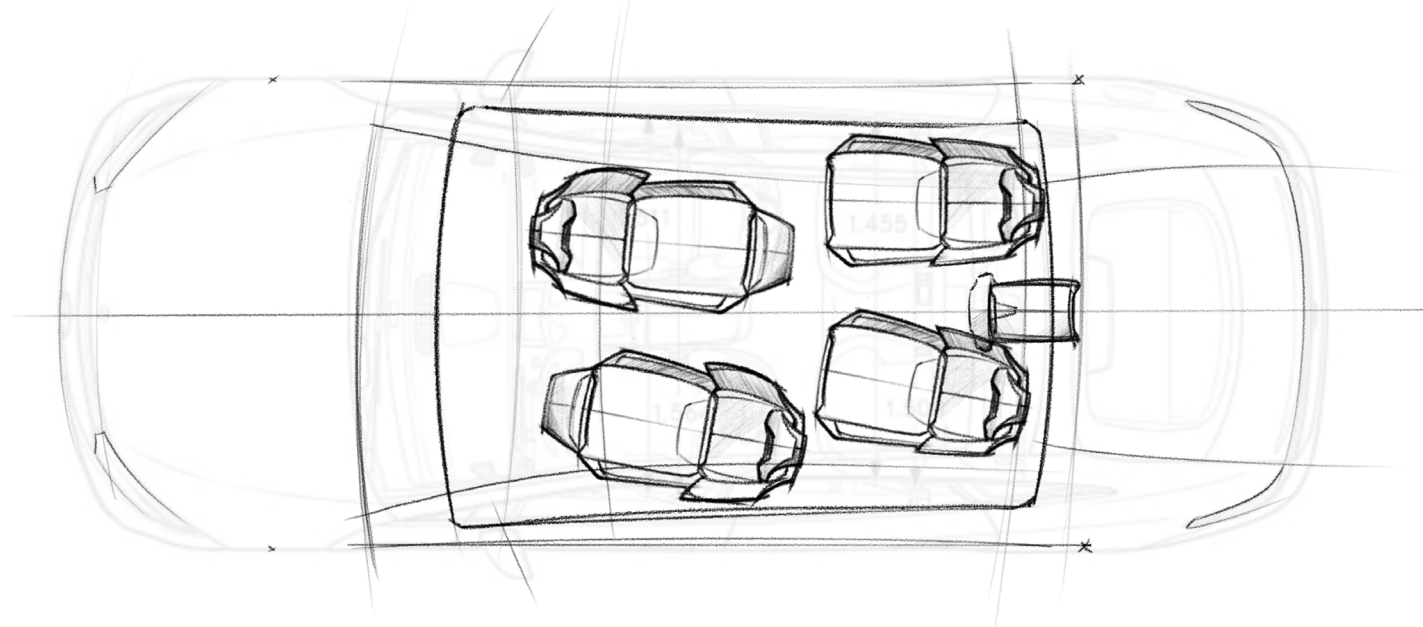
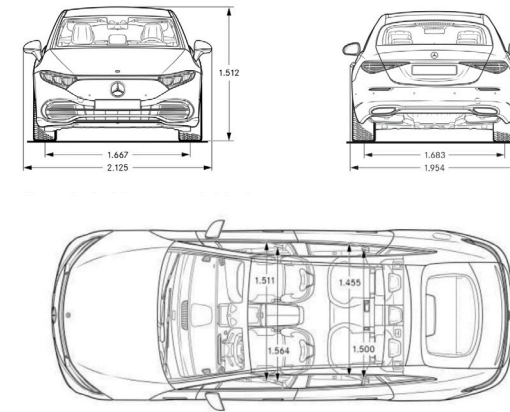


Figure 28 | Example of Seating Configuration that was Mimicked in User Test

17.2 User Preferences Study | to Compare with Mercedes-Benz Data

As someone has got to do with the means available, 8 people from my house were asked their opinion about 6 (roughly mocked up) different car interior configurations (see figure 28, 29). Mainly, they were asked to judge the settings on personal space and comfort, the option to socially engage, the option to 'do your own thing', novelty and overall thoughts and comments. For the settings and obtained results, see appendix C.

Some noteworthy findings, from the study, discussions and the feedback from the research department, are:

- Sitting skewed on the front row creates nerves for the driver and co-driver for leg entanglement, especially when they consider a pedal cluster.
- There is a preference resolving the 'front passenger wall'/barrier for the rear passengers, created by the two front seats closing the different rows off from each other. Enhancing communications between the front and back of the car is generally preferred.
- Passengers can feel 'left behind' if they are in an outer corner seat (one furthest away from the other passengers) of one of the more alternative settings.
- Generally, personal comfort is prioritised over other aspects the study looked into.
- A proper table or desk surface is greatly appreciated.

- Whilst the Mercedes Research Department found the largest customer benefit in a fully reversed right front passenger, my research showed people disliking the setting, especially for longer stints and from the driver's point of view. In this setting, the driver(s) noted that they felt more like a chauffeur than part of the company.

- Communication should be freely done, not in a forced setting. This has to do with shoulder to shoulder distance and view lines per passenger; a forced setting creates a nerve and social awkwardness for passengers. Mercedes-Benz Vans has already implemented a simple idea to improve the communication between the rear and front of the car: microphones and speakers in the headrests to easily talk to all passengers (also those in the rear).

- In a level 4 autonomous driving context, we should strive for a situation in which a chauffeur is nicely and smoothly relieved from their driving job.

- Regarding rotating seats: the Mercedes F015 study found; rotating whilst driving is a mess. Whilst stopping alongside the road, getting out of the car and rotating the seat is not a Daimler Solution (Fischer, January 2022). Conversely, we can once more ask ourselves whether there is a need for a reversed seat at all (considering earlier comments, and the increased chance of nausea when driving reversed).

- For rotating and swivelling seats, firstly, the car needs to be very wide, and secondly, you need a car without a B pillar.

- The absence of a headrest greatly benefits the 'openness' of the cabin and the feeling of a company in social settings.

- Take inspiration from a bench/table combination in the train; rearranging one's posture might have a sufficient influence for the level of engagement.



Figure 29 | Pictures from User Test

PART IV Concept Ideation and Development

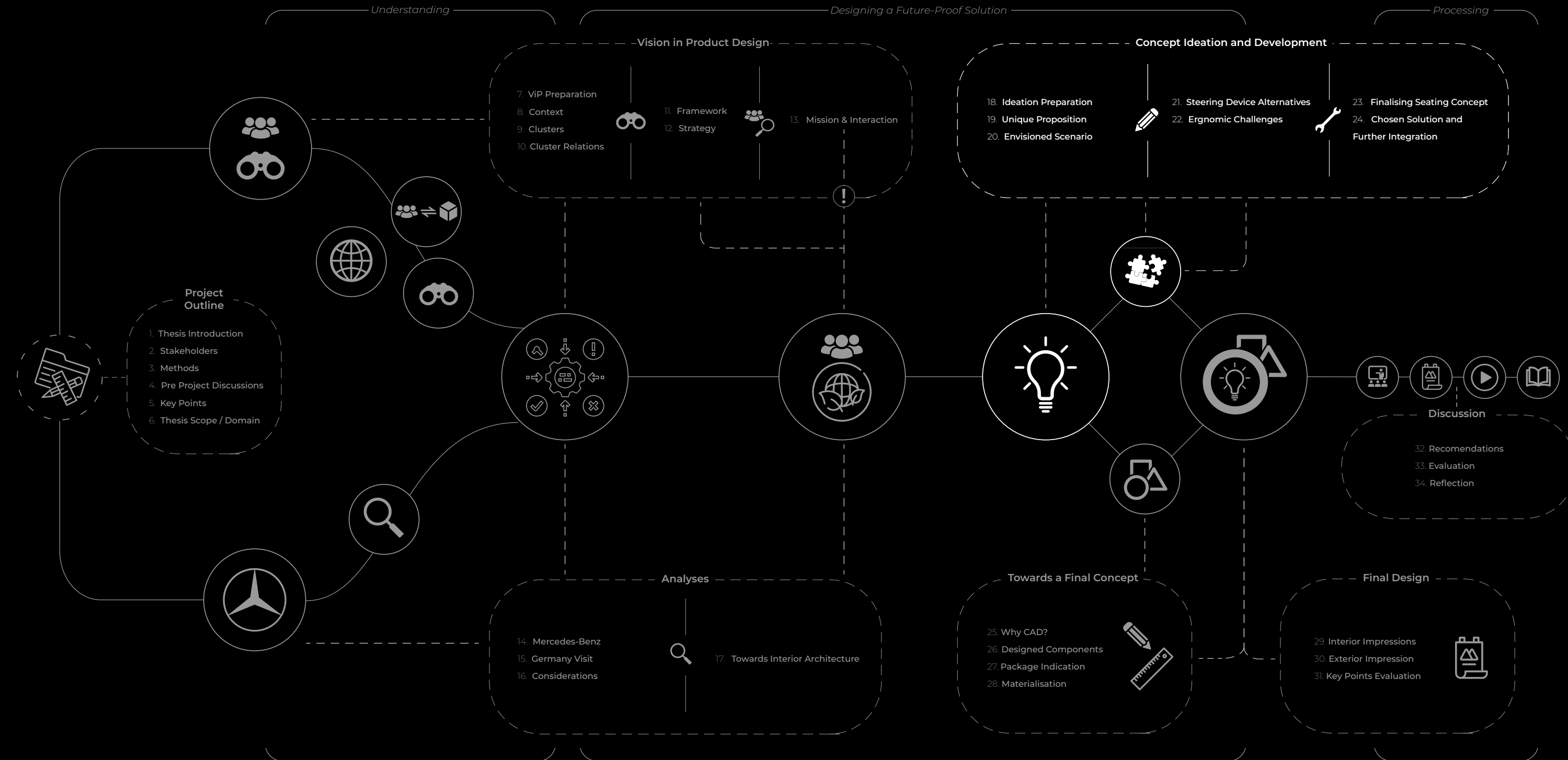
Key Takeaways

Unique Proposition

Considering ergonomic challenges, user benefits and an envisioned scenario, it was decided to **design interior architecture** around a **proper desk and table**.

In a **future context**, the user still needs to **achieve joy in driving**, so an **adequate advanced steering wheel** is integrated.

When the car can cruise autonomously, the steering device folds away and the **table** can be **extended from underneath**.



18 Ideation Preparation

18.1 Starting the Ideation Phase

An extensive explorative sketching (Delft Design Guide, 2013) and ideation phase started with drawing up interior concepts or solutions for fulfilling the mission statement. In these sketches, numerous directions and ideas were explored that incorporated different ideas from earlier work and discussions. In an early stage, the mission statement was examined more closely. More importantly, rough ideas and directions to make the mission statement into a physical design were summarised (moods to core-activities, see figure 30) and the mission statement was further dissected.

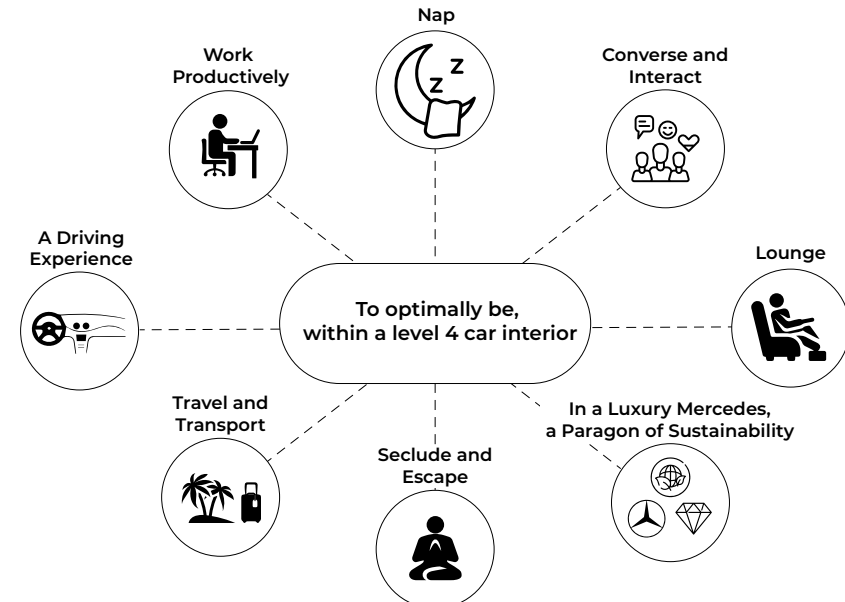


Figure 30 | Level 4 Interior Core Activities

Being a paragon of sustainability -

- Not distancing the user from nature
- (Visually) lightweight design, hinting to component reducing design approach
- Design for longevity, durable and timeless materials alongside an as little as possible amount of rapidly outdated technology

To optimally be -

- For the driver, a smooth and sensible transition between place to ride in and place to reside in
- A rigid and large working surface (proper Daimler solution, see chapter 15)
- Facilitating personal comfort, the right view lines and personal spaces (social configurations)
- A personal and relaxing escape of modern day's hectics

For the Mercedes driver -

- Expressed in Mercedes (German) specific design, presenting new ideas but also linking to heritage

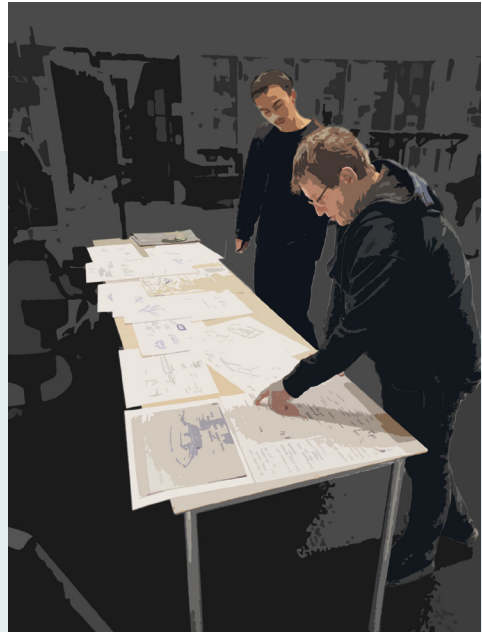
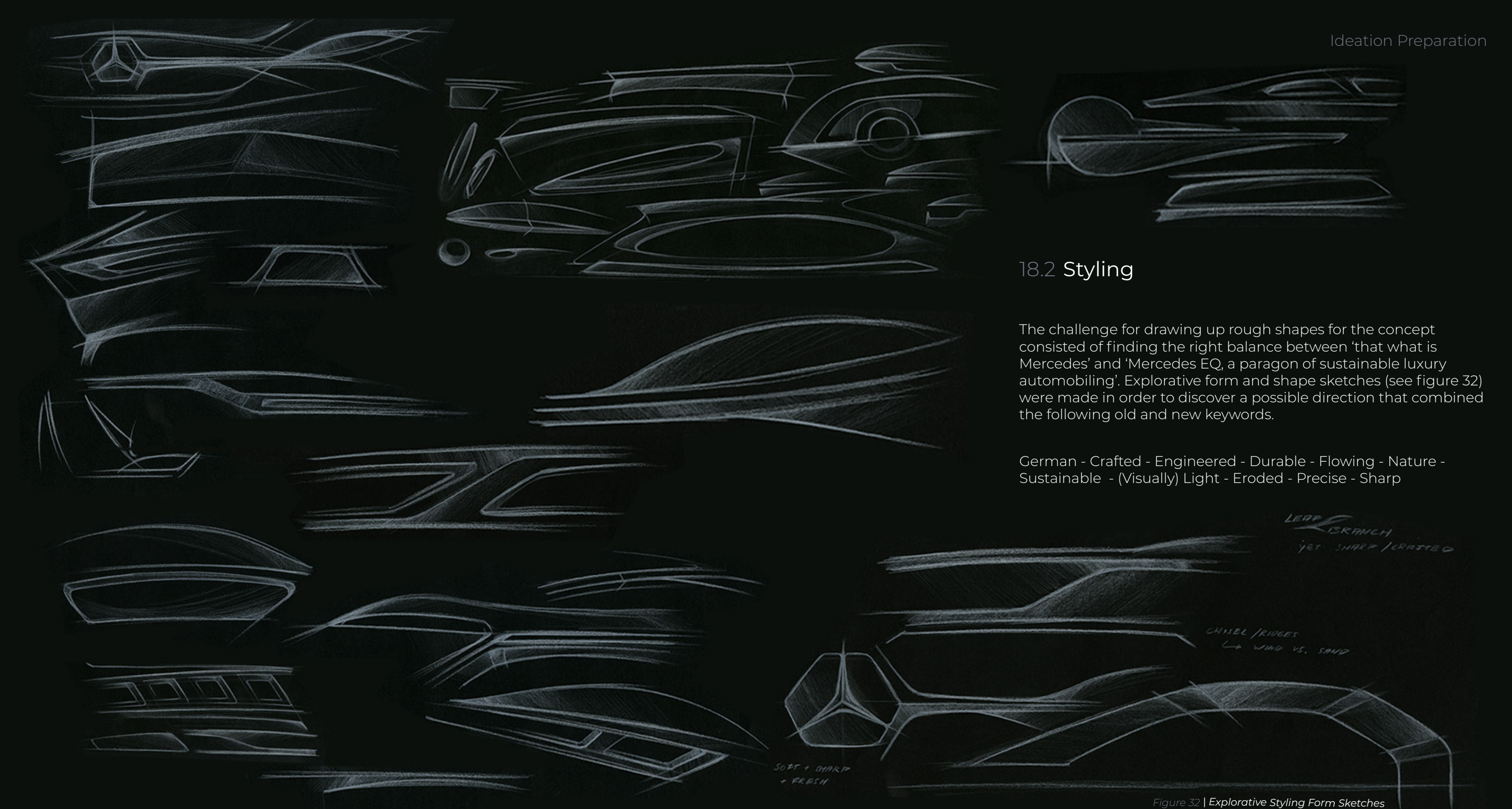


Figure 31 | Starting the Ideation Phase

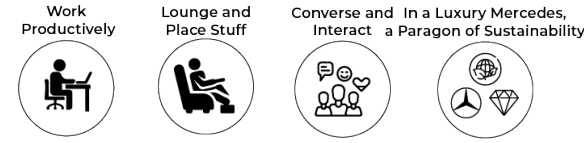


18.2 Styling

The challenge for drawing up rough shapes for the concept consisted of finding the right balance between 'that what is Mercedes' and 'Mercedes EQ, a paragon of sustainable luxury automobiling'. Explorative form and shape sketches (see figure 32) were made in order to discover a possible direction that combined the following old and new keywords.

German - Crafted - Engineered - Durable - Flowing - Nature - Sustainable - (Visually) Light - Eroded - Precise - Sharp

Figure 32 | Explorative Styling Form Sketches



19 Unique Proposition

19.1 The Unique Proposition

During the sketching ideation phase, one highlighted setting or mood was 'Office Life' (Fischer, December 2021). The key element of this mood/setting was a proper surface/table to work on for mainly the front seated passengers (see figure 35). This element provided a unique idea regarding the implementation of 'livingroom-esque' elements in a car interior.

Start with the table!

"We (car brands/designers) are constantly trying to bring this living room idea into cars; huge displays, fold-away steering wheels... even plants. But what is the point if we need to keep all our utensils on our lap? Our devices, some snacks, a drink.... Imagine a living room without a proper table... Start with the table, it's something I have never seen before. The rest of the proportions/configuration will follow around the table solution. The table is the dish. Swivelling chairs and dynamic settings, that's the spice." (Fischer, December 2021)

19.2 The Table, more than Something to Put Stuff on

It's remarkable that, consciously or subconsciously, also in the ViP Analogy (see figure 33), the table can be seen in multiple places. Noteworthy is that the table in these settings offers more than a place to solely put stuff on. It can also act as a connecting element between different passengers. For example: something via which objects are passed, something that invites a physical posture towards others, a physical guiding element in the settlement of persons around it...



Figure 33 | Table Surfaces in ViP Analogy Visual

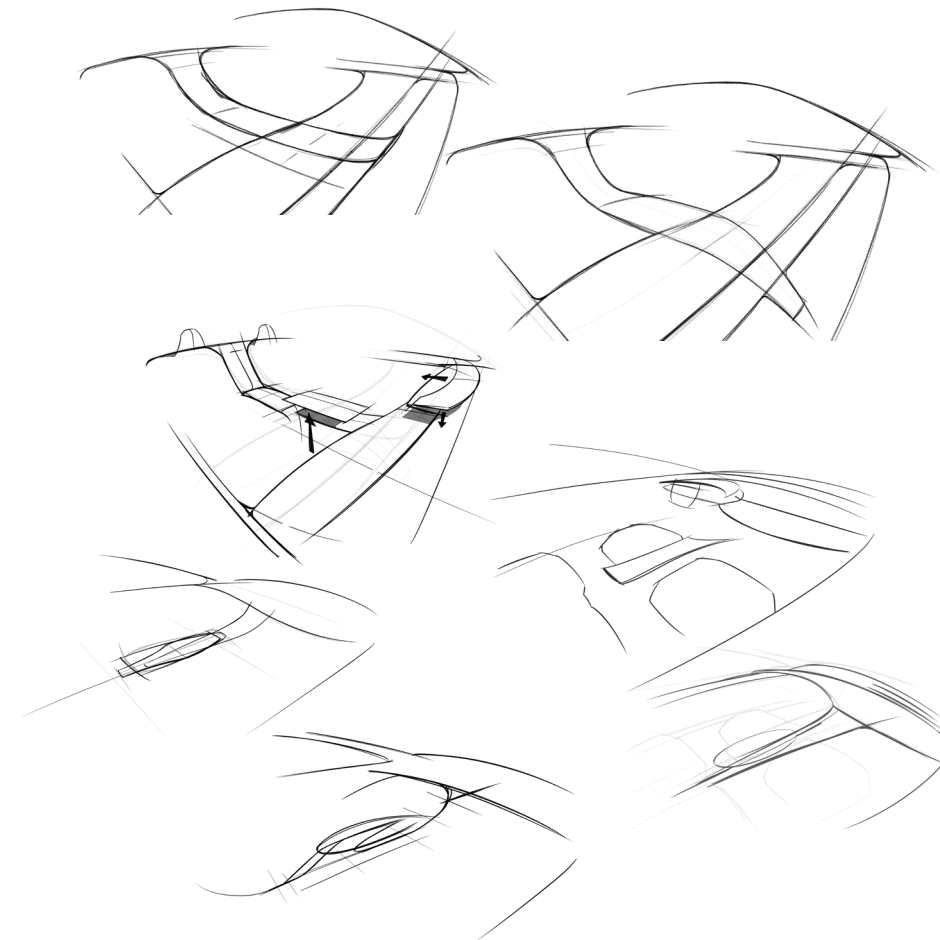


Figure 34 | Desk and Saloon Ideation

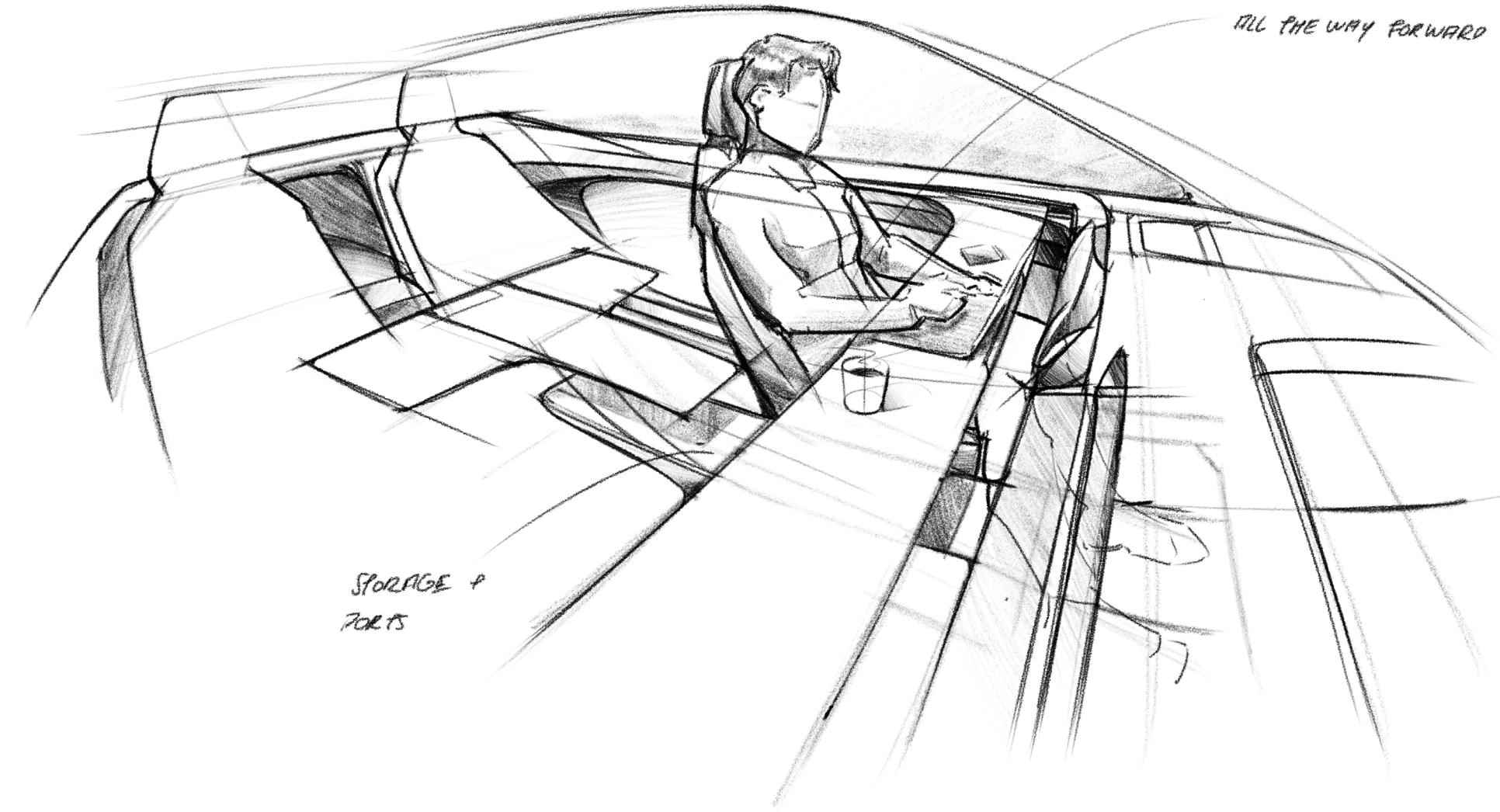


Figure 35 | Office Life Mood Explorative Sketch

19.3 Forschung und Entwicklung Collaboration

Right before the Christmas holiday break Jan delivered positive news from the Mercedes department. The ideas regarding a proper surface to work on/desk/table were received positively. Substantiated by the ViP research and the Analogy Visual (see figure 17, chapter 13), the added customer value became clear. This surface can provide space to put stuff on or as a guiding element for social interactions. Designed well, it can for example provide a good posture for working behind a desk (in a car), a place to put your beverage when lounging and a surface to play games on in a company. The department also agreed on the idea of the Daimler solution not being a foldable, surprisingly strong small table, but instead; a proper German design solution. The ideas were valued so much that they decided to use internal resources for the project/idea. The plan came together to have their engineering exploration meet my proposed design solutions. This development furthermore resulted in the table, for the thesis, being the initial core designing point for the interior, from which the rest of the elements could follow. Therefore, it was decided to intensify efforts during this period on coming up with solutions for the front passengers and the integration of the table with the miko and dashboard, in order to achieve a fruitful collaboration with Forschung & Entwicklung and Phi CAE.

It quickly became apparent that implementing such a disruptive (physical) element as a table/desk in a car, in a fashion that allows the driver to smoothly engage or disengage with a steering device, would be complex. Furthermore, when the table is not necessary, it should not take up too much of the personal room and reduce the comfort of the passengers. During the further ideation and development; the main challenges consisted of getting the idea ergonomically sound and designing or picking the right layout for other devices and arrangement in the dashboard.

19.4 Unique Proposition Pitch Visuals

Initially, the preliminary concept was internally pitched using the sketches (see figure 36 and 37). In a later stadium, the concept was shown to their supervisors respectively, using the renders from Phi CAE (see figure 38) (Phi Cae, 2022).

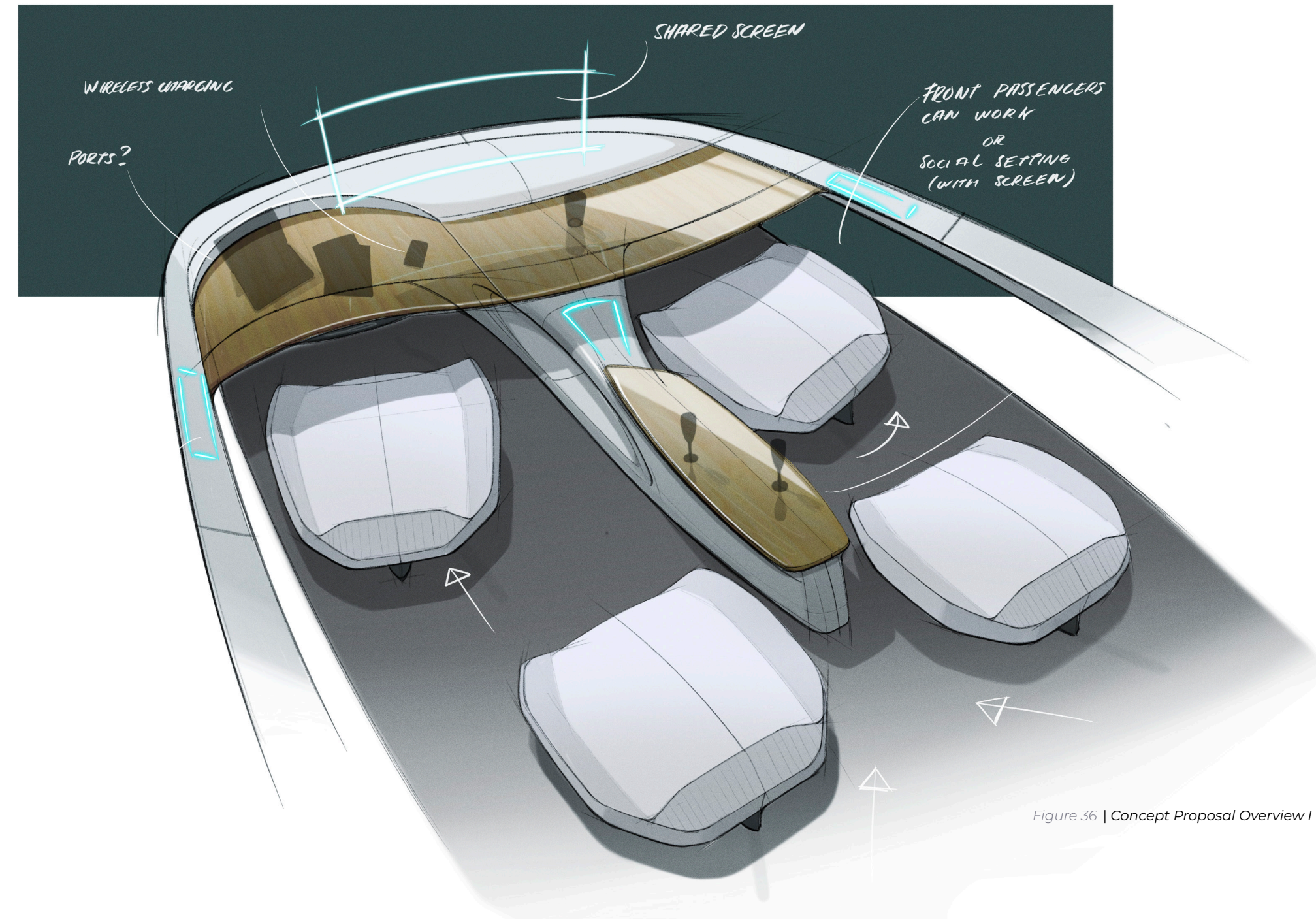


Figure 36 | Concept Proposal Overview I

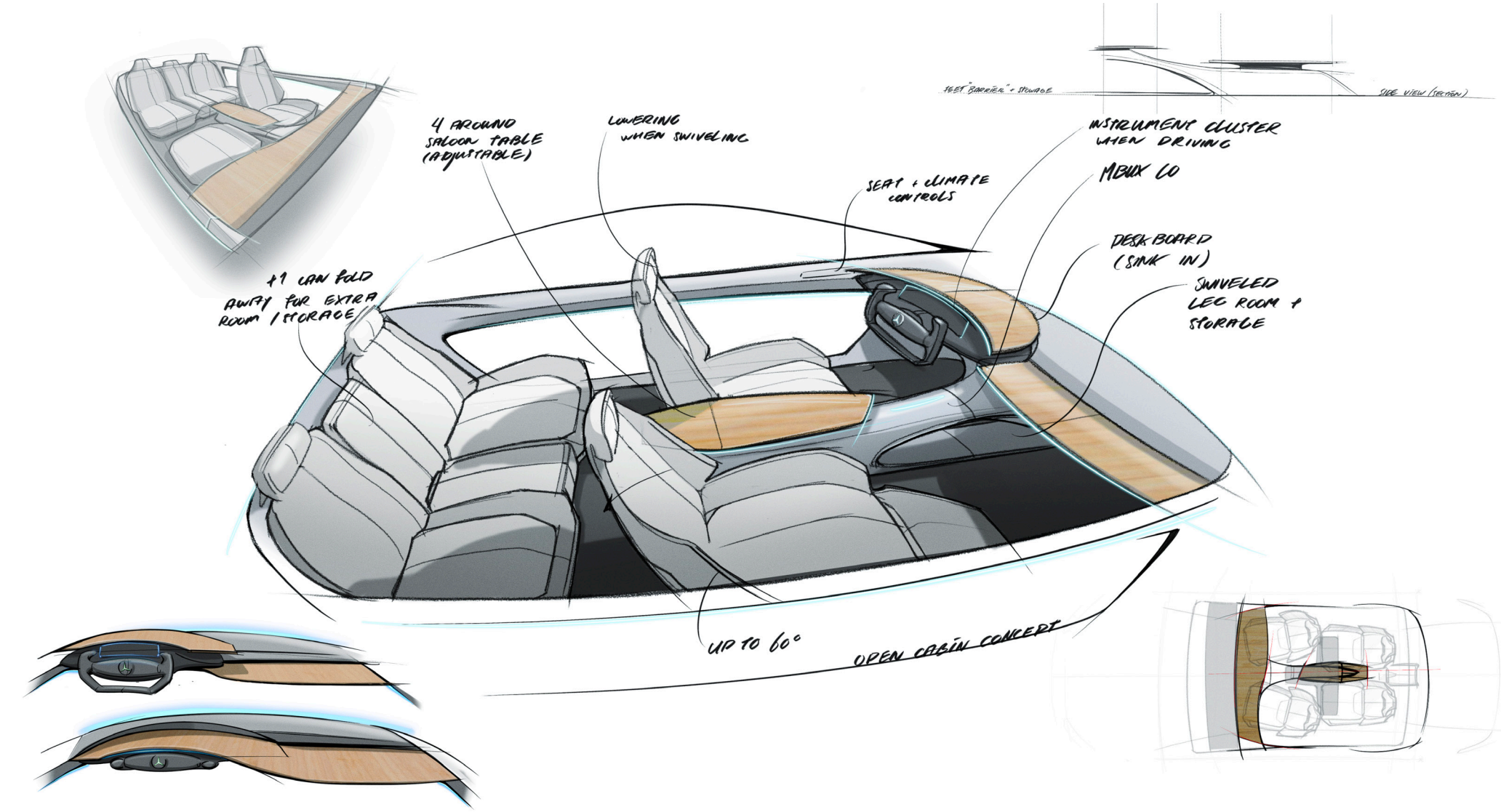


Figure 37 | Concept Proposal Overview II

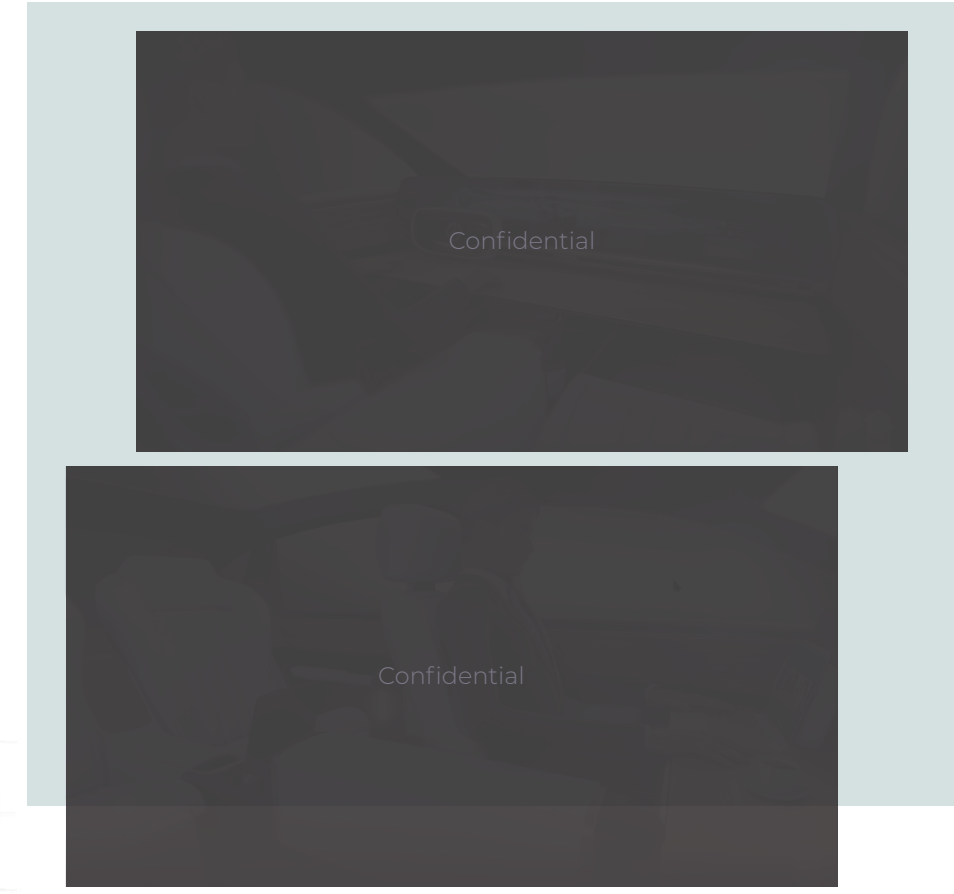
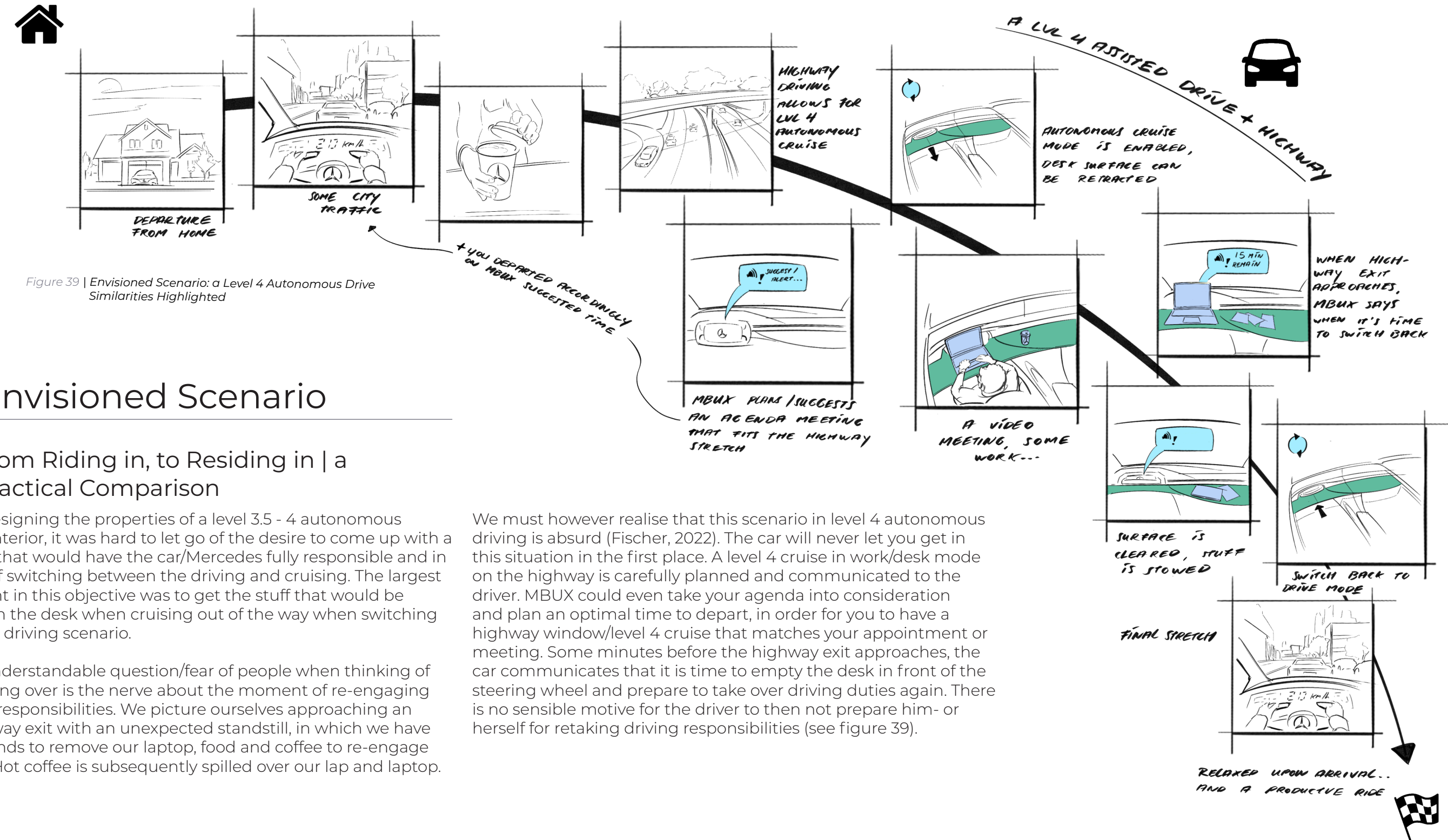


Figure 38 | Concept Renders from Phi, using a Conventional Steering Column



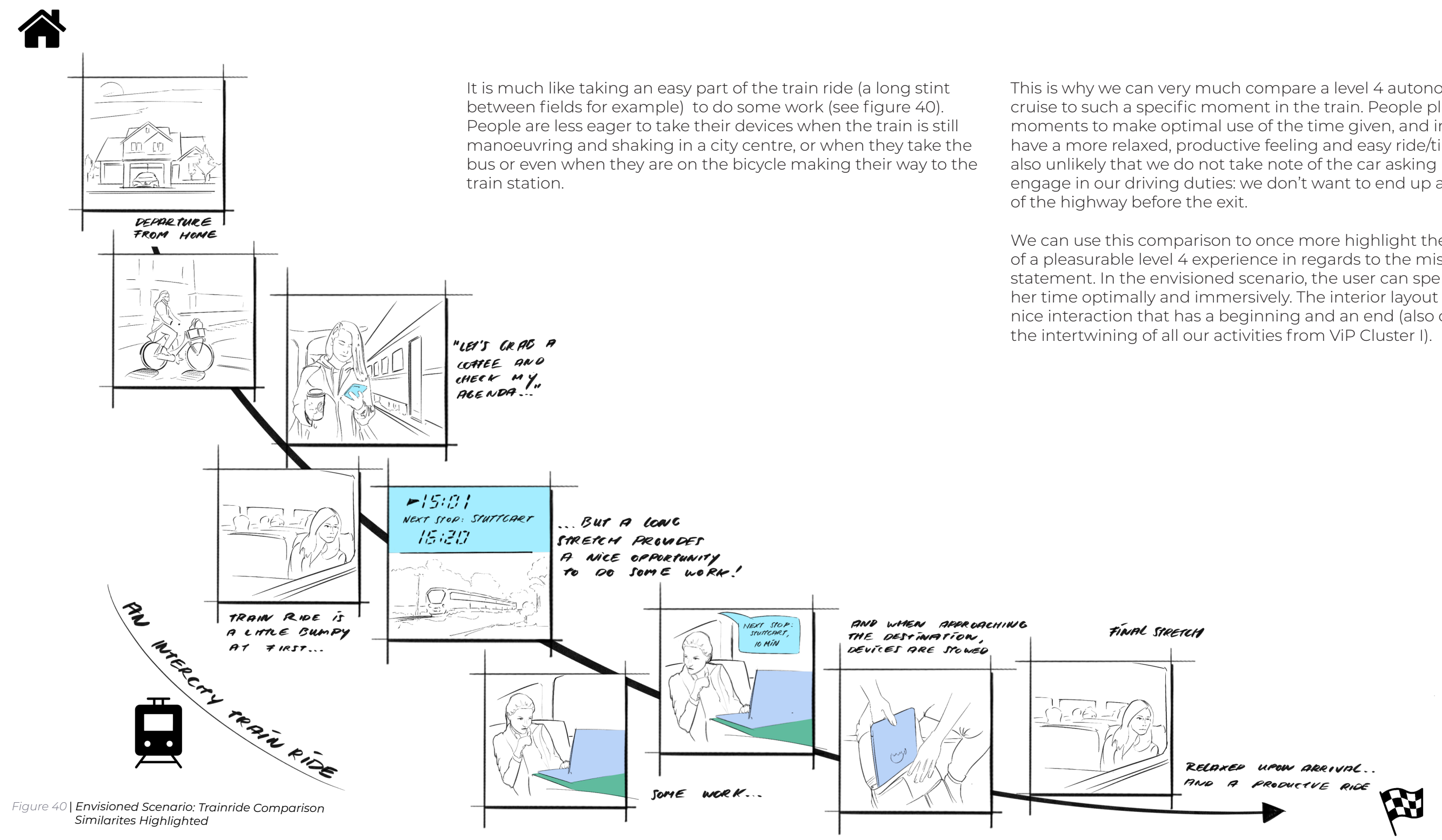
20 Envisioned Scenario

20.1 From Riding in, to Residing in | a Practical Comparison

When designing the properties of a level 3.5 - 4 autonomous driving interior, it was hard to let go of the desire to come up with a solution that would have the car/Mercedes fully responsible and in charge of switching between the driving and cruising. The largest pain point in this objective was to get the stuff that would be placed on the desk when cruising out of the way when switching back to a driving scenario.

A very understandable question/fear of people when thinking of a car taking over is the nerve about the moment of re-engaging in driver responsibilities. We picture ourselves approaching an icy highway exit with an unexpected standstill, in which we have but seconds to remove our laptop, food and coffee to re-engage driving. Hot coffee is subsequently spilled over our lap and laptop.

We must however realise that this scenario in level 4 autonomous driving is absurd (Fischer, 2022). The car will never let you get in this situation in the first place. A level 4 cruise in work/desk mode on the highway is carefully planned and communicated to the driver. MBUX could even take your agenda into consideration and plan an optimal time to depart, in order for you to have a highway window/level 4 cruise that matches your appointment or meeting. Some minutes before the highway exit approaches, the car communicates that it is time to empty the desk in front of the steering wheel and prepare to take over driving duties again. There is no sensible motive for the driver to then not prepare him- or herself for retaking driving responsibilities (see figure 39).



It is much like taking an easy part of the train ride (a long stint between fields for example) to do some work (see figure 40). People are less eager to take their devices when the train is still manoeuvring and shaking in a city centre, or when they take the bus or even when they are on the bicycle making their way to the train station.

This is why we can very much compare a level 4 autonomous cruise to such a specific moment in the train. People plan these moments to make optimal use of the time given, and in the end have a more relaxed, productive feeling and easy ride/time. It is also unlikely that we do not take note of the car asking us to re-engage in our driving duties: we don't want to end up at the side of the highway before the exit.

We can use this comparison to once more highlight the essence of a pleasurable level 4 experience in regards to the mission statement. In the envisioned scenario, the user can spend his or her time optimally and immersively. The interior layout makes for a nice interaction that has a beginning and an end (also countering the intertwining of all our activities from ViP Cluster I).



21 Steering Device Alternatives

21.1 Researching Steering Device Alternatives

As the conventional ways of implementing a steering device take up a relatively large amount of space, logically, alternatives were considered (see figure 41 and 42). Subsequently, thought was put into how a steering device can provide an alternative function when not used for steering.

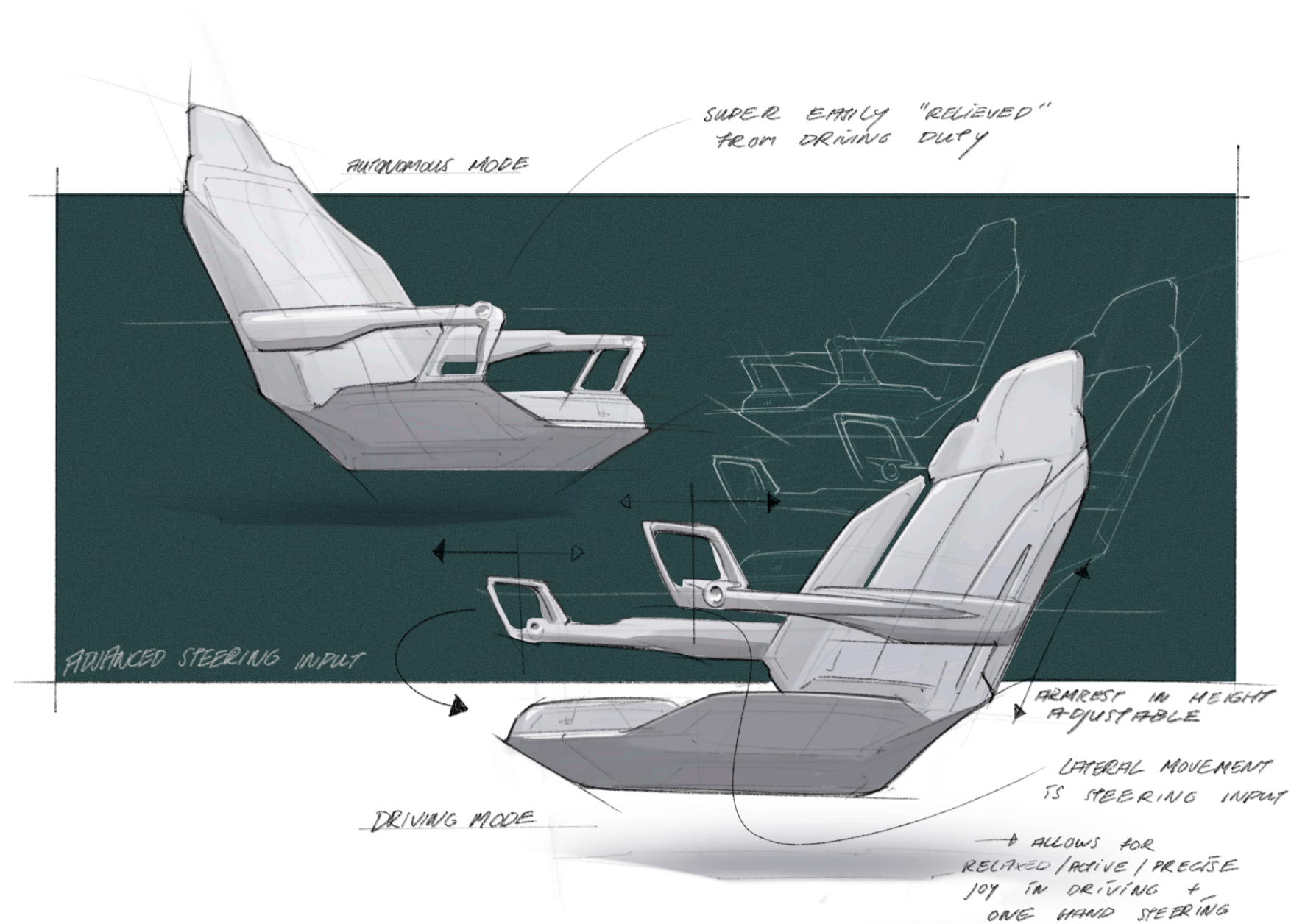


Figure 41 | Example of Steering Wheel Alternative Ideation

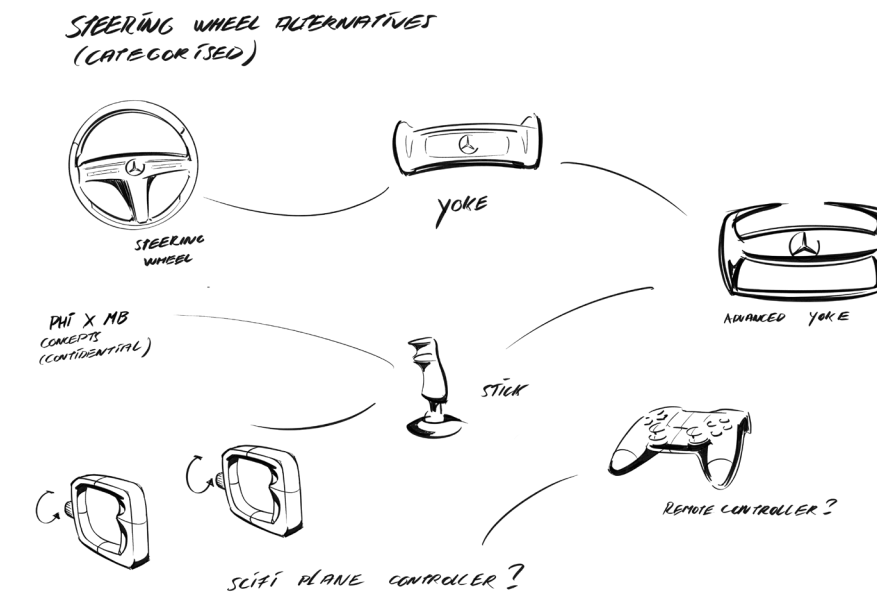


Figure 42 | Steering Wheel Alternatives Categorised

After the brainstorm and analysis, the results were discussed and compared to a variety of advanced steering concepts from Phi CAE and Mercedes. The most interesting conclusions drawn from this discussion were the following:

- Sensitivity of steering input is not necessarily an issue according to Jan: "you get used to it pretty fast, partly due to that the input is not linear in relation to the steering movement".

- However, we must realise that 30-40% of level 4 autonomous driving time is spent on the highway, which is not even half of the time. Also, when we look at the envisioned scenario (chapter 20), we can see that there will still be a lot of situations in which the user is actively driving on short rides. A device that replaces a steering wheel must thus be adequately well able to provide joy in driving.

21.2 Concepts from PHI X Mercedes-Benz

- Most concepts presented by PHI make the car/seat too wide, or introduce an additional 'getting in or out of the car' struggle. The extra room in front of the driver subsequently doesn't offer much more than when you'd have a conventional architecture; when you're driving you need nothing more than your instrument panel in front of you. Regarding the desk, with an alternative steering device, the desk still needs to be cleared of objects when switching to driving.

- See how you can space-wise optimally interchange an advanced yoke steering device with the desk.



22 Ergonomic Challenges

22.1 Getting the Concept Ergonomically Sound

When assessing the concepts, the following points were continuously kept in mind:

- Elbow height: provide an elbow height in which shoulders and upper arms can be relaxed whilst working
- Elbow support: consider the depth of the working surface or arm supports as elbow and/or underarm support is preferable when working behind the desk. If the surface depth is limited, additional elbow support is preferable (Pinola, 2014).
- Depth/Reach: the depth of the surface needs to provide adequate room for a laptop and should easily be within reach of the user when the seat is moved forward

- Surface area: here we can consider: the more room or surface area, the better.
- Screen angle and distance to instrument panel: the configuration should provide room for an ergonomically sound screen angle of both laptop/device and instrument panel. Furthermore, the closer the instrument panel/UI screen is to the user, the smaller elements displayed on this panel and thus the more stuff we can display in greater detail.
- Legroom and knee angle: ergonomically sound legroom and knee angle

- Neck angle and visibility through the windshield: ergonomically sound neck angle towards different devices and UI elements, alongside a clear and unobstructed sufficient view through the windshield.

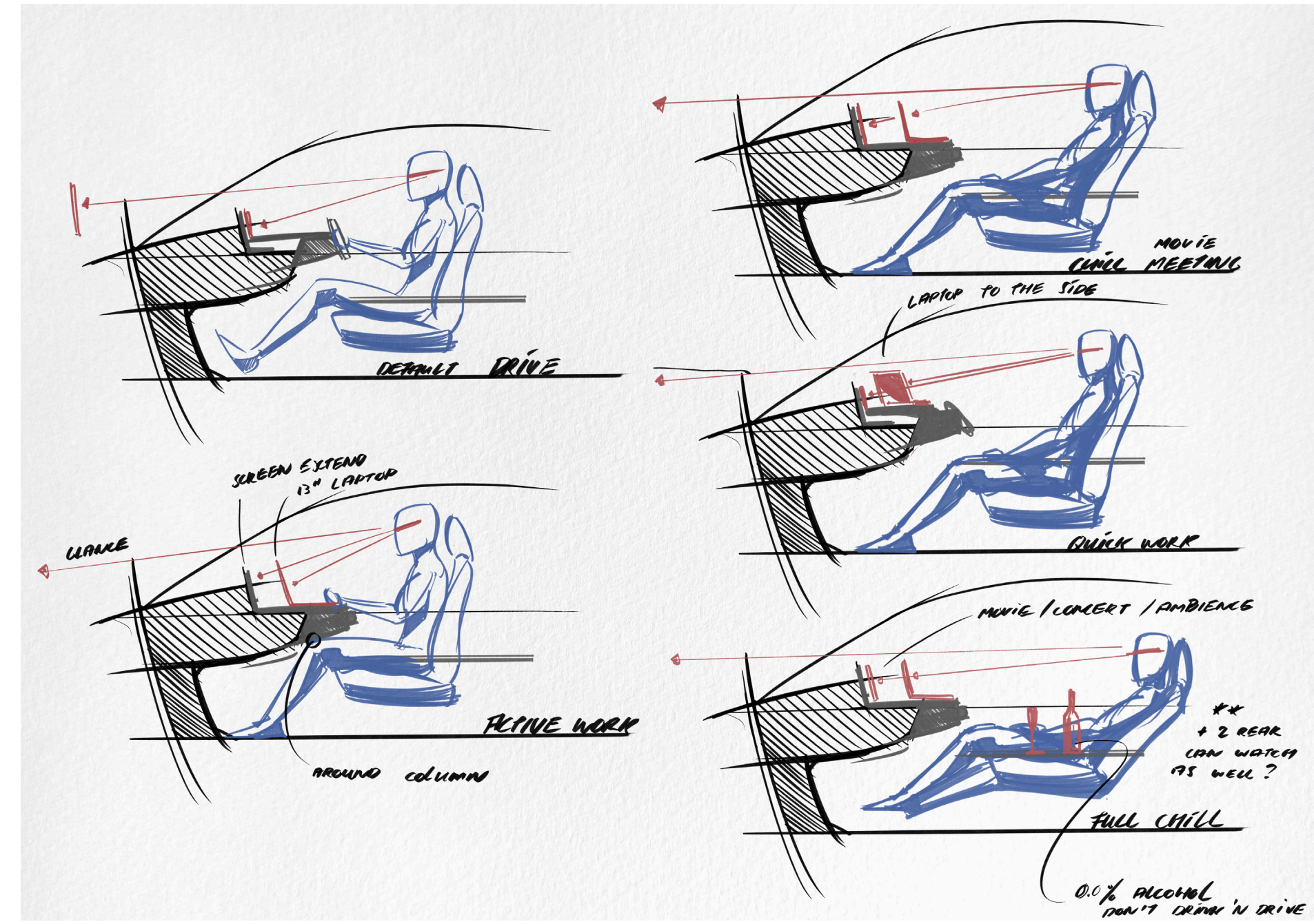
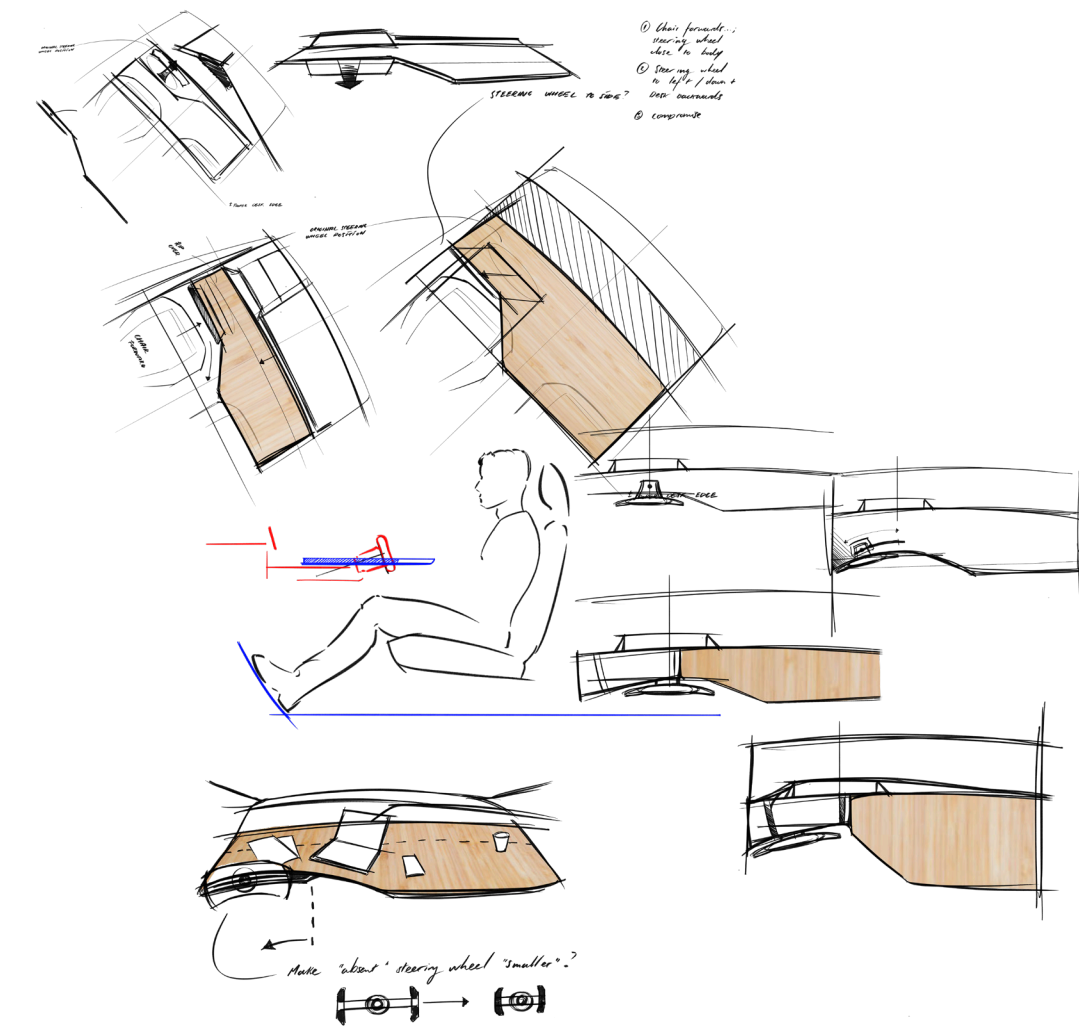
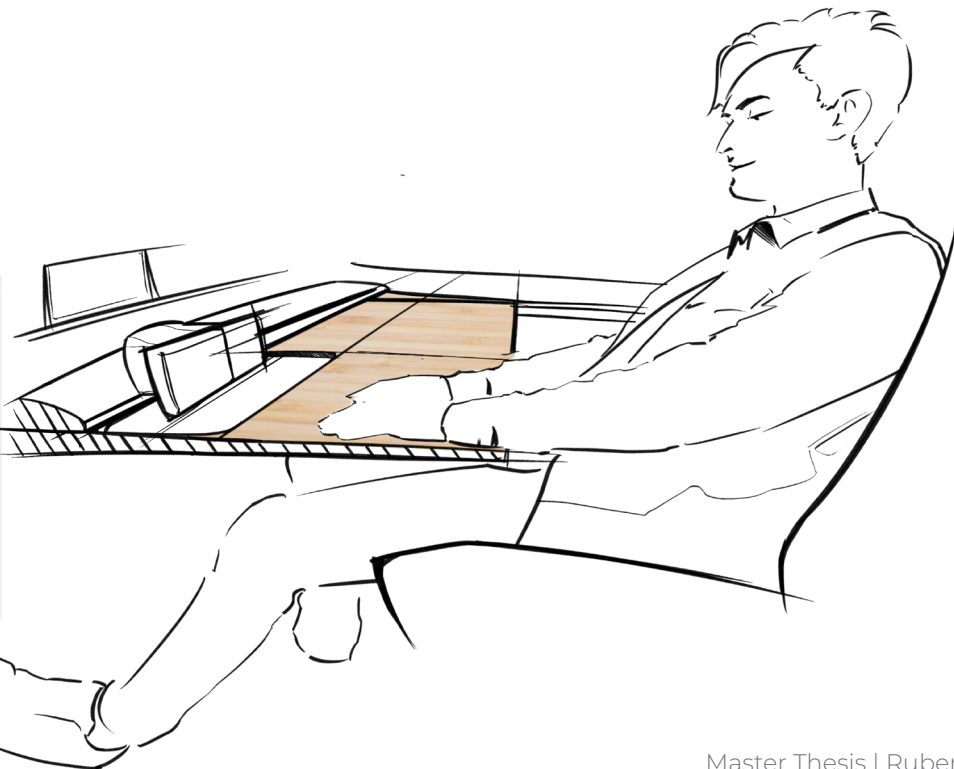
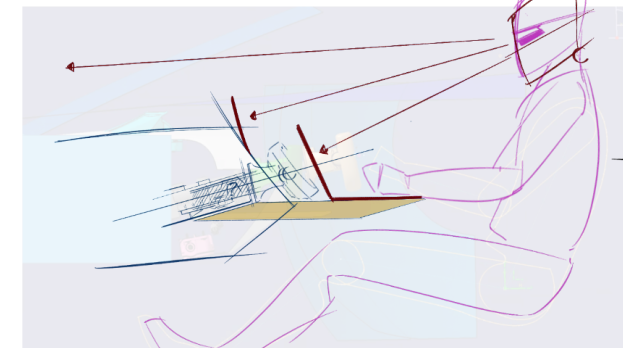
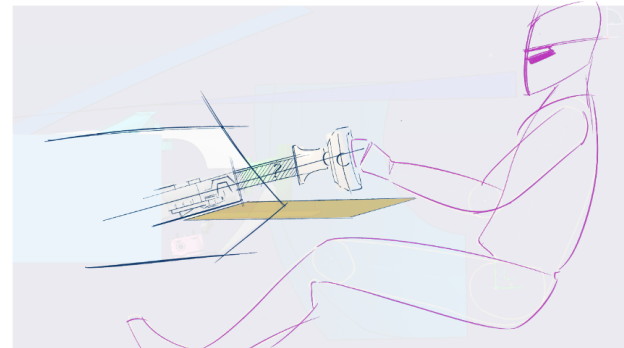
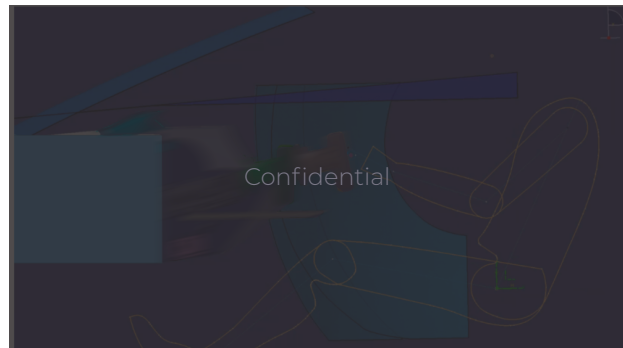


Figure 43 | Using Interior Layout Geometry as Underlayer

Figure 44 | Explorative Sketches towards Ergonomic Geometry

22.2 The Interchanging of Steering Device and Desk

After the ideation phase, the design process boiled down to choosing between three options:

- Architecture with a desk interchanging with the steering device, where the desk comes from above the steering device (see figure 46, upper)
- Architecture with a desk interchanging with the steering device, where the desk comes from below the steering device (see figure 46, middle)
- Architecture with a desk interchanging with the steering device, where the desk comes from beside the steering device and the steering device moves further to the side (see figure 46, bottom)

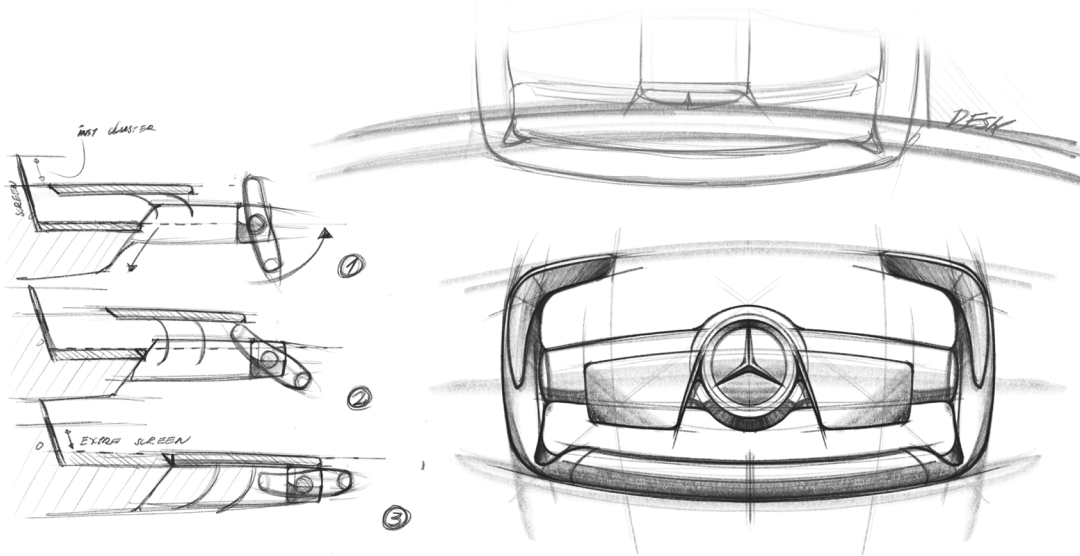


Figure 45 | Steering Device Concept Folding Idea

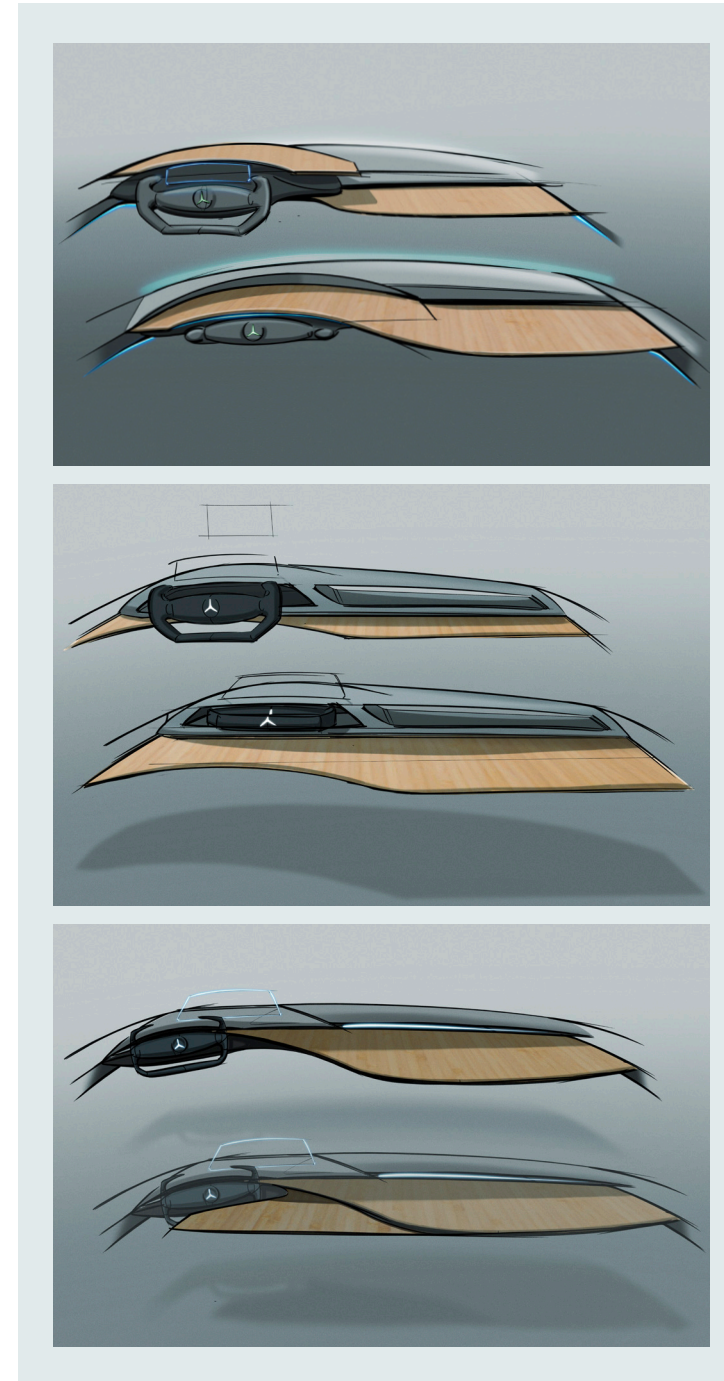


Figure 46 | Different Concepts of Interchanging Steering Device and Desk

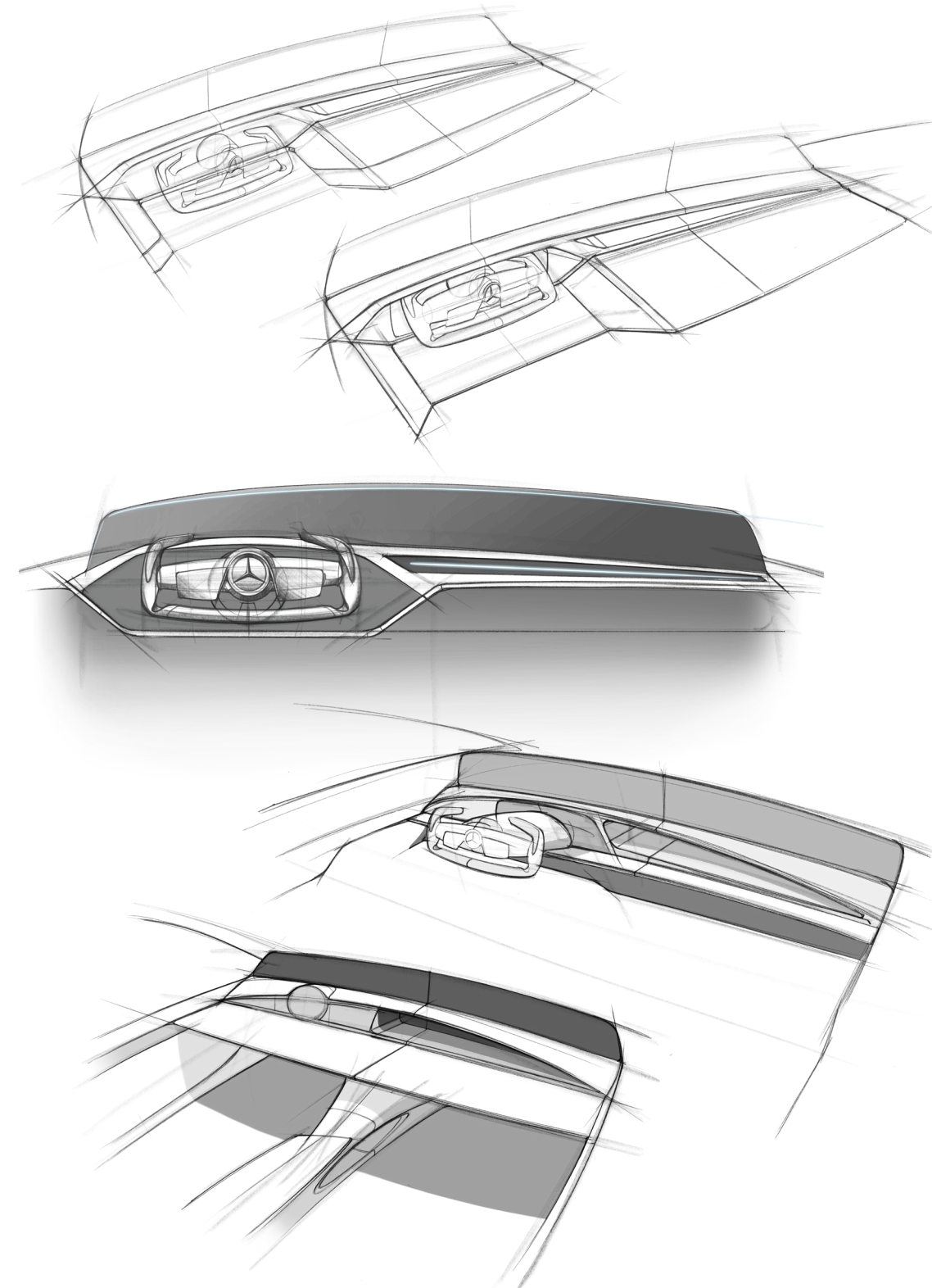


Figure 47 | Sketch Ideation for Different Geometry Concepts

After summing up the essential necessities for the concept to, ergonomically and spacewise, make sense, a choice can be made.

Core: you want as much as possible personal space, space around your legs and freedom of movement around the desk

Core: you want to provide an as ergonomically sound as possible component architecture that makes sense within the driving car context

Core: you want to move as little as possible switching back and forth between driving and desk mode

Core: when not used, you want the steering device to take up as little space as possible to have more space to work or manoeuvre in (considering an advanced steering device alternative is discarded)

Core: the driver needs to be nicely relieved from his or her driving obligations and responsibilities. In the end, the driver also should be able to smoothly switch back to driving obligations and responsibilities.

22.3 Observations from a Real Life Scenario

In order to find out which of the earlier proposed architecture would fit the core necessities (see chapter 22.2) of the concept best, some real-life scenarios were analysed.

In figure 48 it is visible how a similar arrangement in terms of desk and seat are implemented in a mobility concept. This configuration approaches a setup where the desk comes from underneath the conventional steering column (figure 43). Note when, with the desk being relatively far away, the elbows are supported by additional supports.

Douwe (Male, 1.83 m) was quite content with his setup. He could see himself working in this position. His only predicted his shoulders and arms to grow tired after some time.

Some main thoughts of Rens (Male, 1.90 m) regarding the setup were:

- The surface, in terms of reach, is too far away/deep
- The height seems oke, especially for a 'relaxed' setting. It (the desk) could be slightly higher, but my elbows being at an angle larger than 90 degrees seems good for a relaxed working setting.
- The part of having this desk as an option is essential; if I'm on my phone I don't want the table intruding in 'my space'.
- This configuration prohibits the unfolding of a laptop screen (because the screen bumps into the chair to which the desk is attached to) and prohibits me to work with an appropriate screen angle.
- I could use some more room for e.g. a mouse or other extra stuff.

This posture and desk - seating arrangement mimics the configuration in which the desk surface is exchanged with the steering device, whilst coming from above the steering device. Here, it becomes apparent that there is little extra room between the surface and lower body parts of the user for the fold-away steering device. Additionally, some observations by Vincent (Male, 1.85 m) were:

- My upper body seems well positioned for a somewhat relaxed setting.
- I would really prefer to elevate the chair and move the chair forward. My arms feel squished.
- I would prefer a larger elbow angle, and in my eyes elbow support is crucial as I cannot rest my elbows on the table surface.

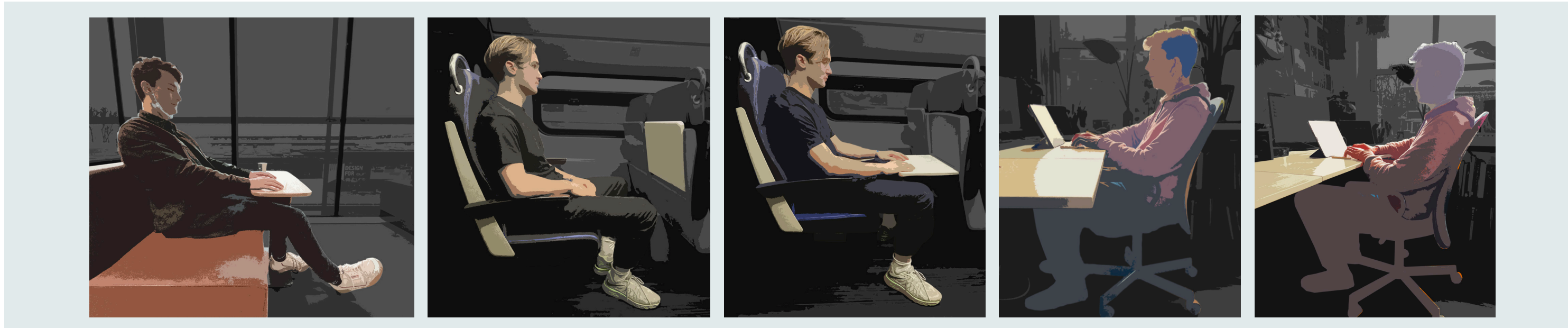


Figure 48 | Rapid Ergonomic Evaluation, (from Left to Right); Douwe, Rens, Vincent

22.4 Deciding on a Steering Device - Desk - Dashboard Architecture

Moving the steering device to the side appeared not to be feasible, due to the following reasons. The steering wheel takes up space unnecessarily, at the expense of the desk/table surface. Arranging the desk/table surface in this way introduces the need for a rotating chair or a desk that moves over two axes, adding unnecessary complexity.

Therefore, the interchanging of the steering device and desk conundrum boiled down to the question: do we exchange the steering wheel via above, or via beneath the desk surface? In the end, it was decided together with Mercedes Forschung und Entwicklung (Forschung und Entwicklung, meeting, 2022) to house the desk surface beneath the steering device, for the following reasons:

- Component wise this seems more feasible
- Stowed away, in this arrangement, the user has no steering device in his or her lap



Figure 49 | Archetypical Correct Desk Posture
TU Delft | Mercedes-Benz AG

- The arrangement allows for a smooth switch between modes, no interchanging/hassle in quickly moving stuff aside but a nicely planned 'closure' of your time spent with the desk (as discussed in chapter 20)
- A flowing movement of components
- The nature of the car to facilitate a more relaxed body posture (considering long drive times), striving for the 'everything 90 degrees' posture (see figure 49) clashes with this existing architecture. When elevating a surface above the steering device (which remained to be the other option), we leave stuff on the desk that ends up in front of the instrument cluster. Subsequently, we create an elevated plateau of which stuff can fall or roll off (see figure 47, previous page).

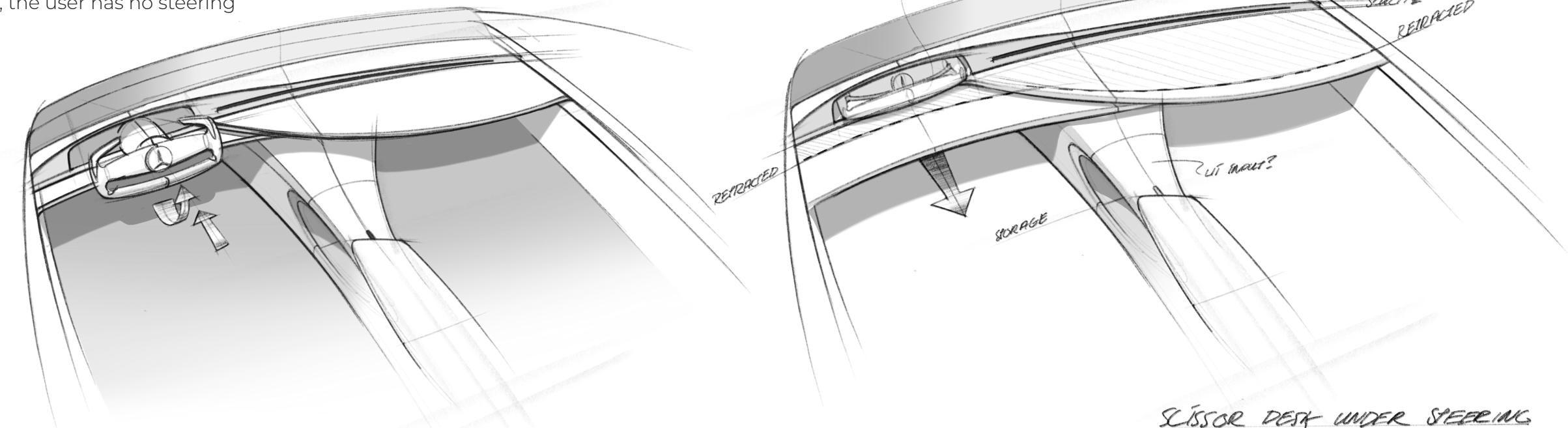


Figure 50 | Improving Forschung und Entwicklung Concept without being restricted by Conventional Steering Column



23 Finalising a Seating Concept

23.1 Facilitating other Moods

Now that the unique proposition was starting to take shape, we could slowly start thinking about how the rest of the interior could take shape. In order to realise the Mission Statement and also provide users the opportunity to optimally 'be' in situations where they do not need the table, the remaining core-activities (see chapter 18).

23.2 Seating Idea

Until now, for different seating arrangements and (social) settings and postures, we looked at ways to rearrange the seats within the car by rotating and swivelling them. If we take inspiration from the living room, rearranging the chairs seems to be a logical solution. But, if we look at couches and benches for example, we can take inspiration from repositioning or reposituring oneself/changing on a fixed item.

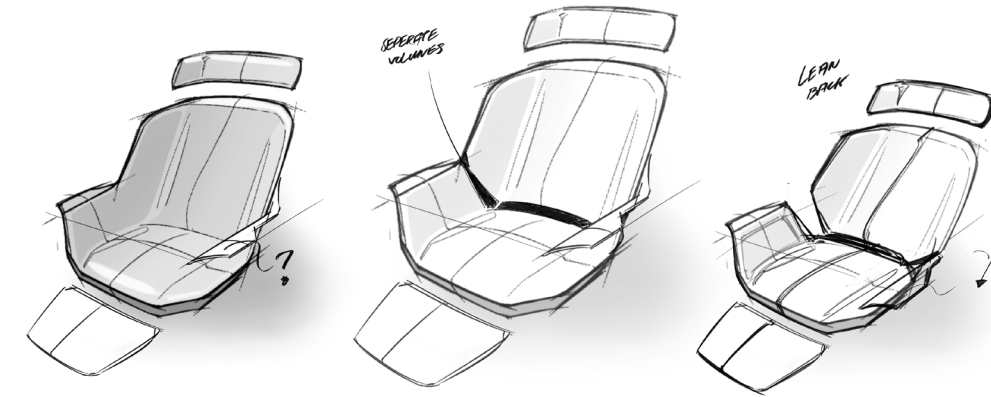


Figure 52 | Towards a Lounge Seat

An asymmetrical seating concept was drawn up that allows the user to sit in a conventional way, but also enables the user to comfortably change posture to a skewed and open position. Next to this open position, the seating concept also allows the user to sit back and relax, but more importantly: the concept offers appropriate head/neck support for sleeping, a true benefit for level 4 cruising.

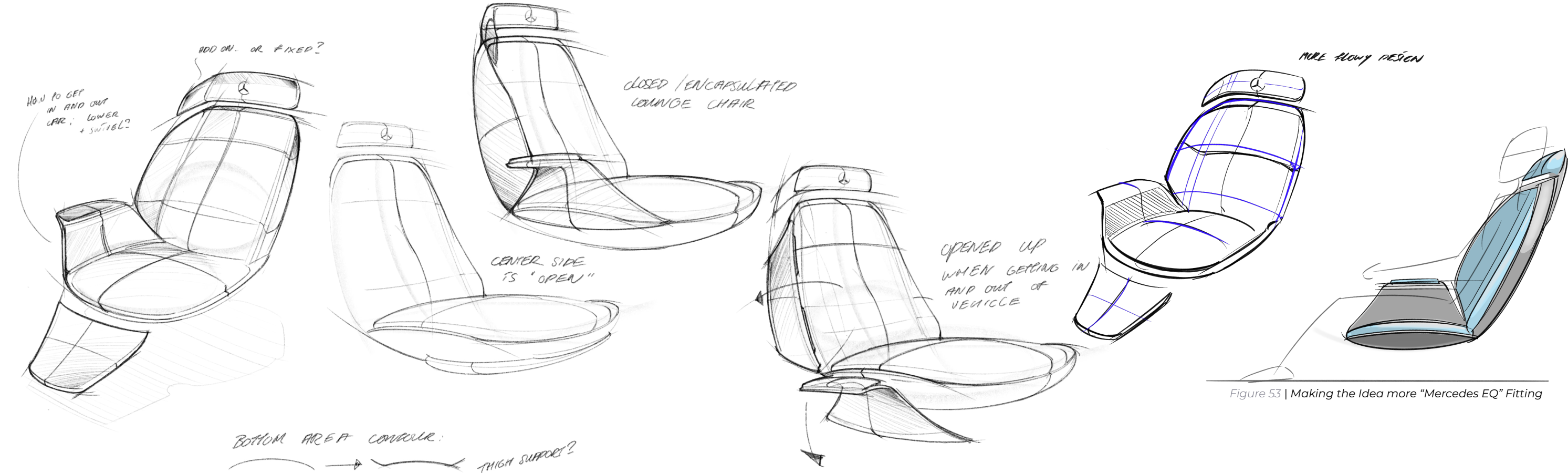


Figure 53 | Making the Idea more "Mercedes EQ" Fitting

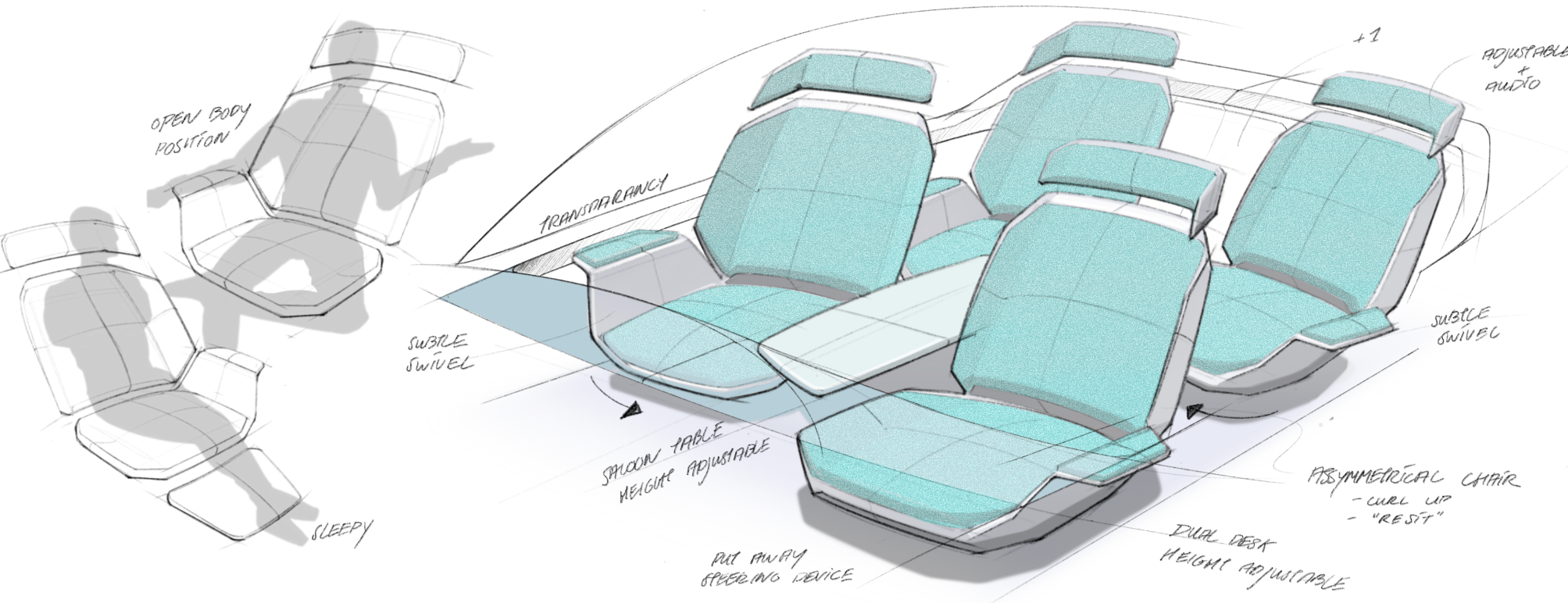


Figure 51 | Initial Seating Idea

24 Chosen Solution & Further Integration

The following sketches (see figure 54, 55 and 56) were considered as a starting point for the next phase of the concept development stage.

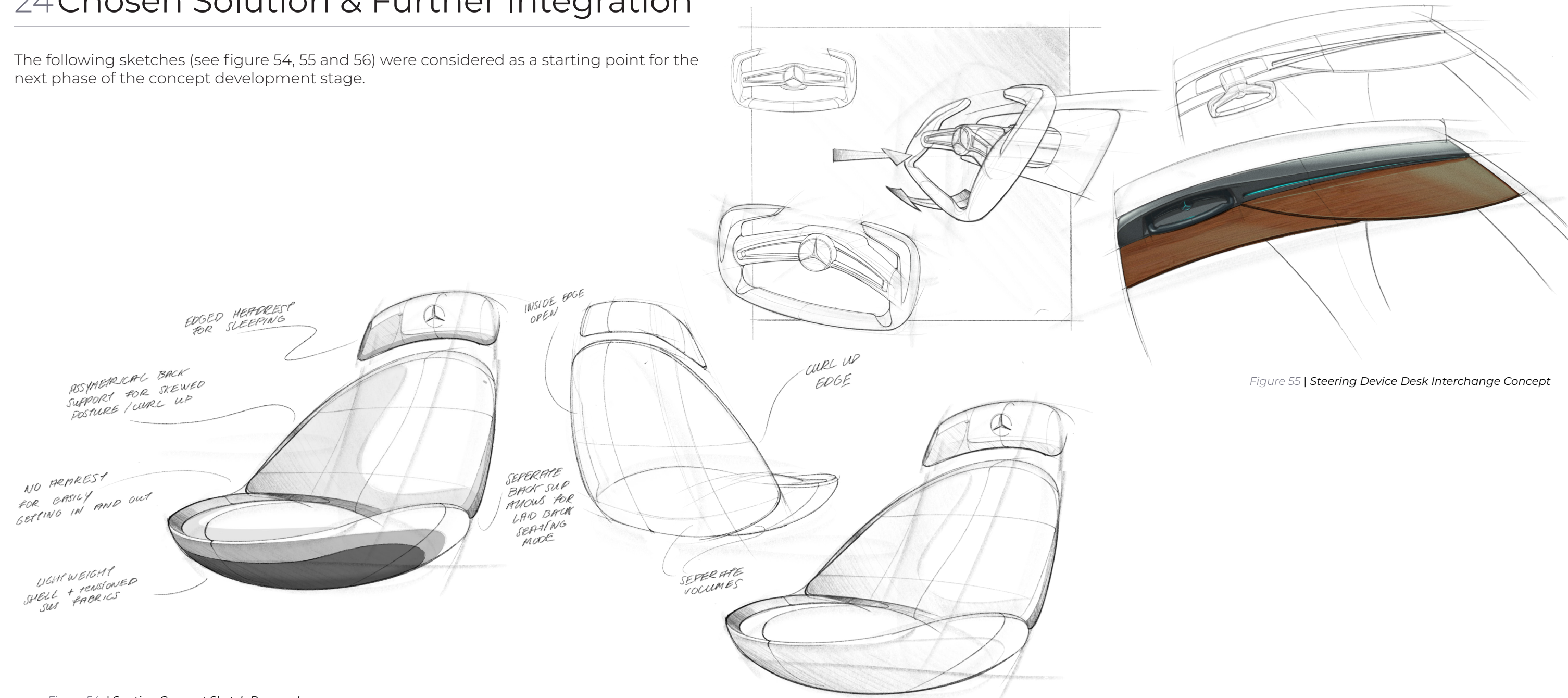


Figure 54 | Seating Concept Sketch Proposal

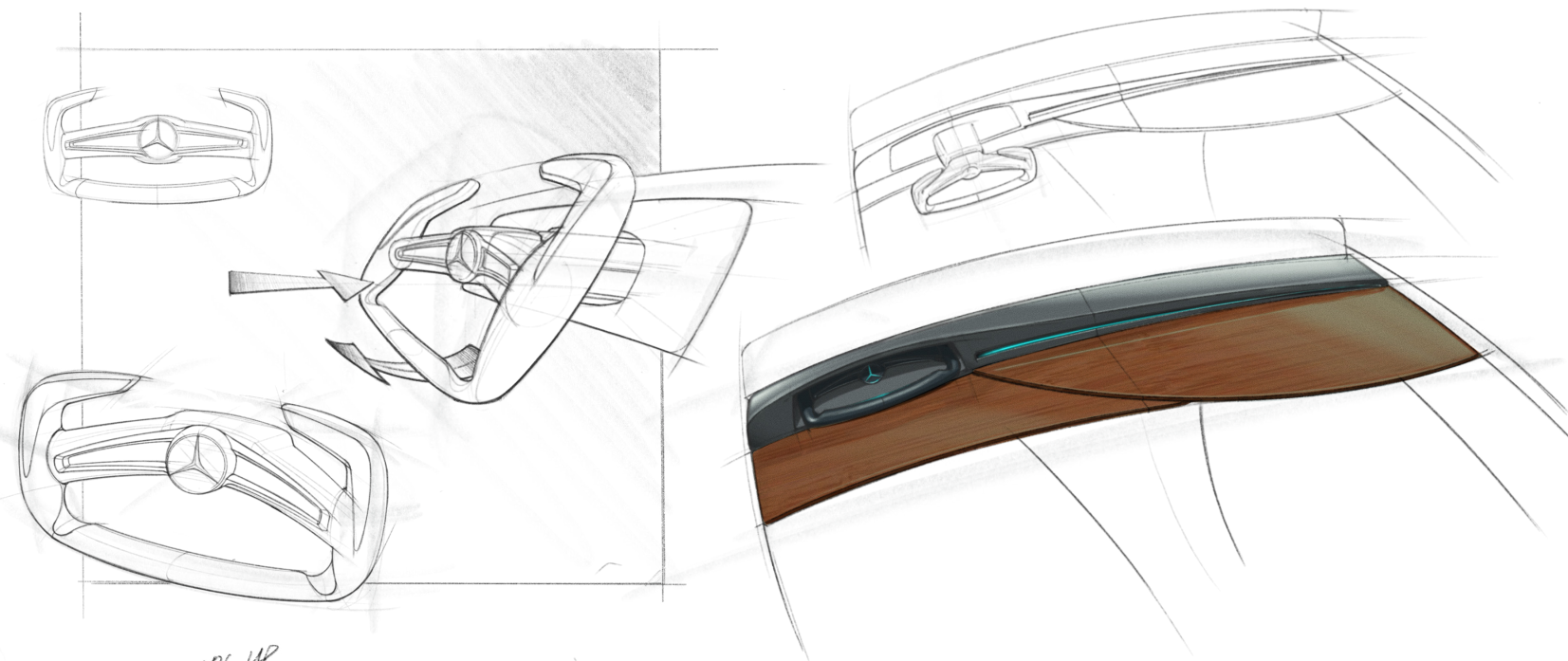


Figure 55 | Steering Device Desk Interchange Concept

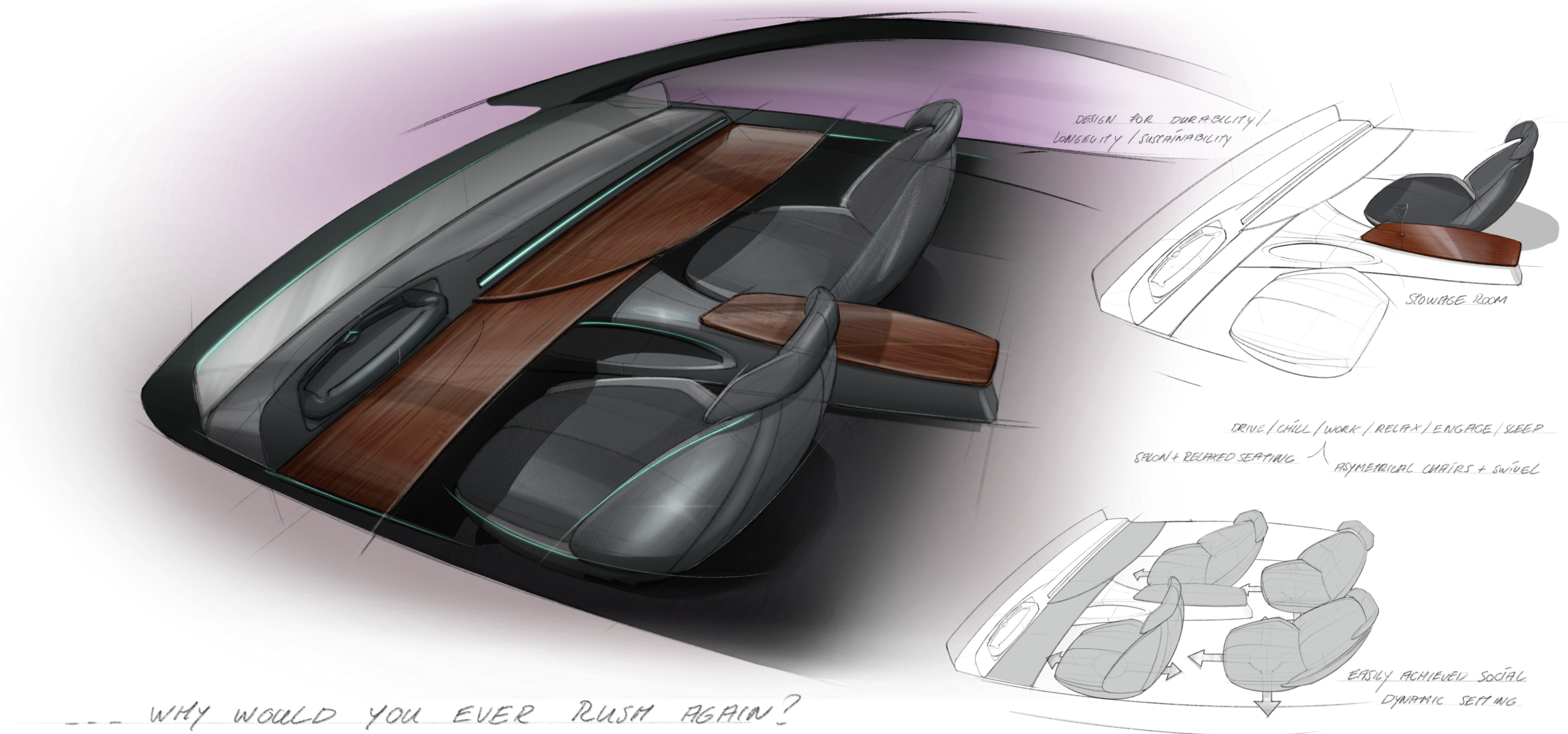
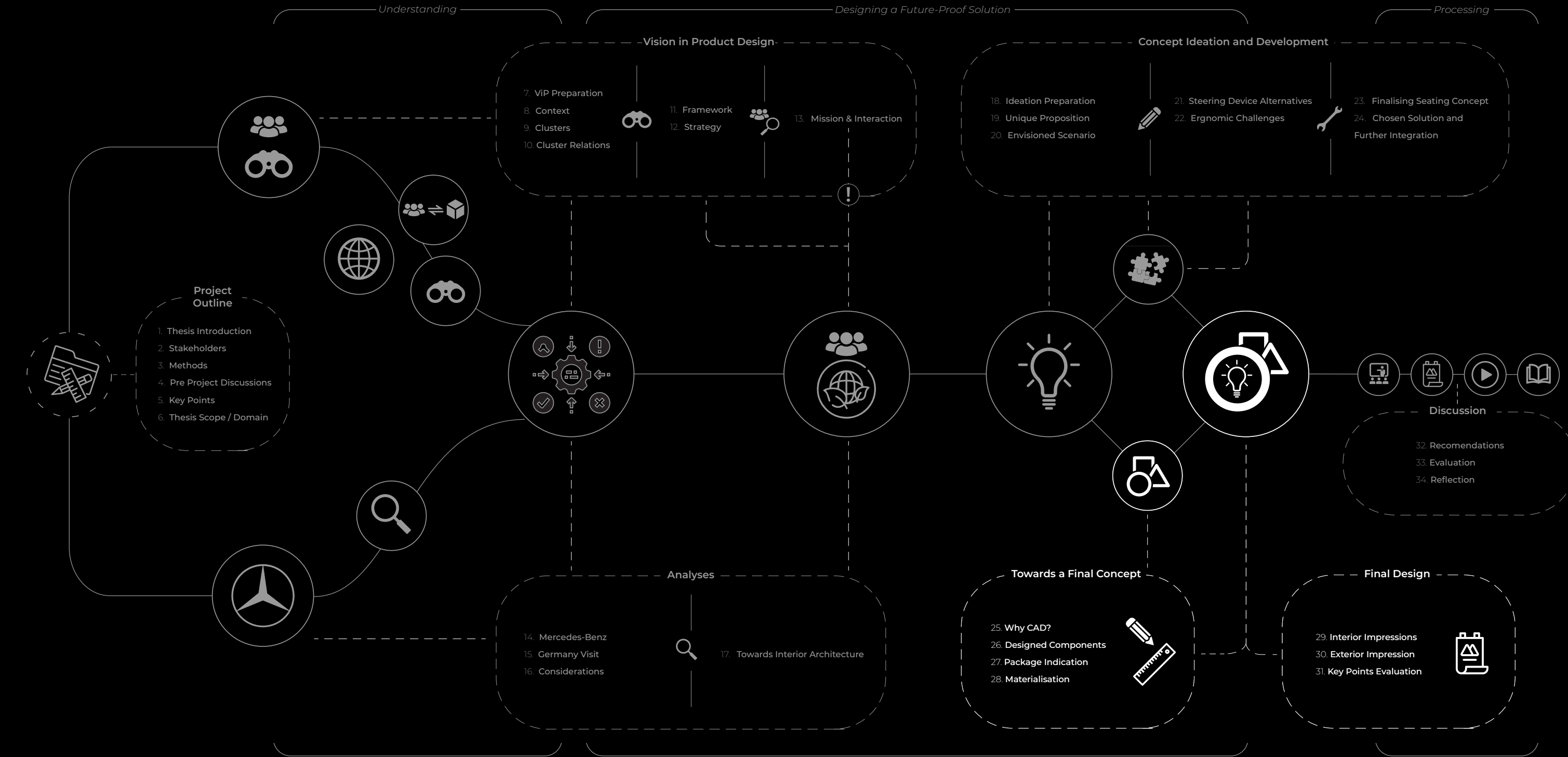
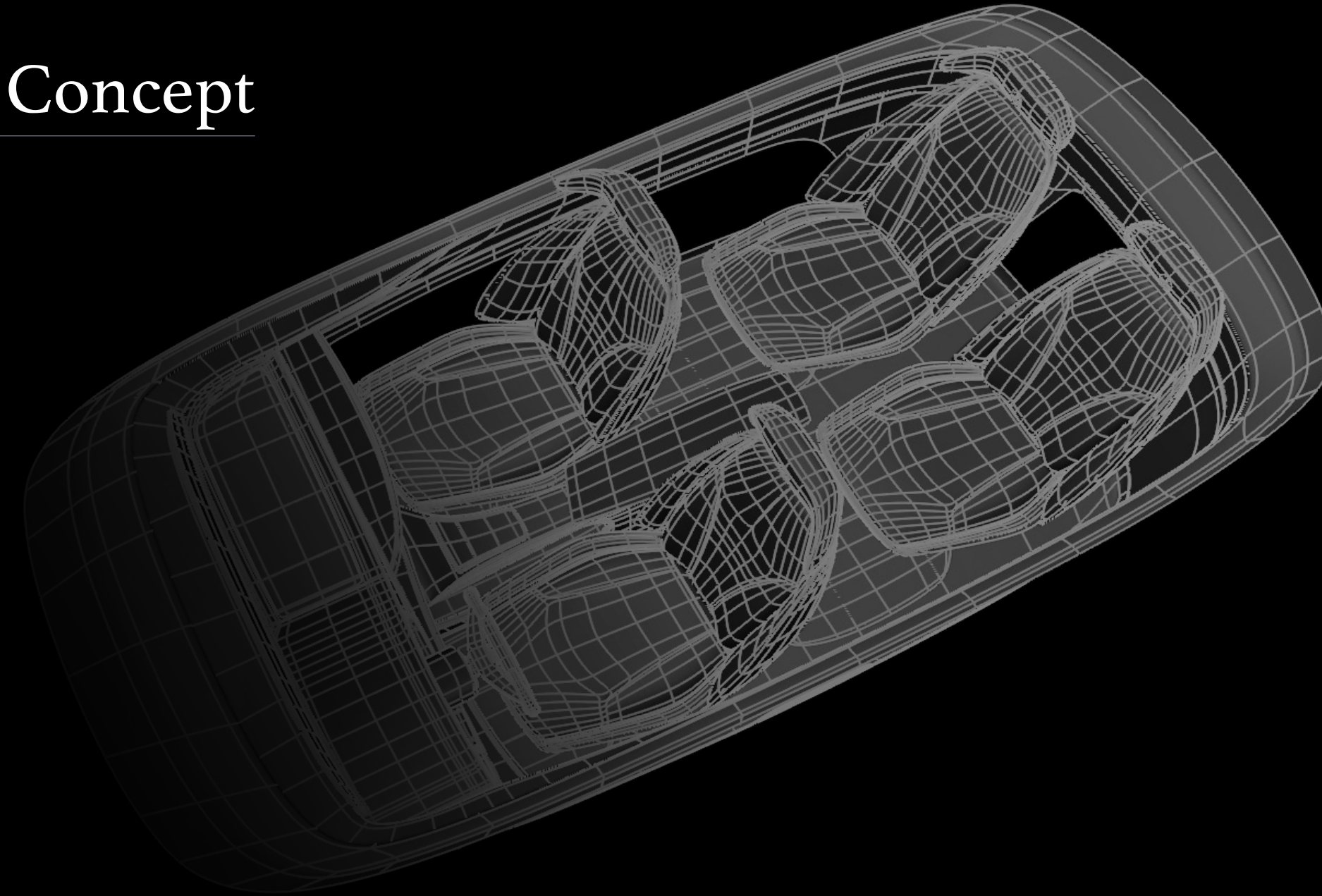


Figure 56 | Final Sketch Proposal

PART V Towards a Final Concept



25 Why CAD?

25.1 From Sketches to CAD Model

After coming to a final sketch proposal, it was time to validate the geometry. It was chosen to do this by creating a CAD model in Blender (Blender Foundation 2002). The Blender geometry serves as a mock-up model in which the objects related to each other and also the user can be assessed. Furthermore, a rough package layout could be built around the interior geometry which provided an underlayer for an exterior direction.

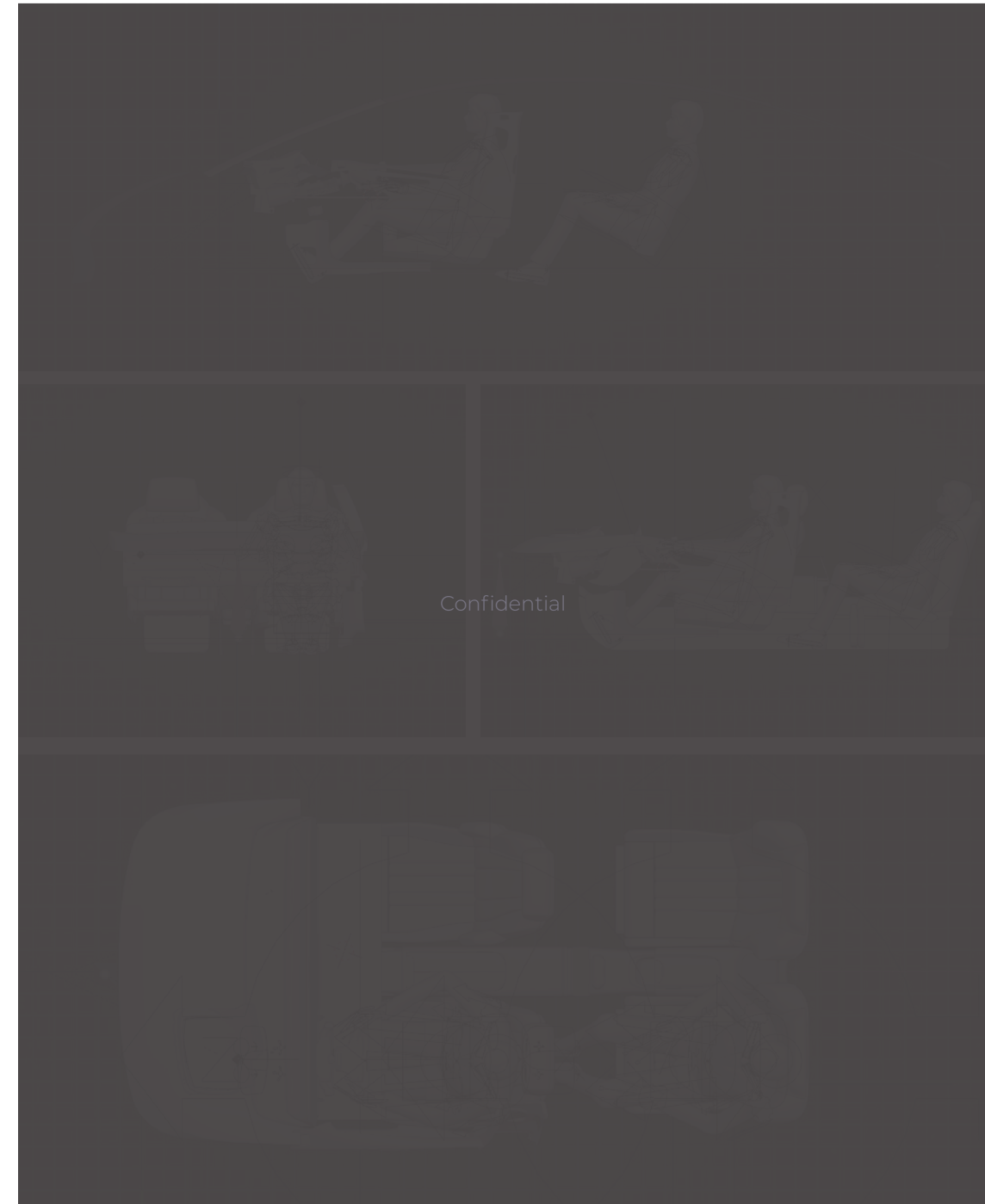


Figure 57 | Architectural Package Provided by Phi / Forschung und Entwicklung

25.2 Assessing Magnus

In interior design it is essential to assess the ergonomic properties. Magnus, a rig that represents a 1.85 meter tall male user, was provided by PHI Cae and used to digitally evaluate whether the different component in the different envisioned configurations ergonomically made sense (see figure 58).



Figure 58 | Magnus, a Rig Provided by PHI Cae, in Active Driving Position

26 Designed Components

26.1 Desk Surfaces

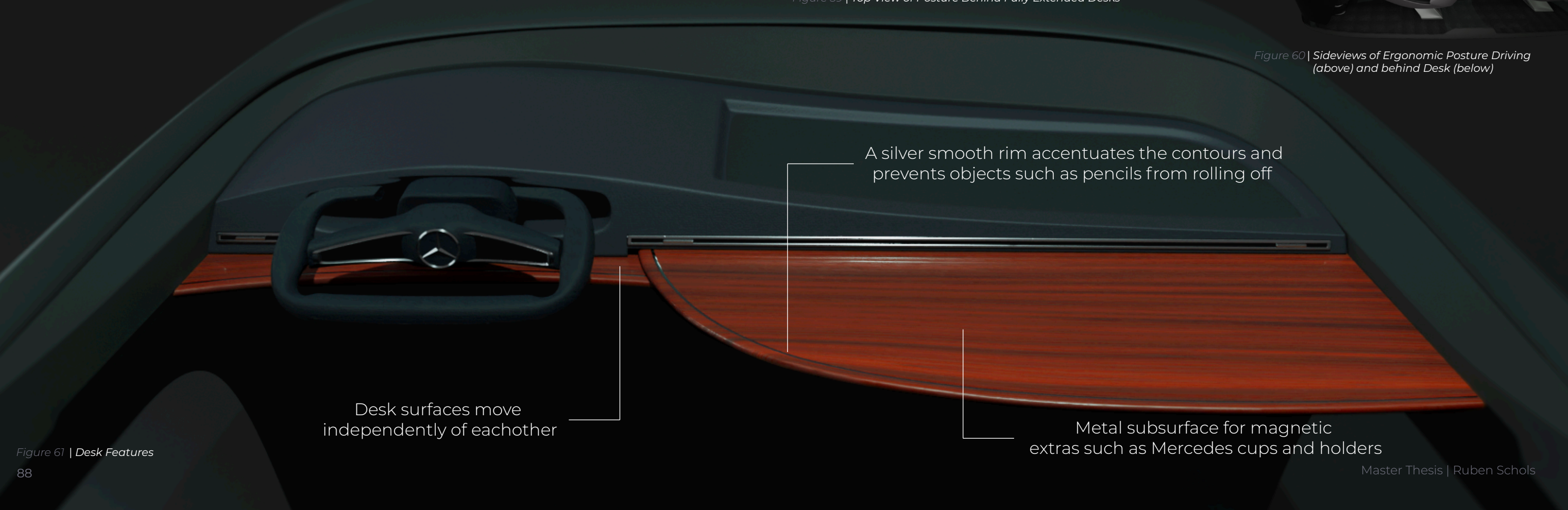
Flowing lines contour two separate surfaces that allow the desks to be used independently of one another. Furthermore, even when both are retracted they provide a surface to place small objects on. A Mercedes-esque silver detail in the form of a rounded off silver edge prevents objects from sliding or rolling off the surface without cutting into the arms of users when they rest their underarms on the surfaces (see figure 59, 60 and 61).



Figure 59 | Top View of Posture Behind Fully Extended Desks



Figure 60 | Sideviews of Ergonomic Posture Driving (above) and behind Desk (below)

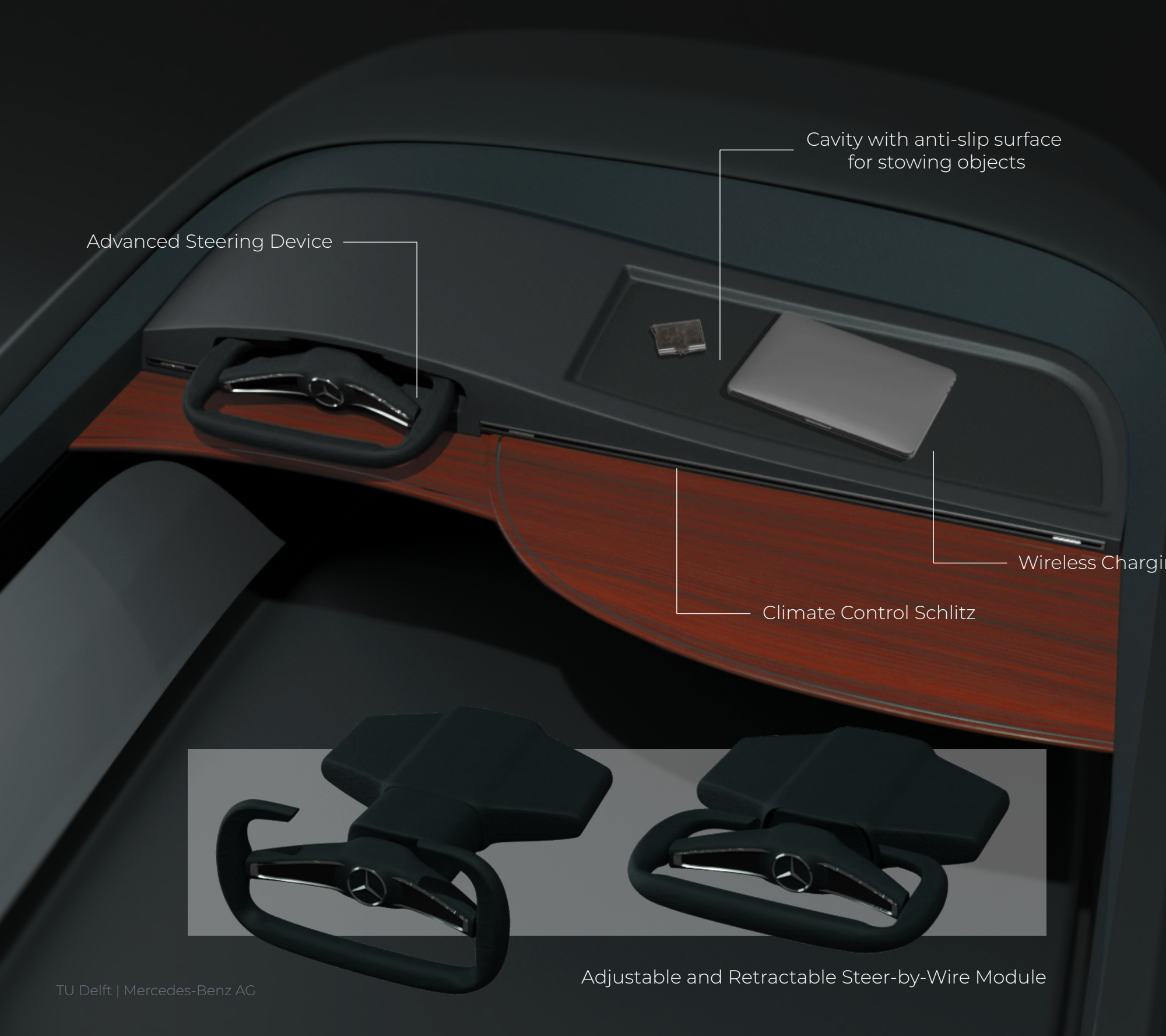


Desk surfaces move independently of each other

A silver smooth rim accentuates the contours and prevents objects such as pencils from rolling off

Metal subsurface for magnetic extras such as Mercedes cups and holders

Figure 61 | Desk Features



Advanced Steering Device

Cavity with anti-slip surface for stowing objects

Wireless Charging

Climate Control Schlitz

Adjustable and Retractable Steer-by-Wire Module

26.2 Upper Dash Structure

The upper dash structure has been shaped this way (see figure 62) to house and integrate the following features.

- It houses the steering device. This device is shaped the way it is to be able to fold away completely flat. It consists of an ergonomic loop-like shape which is nice in cornering and when doing manoeuvres with the car that require a lot of rotated steering input. There is a possibility to integrate touch buttons with haptic feedback, and this area is surrounded by a Mercedes-esque silver detail in the form of a rim. This rim prohibits the user from accidentally pressing the buttons whilst manoeuvring (exiting a roundabout for example), but also to provide the user with a physically guiding element to reach the buttons without taking one's eyes off the road.

- It houses the steering device module and provides the possibility for lateral movement and the extending and angling of the steering device.

- It embodies the schlitz-vent, positioned in front of the HVAC systems and HEPA filter. It houses the two desk surfaces.

- An upper cavity with an anti-slip mat is integrated. Here the user can quickly put objects like a laptop, phone or wallet when switching between modes.

The dash is kept as flat as possible for an as large as possible field of view through the windshield. Yet, an estimation was made for a volume that provides enough room to embody the necessary technology, systems and mechanics for

Figure 62 | Upper Dash Structure Features

26.3 UI Screen

Following the contour of the upper dash structure, a screen was added to the interior concept (see figure 63). This screen displays the instrument cluster when driving and the necessary trip or riding information when cruising autonomously. It displays MBUX functions and can serve as an extension of the user's smart devices.

Mercedes should support and make it easy to connect devices and to extend these devices via the UI. This way, car company Mercedes creates a durable interior that enhances using rapidly updated smart devices, rather than having MBUX compete with the technology of tech companies like Apple and Microsoft.

To provide the optimal viewing angle, the screen can be tilted. The screen is placed and dimensioned, whilst taking the windshield location, dash structure, screen eye distance and the necessity to display content in a suitable size, into account. Furthermore, it is placed above the steering device in order to also serve as an extended screen for a laptop placed on the desk. If the technology is available around 2035, Mercedes should strive for a see-through display. Essential navigational and IP information can be displayed on the windshield, using a HUD. This way, when display features are not used, the screen uses no energy, doesn't obstruct the view out of the window and creates a more spacious feeling in the cabin.

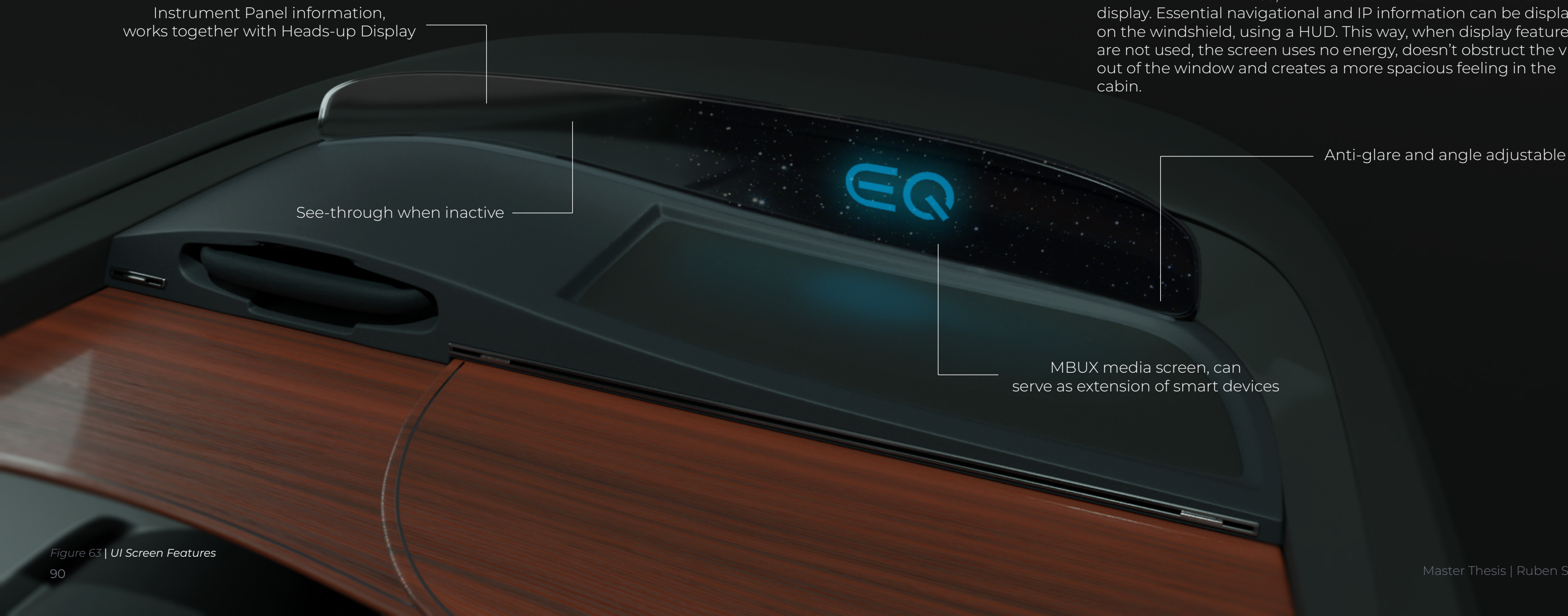


Figure 63 | UI Screen Features

26.4 Miko and Saloon Table Architecture

It was chosen to integrate a middle console (see figure 64) to visually connect the two table surfaces and provide structural support. Not only is this necessary to have a durable and strong architecture also the weight of objects on the table and a person leaning on the edge of the surface, create a large force and subsequently moment around the point where the table(s) come out of the dashboard. By providing support on the outer edges and in the dead centre, the optimal division of space and strength is provided. Furthermore, the miko architecture sweeps backwards and is curved for as much leg-space as possible. It houses the mechanism that adjusts the saloon table and provides a wireless charging tray for devices. Beneath that there is some room for objects like a purse or handbag. As this space is rimmed, these objects will not roll or slide around the car whilst cornering.

Furthermore, the miko provides a place in which an essential UI element is integrated. A touch surface that functions as a pad for controlling the UI on the screen is integrated and enclosed by a silver edge. This way the user can easily find the pad without looking down. Input for the UI can be done via this pad or via voice control, as, due to the dash structure where the user can put away stuff, the screen is relatively far away in a default driving position. By eliminating the necessity of using a touchscreen for input, the screen becomes less complicated and there is less issue with fingerprints making the screen dirty.

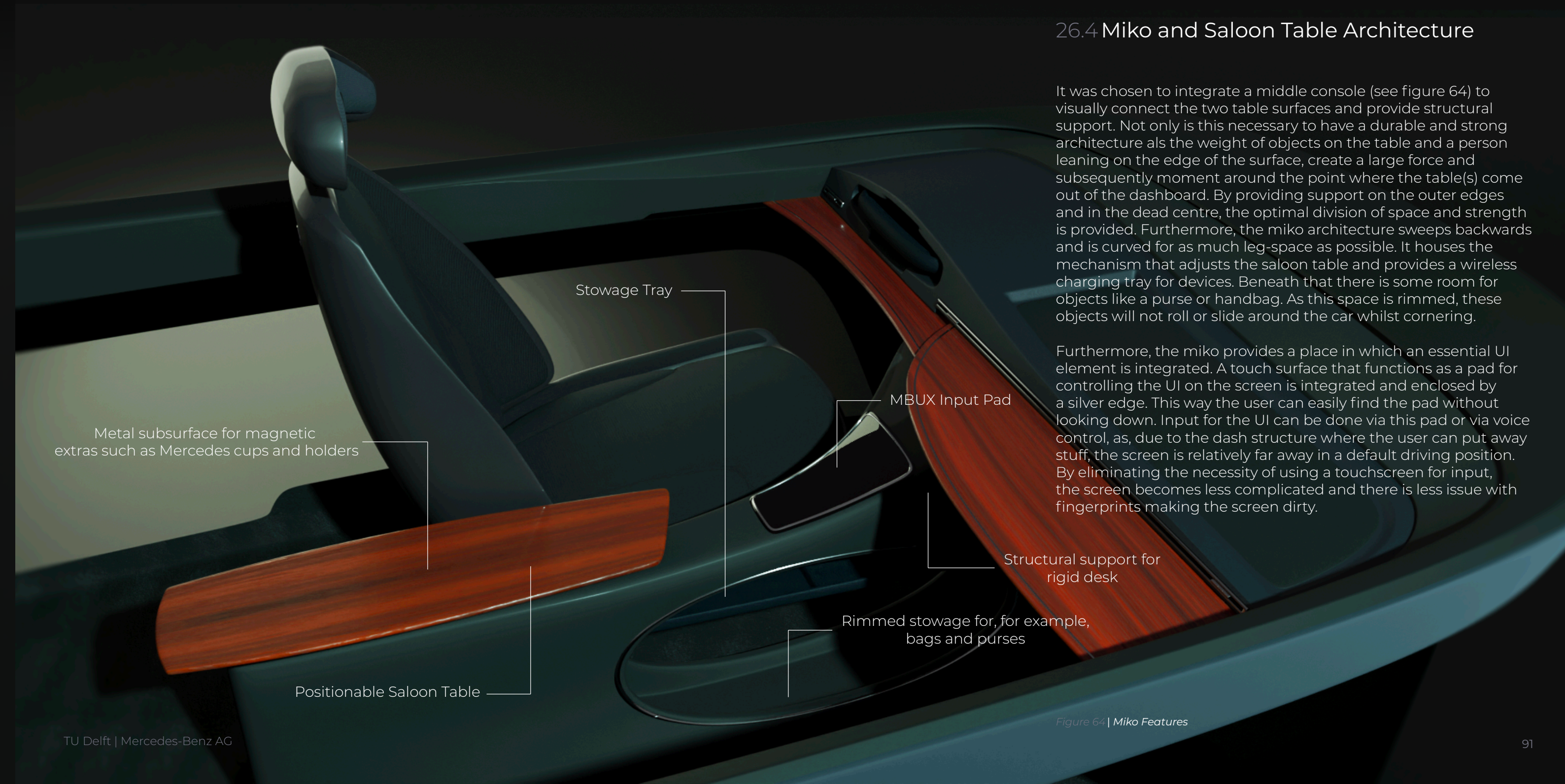


Figure 64 | Miko Features

26.5 Seating



Figure 65 | Pinched Rear Seating Adjustability

To not make the car wider than necessary and to keep the seating design simple and durable, it was chosen to exclude the option to rotate or swivel the seats. The chairs are designed in a way that they facilitate users to temporarily sit skewed or twisted. As research (see chapter 17) pointed out that users don't want to sit reversed or swivelled for a long period of time, together with Forschung & Entwicklung it was concluded that the seating, designed in the proposed way, sufficed.

We do however provide the rear passengers with the option to position their chair not only forwards and backwards, but also sideways (see figure 65). This choice was made to provide the rear passengers with the ability to move towards the saloon table. They can also put themselves in a position where they are not directly behind the front passengers, in order to achieve a more dynamic

social setting between the front and rear of the car. Furthermore, the rear passengers still have complete control over their personal room/space and the option to go into laid-back seating mode (see figure 69).



Figure 66 | Interior Seating Overview



Figure 67 | Seating Concept Features

Finally, the seating design encloses each passenger respectively within the cabin (see figure 66). This might prohibit users from smoothly getting in and out of the car. Therefore, the seat can open up the enclosing part of the back support in an inviting way for when a user gets in or out of the car (see figure 68).



Figure 68 | Opening Chair Flap for Getting in and out of the Car

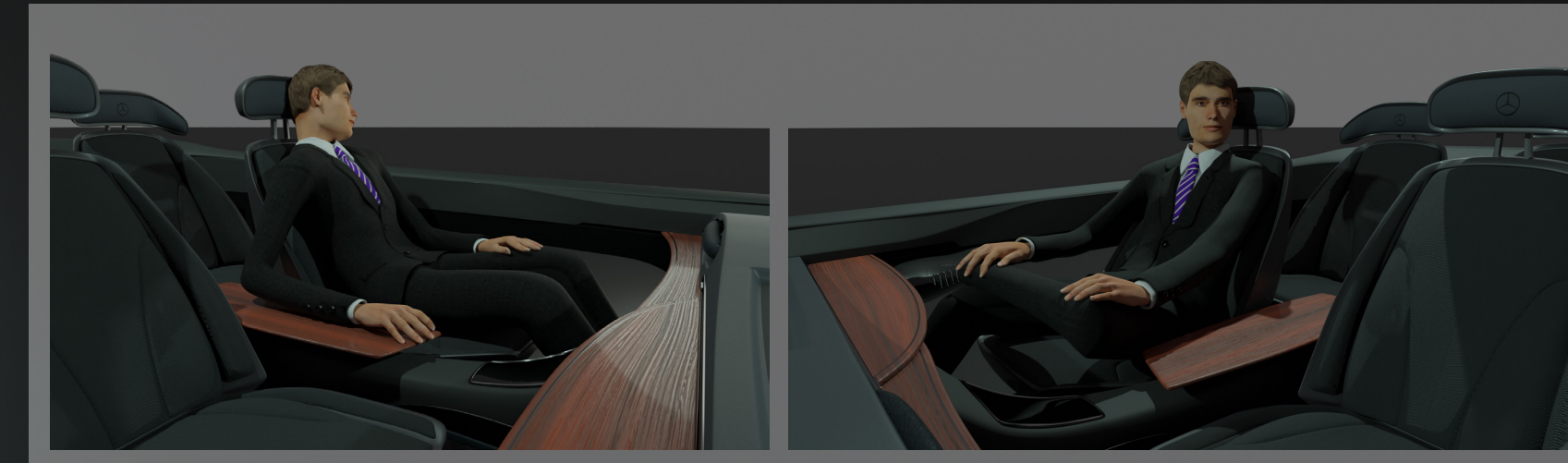


Figure 69 | Posture in Laid-Back Mode (left) and Posture Sitting Skewed

27 Package Indication

27.1 Towards a Final Design | Package

Next to the interior, a rough package (figure 70) was modelled in Blender. It features an advanced, slim and light battery package and an electrical four-wheel drive drivetrain. To make a rough estimation of the package proportions, dimensions for systems like the battery, climate control module, suspension and cooling components were mocked up. Apart from a trunk, a front trunk (or frunk) was integrated. The user has a lot of cabin stowage space and a large volume in the rear for transporting objects. The user can subsequently place more precious goods, that for example are more delicate or should not get dirty, in the frunk.



Figure 70 | Main Package Features

Figure 71 | Key Styling Ideation Cues

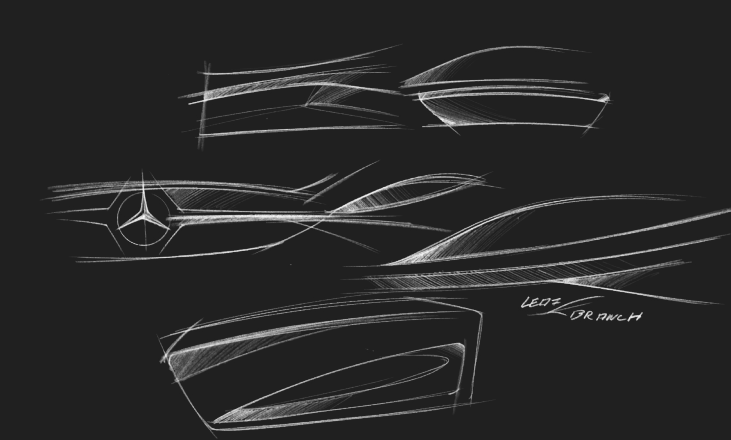
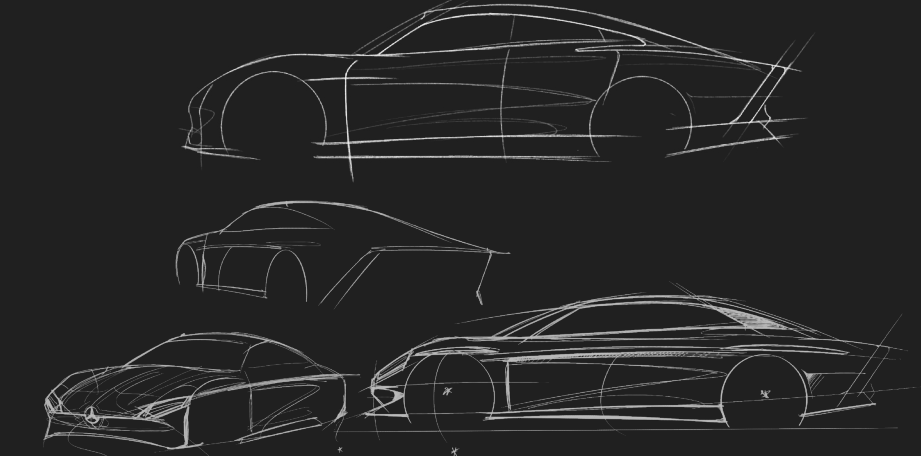


Figure 72 | Unravelling Mercedes EQ Styling



27.2 Towards an Exterior Impression

The package also provided an underlayer for an exterior sketching session (see figure 71 and 72). Explorative sketches were made to come up with a rough exterior proposal (see chapter 30 for the final result) that further propagates the interior design values.

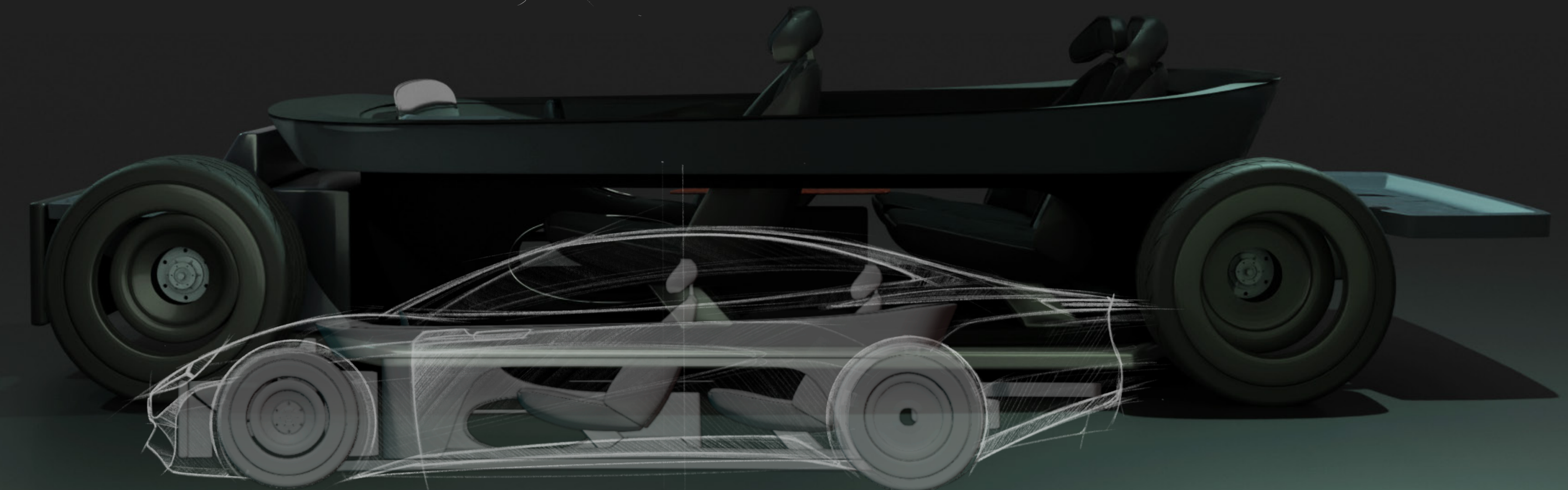


Figure 73 | Assessing Exterior Sketches with the Package Underlayer

28 Materialisation

28.1 Towards a Final Design | a Design Brief for the CMF Department

Initial Design Brief

In the final sketch proposals, the decision was made to choose materials and dark colours that create a cosy but stately atmosphere. Dark colours were also chosen to envision fabrics that contribute to a long lasting interior as lighter colours are more easily permanently stained. This is something to strive for as the lifespan of interiors is often the limiting factor in a car's longevity (see appendix A). A design brief for the CMF Department included in the final concept proposal consists, apart from the earlier established guidelines (see chapter 18.1), of the following elements:

- A cosy living room-esque atmosphere, fitting a luxurious but relatively conservative Mercedes-Benz driver
- Interior finishes that are beautiful and admirable, yet not distracting for the driver
- Design details that hint back to the brand's heritage and durable and precise German craftsmanship, and show progressive technology and precision in engineering
- Carefully implemented technology and lighting design that is kept simple to prevent these elements from becoming outdated rapidly. The finishes and interior should be sufficiently beautiful on their own, without heavily depending on led strips.

Suggestions for implementations

Ideas for or possible directions for the CMF department, that were found and discussed throughout the whole thesis duration, are summed up as follows:

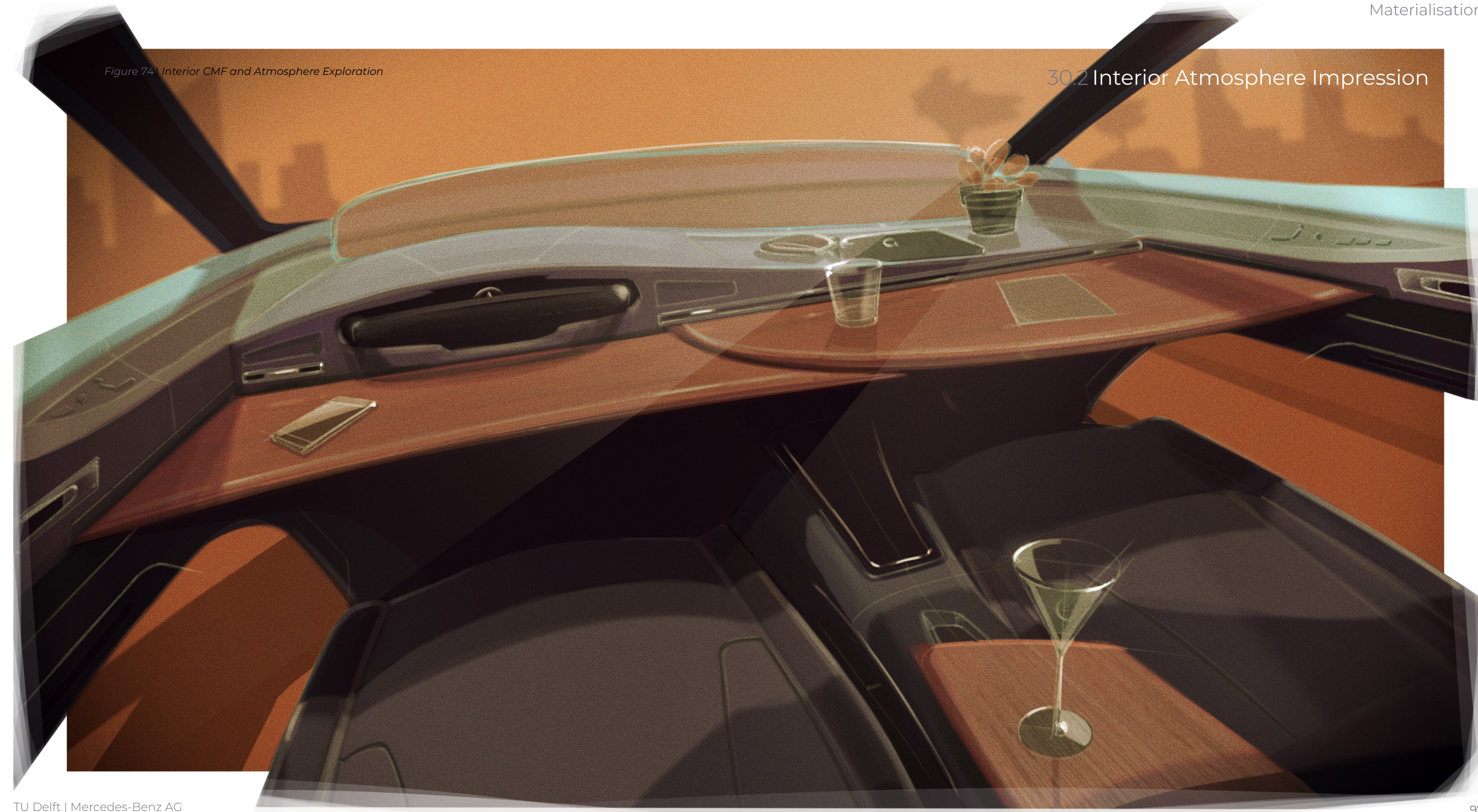
- Bamboo as baseline material for table surfaces. Bamboo is easy to grow and grows very fast, thus it can provide large quantities. Delivered with an appropriate finish and tone, the material could provide a solid base option for the wooden surfaces.
- Twelve.co (TwelveCo, 2021) is already working together with Mercedes-Benz and promises a revolutionary way of binding CO₂ to transform it into essential products. They call this method "carbon transformation", which is essential in their mission to eliminate global emissions and lead the transformation to a fossil-free energy system of the future. Striving to effectively advertise the use of lightweight plastics from twelve.co (e.g. via badging) can help the concept to be a paragon of sustainable luxury automobiling.

- As suggested by Jan Fischer (Forschung & Entwicklung, Mercedes-Benz) and Karola Hoffman (Phi Creative Advanced Engineering), elegantly knitted wool can provide a sustainable, durable and comfortable seating and interior material.

- New innovative materials (as seen on the Mercedes EQXX concept) such as apple leather, seaweed and recycled fishnets can be used for e.g. the steering wheel, but also other accent materials, panels, floor mats and carpets. It is advised to implement the already very well established metal refining and recycling structures from Mercedes-Benz (as seen during the Mercedes plant visit, November 2021).

Figure 74 Interior CMF and Atmosphere Exploration

30.2 Interior Atmosphere Impression



29 Interior Impressions



Figure 75 | Lounge Mood Setting



Figure 76 | Work Mood Setting

The following impressions (see figure 75, 76 and 77) serve as a comparison between the earlier sketched mission statement analogy. The three impressions displayed in this page are much alike situations we found in the lounge coupe.



Figure 77 | Social Mood Setting

30 Exterior Impression

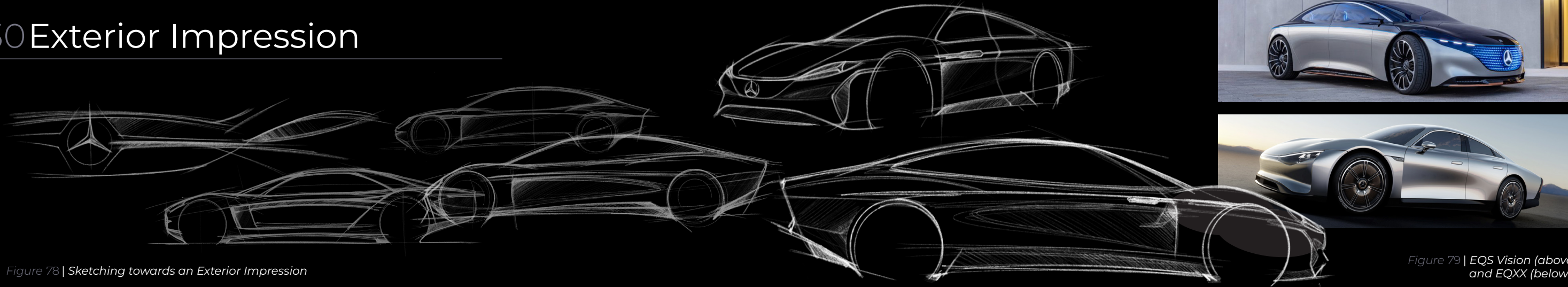


Figure 78 | Sketching towards an Exterior Impression



Figure 79 | EQS Vision (above) and EQXX (below)

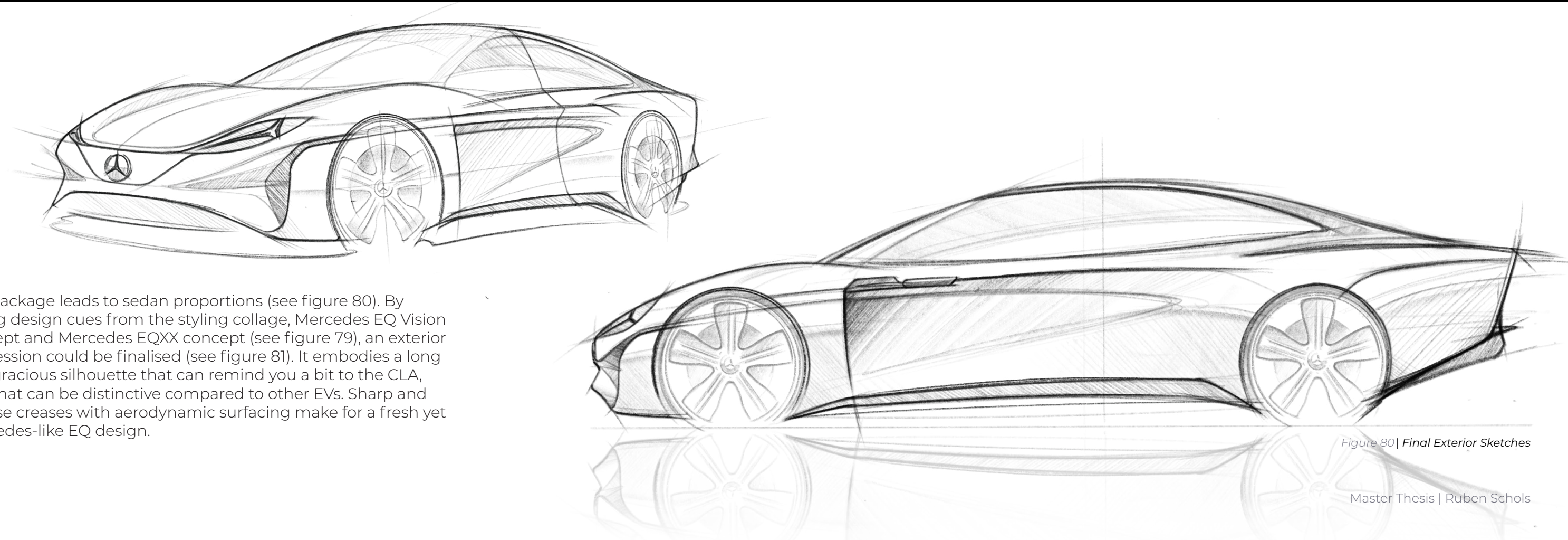


Figure 80 | Final Exterior Sketches

The package leads to sedan proportions (see figure 80). By taking design cues from the styling collage, Mercedes EQ Vision concept and Mercedes EQXX concept (see figure 79), an exterior impression could be finalised (see figure 81). It embodies a long and gracious silhouette that can remind you a bit to the CLA, and that can be distinctive compared to other EVs. Sharp and precise creases with aerodynamic surfacing make for a fresh yet Mercedes-like EQ design.

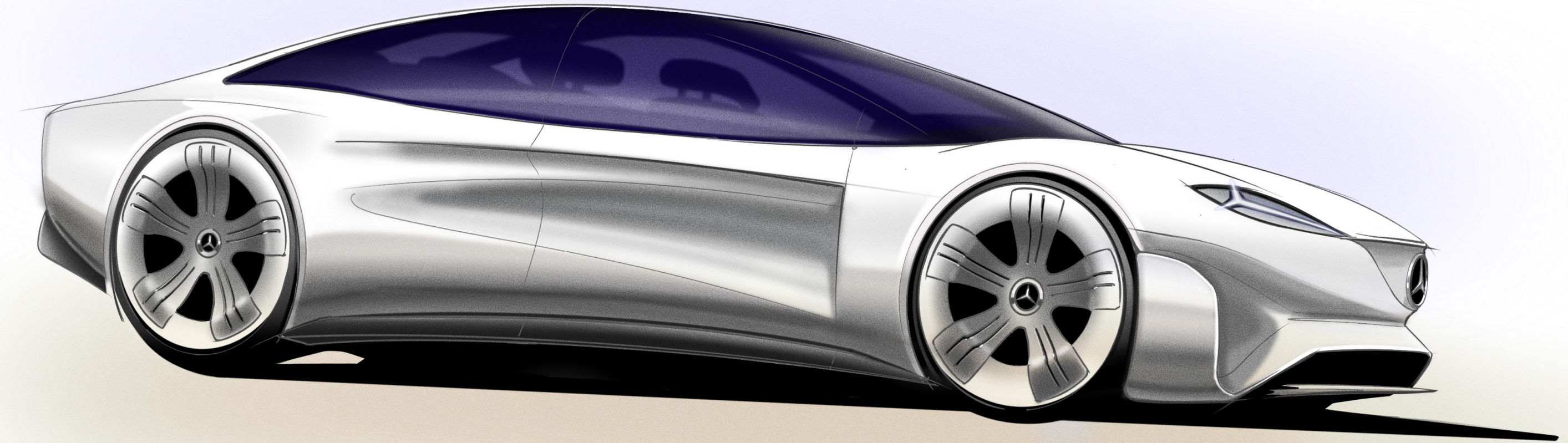


Figure 81 | Final Exterior Sketch Render

31 Key Points Evaluation

As mentioned in the chapter four of this report, key points to ensure the added value for the stakeholders involved were formulated. In this brief section it is touched upon whether these key points have been met through evaluating the design outcome and comments from multiple industry experts.

31.1 Key Point 1 | Final Assessment

- Key point I: why is 'it' here > how is 'it' here (in which 'it' can refer to multiple aspects; from findings and conclusions to physical architecture)?

All introduced design elements serve the goals of providing real user benefits. Consequently, these elements contribute to the part of the mission statement which states 'the desire to provide an environment where the users can optimally be in their current situation'.

“Im Hinblick auf Autonomes Fahren Level 4 halte ich es für die absolut richtige Entwicklung des Lebensraum im Fahrzeug. Es wirkt komplett anders als wir Innenräume bisher kennen und somit ein Meilenstein der zukünftigen Fahrzeugentwicklung mit Blick auf den Innenraum/Fahrer.”

“Die Designelemente machen Sinn!”

- Thomas Weckerle, Interieur Integration und Gesamtkonzept
Vorentwicklung Cockpit, RD/KII, Mercedes-Benz AG

“Die Trennung des Tisches von Fahrer und Beifahrer Seite gibt zusätzlichen Nutzen in weiteren Use-Cases.”

- Clement Virat, Ingenieur, kreativ-Team phi CAE GmbH

“The interior looks very spacey (as extra space is needed due to a long instrument panel, which is necessary for the desk).”

- Sascha Blome, Interieur Integration und Gesamtkonzept
Vorentwicklung Cockpit, RD/KII, Mercedes-Benz AG

31.2 Key Point 2 | Final Assessment

- Key point II: (how) is it Mercedes specific, and is it not easily copyable for other car brands?

Design elements are envisioned in forms and shapes that match the Mercedes brand image and identity, yet in a progressive fashion. They contribute to a stately, neat and easy/relaxing interior environment. In a Mercedes-like fashion, the interior integrates clear and proper design elements that are prioritised over fancy and state of the art technology. This state of the art technology however, is present 'behind the screens' and in the form of safety and performance. The exterior propagates these same values in a progressive, yet classical shape.

“Das Layering-Thema im Interior ist sehr passend für Mercedes-Benz. Die großen Holzflächen erinnern an die Gestaltung von Yachten.”

- Johannes Bock, Transportation Interior Designer, kreativ-Team phi CAE GmbH

“Ja, dass Design passt zu Mercedes! Mit Hinblick auf einen luxuriösen Innenraum und Aufwertung des Interieur unbedingt!”

- Thomas Weckerle, Interieur Integration und Gesamtkonzept
Vorentwicklung Cockpit, RD/KII, Mercedes-Benz AG

“Das Gefühl erinnert mich an einen Gentle(wo)mens' Club. Den Transfer in ein Fahrzeug finde ich sehr passend für Mercedes-Benz.”

- Karola Hoffmann, Leitung, kreativ-Team phi CAE GmbH

31.3 Key Point 3 | Final Assessment

- Key point III: is the story inspiring yet realistic, and does it evoke the enthusiasm to set to the challenge

The story is well perceived and has motivated the client to set to the challenge of exploring the design, as became apparent halfway during the project (see chapter 19).

“The interaction between front airbags and the desk could work (for the first time).”

“The Idea of asymmetrical seats to fulfil lounge requirements is cool (head support, adjustable side support for back).”

- Sascha Blome, Interieur Integration und Gesamtkonzept
Vorentwicklung Cockpit, RD/KII, Mercedes-Benz AG

“Die wohnliche Atmosphäre, weg vom klassischen Interior Design ist definitiv ein Thema für die Zukunft.”

- Dennis Heinle, Transportation Interior Designer, kreativ-Team phi CAE GmbH

Guaranteeing these Key Points will ensure that Mercedes EQ users will be a paragon of sustainable luxury automobiling.

31.4 Key Point 4 | Final Assessment

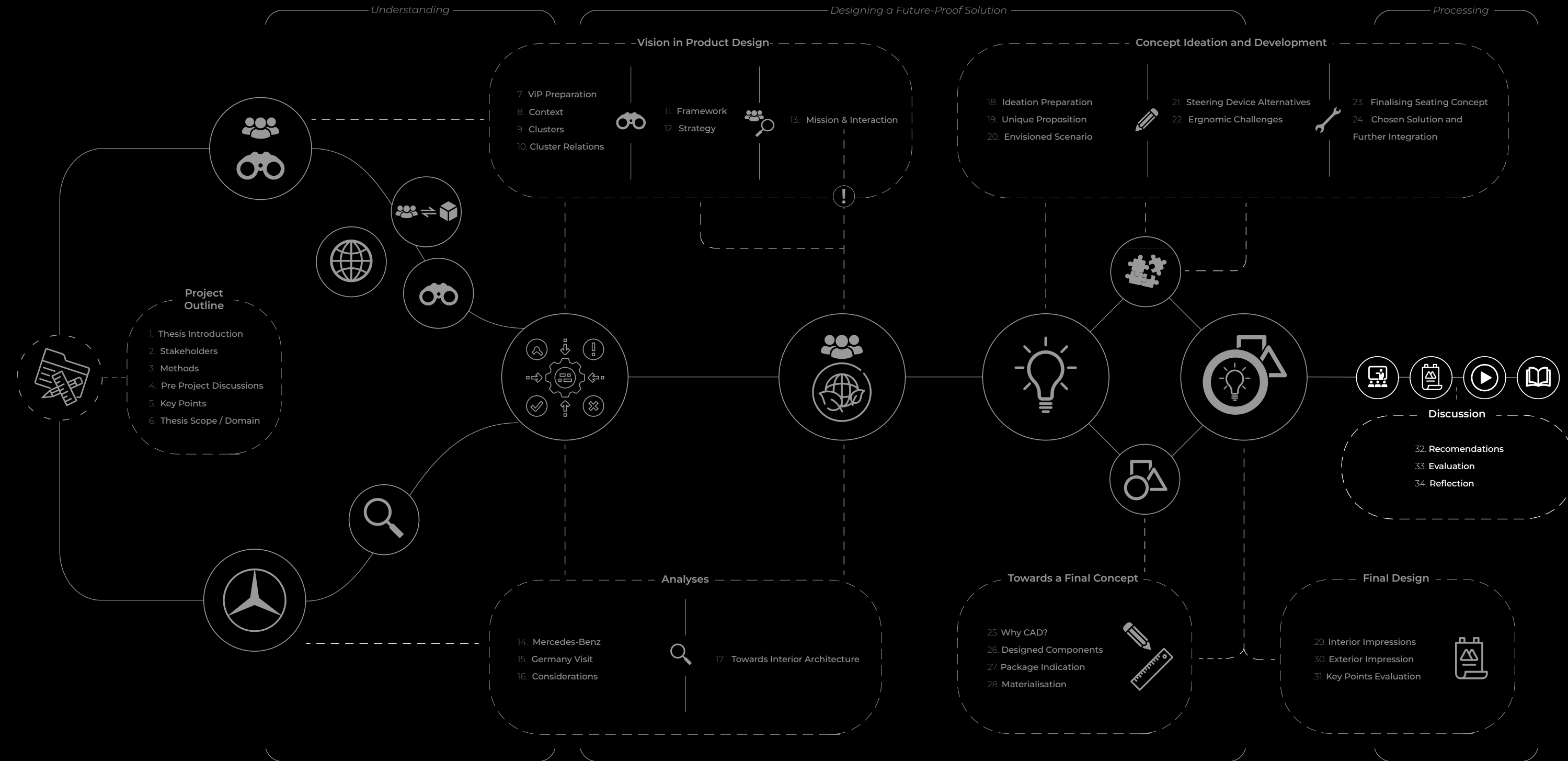
- Key point IV: are decisions in line with sustainable and durable design guidelines and principles

The interior architecture that is proposed provides a basis for geometry that is well-argued and can be materialised according to the classic designing for sustainability/durability/longevity principles. The architecture furthermore enhances the time spent by the user whilst travelling, whilst decreasing the need to arrive at a destination faster, thus also decreasing the amount of energy per mile for propulsion of the vehicle.

“The interior fits well to the Mercedes-Benz brand claim of “modern luxury”.”

- Sascha Blome, Interieur Integration und Gesamtkonzept
Vorentwicklung Cockpit, RD/KII, Mercedes-Benz AG

PART VII Discussion



32 Recommendations

A Paragon of Sustainable Automobiling

The presented concept provides a solid base for the envisioned elements within the interior. However, to be a paragon of sustainability, the next challenge is to ensure that Mercedes EQ provides a truly carbon neutral vehicle. Furthermore, the concept gives users more time and time awareness, and decreases the need for driving fast when cruising autonomously. However, as we have pointed out that more than half of the time the user is still actively driving, how do we ensure sustainable driving behaviour at these times? It is advised to find a status communicating element and support sustainable road behaviour in these situations.

Further Design Detailing and Ergonomic Optimisation

There is a solid foundation for the idea but it is essential to further detail the designed elements and review the ergonomic properties of the concept (see figure 82).

1. The upper dash structure especially looks a bit dull and needs design iterations. Also, the design needs a lot more detailing in general, from buttons and handles to shut lines of door panels. Elements could do with a more sculptural approach. This could be due to my product design background and relatively little interior design experience.

2. The screen to user distance is too far away now. It would be advised to find a solution where the screen is a lot closer while there is still room to easily temporarily place objects. It would be ideal if these objects then also not obstruct the screen. This was also mentioned by Karola Hoffmann from PHI Cae, and Thomas Weckerle and Sascha Blome from Forschung und Entwicklung. Karola also pointed out that the air vents as they now are, look too small. By repositioning the screen there would also be more freedom in placing the airbags.

3. Thomas Weckerle and Sascha Blome also mentioned that fixing items magnetically needs to be specified and optimised, to ensure a satisfying 'taking from' and 'putting back on' the tables. Furthermore they mentioned the next step of engineering the wireless charging area.

4. The seat design needs reviewing. The shapes need to be tested and optimised in a real life scenario with real users. Sharp edges need to be removed so that they will never 'cut' into the user. It should also be examined how seatbelts influence the experience of the seat.

5. To account for the unlikely event of a crash with the desks extended, the airbags need to be designed so that they prevent pushing objects that were on the desk directly into the user.

6. When a better indication of technologies available can be made, we can review if the proposed way of UI input is optimal. Now, the UI pad is used to control the screen. Maybe this is not necessary anymore after repositioning the screen. It could also be that eye-tracking software or voice commands by that time work adequately.

Only after these steps, it is logical to further detail the concept, make CMF decisions, whilst integrating more detailed package elements for a simultaneous exterior refinement.

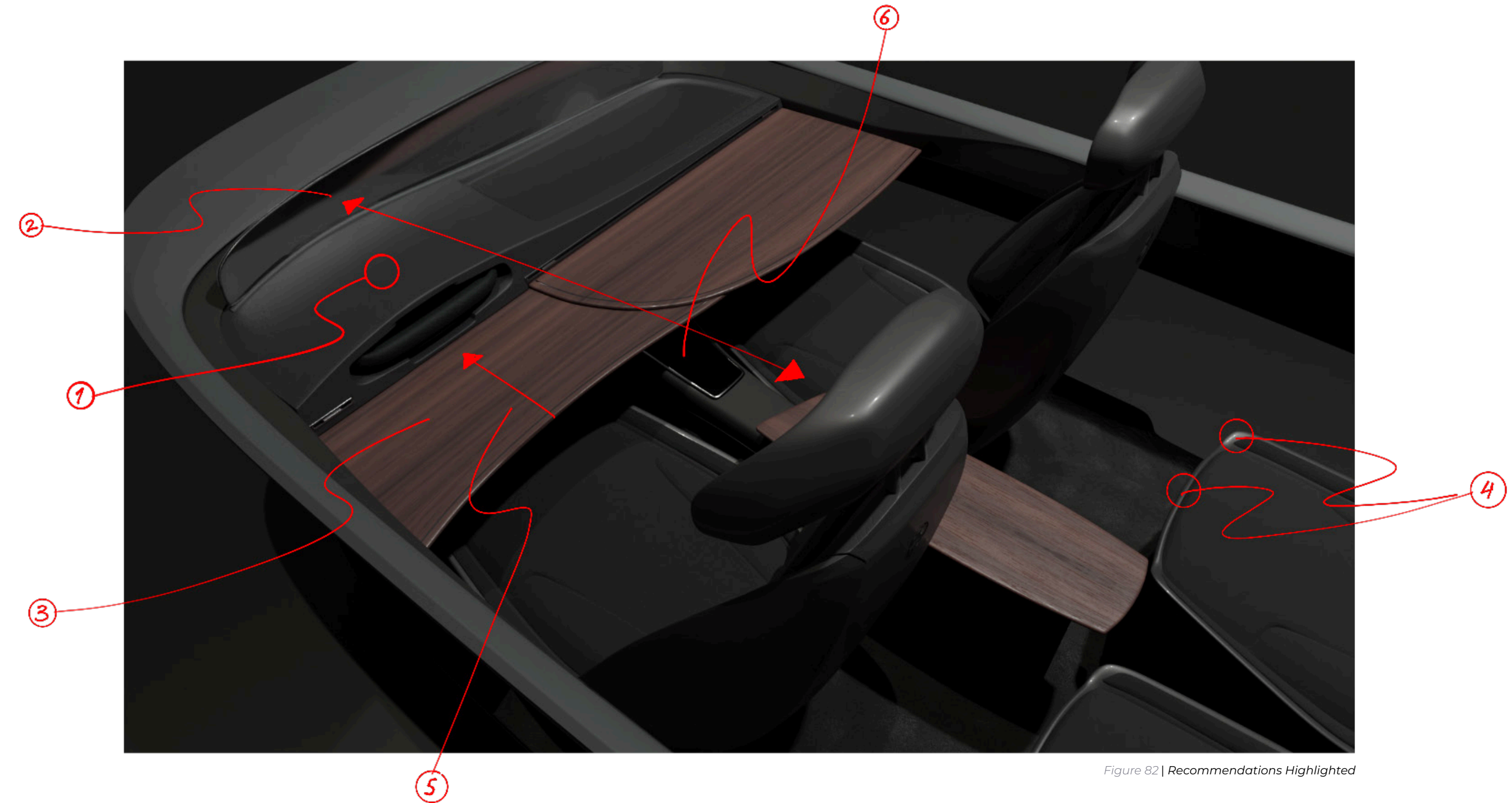


Figure 82 | Recommendations Highlighted

33 Evaluation

Time

The main limitation of this project has been time. Half a year is not long enough for a thorough ViP design process and the desired visual and artistic results formulated in the project brief.

Broad Design Brief / Large Fuzzy Front End

Firstly, it takes a large amount of time to even begin to understand all aspects from the broad design brief. With everything you learn at university and the academic approach you are taught, it is easy to spend a lot of time in the fuzzy front end of design. I had the luck that Jan Fischer, my company mentor, had experience with this academic approach and also the ViP method so these discussions were very valuable. However, it didn't allow me to get more interactions that make sense with other members or departments. Confidentiality between departments and working from home are obviously factors in this case, but the gap between the industry approach and one from Delft is the largest factor.

Academic versus Industry Approach

On one hand are students appreciated for this academic approach and a well-argued research based design foundation, on the other hand was it in my case a limiting factor in terms of interaction with people from the industry. I even made balancing the two a thesis key point but I found out that this remains very difficult.

Kill your Darlings

As the idea is valued so much from within the team but also outside, I would not cut time from the ViP process. Yet, this process is so broad that it is almost impossible for a designer to let go of all the knowledge you have obtained. The desire to integrate everything led to also designing chairs for example, whilst it could have been better to only focus on the desk surfaces, steering device, dash, screen and saloon. Then these elements could have gone through more design iterations and be presented in the more desired 'fancy' fashion. I could have used existing chairs from Mercedes to still deliver a full impression that speaks to the imagination. Once again it becomes apparent how important it is to be able to 'kill your darlings', as I am very unsatisfied with the upper dash structure execution.

Impact

Furthermore, I am very grateful for the positive feedback I have received. Not only the kind words from multiple people but also the literal implementation of my idea in their own concept development. This showed that my idea has not been placed on the shelf to collect dust, which was one of the main goals of the project brief.

Too Much on the Plate

I took too much on my plate in terms of the desire to integrate many interior elements in the concept and wanting to take many findings from ViP and the further analyses into consideration. This ate away time and with the necessary time to finish the obligatory report and TU Delft deadlines, I am left with the feeling that I'm only now at the point at which more frequent consulting with different people and parties from Mercedes really starts to make sense.

As I notice the value but also fun of these discussions and consultations with different parties on more specific design, styling and engineering elements I find it a shame that this can not be put to use and only is part of the recommendation section.

Working from home / Covid-19

As earlier mentioned, there is a gap between the industry approach and an academic approach. This effect was amplified by the pandemic. As I worked from Delft it was easy to get lost on your own 'designer island'. It also resulted in that I was only at limited occasions obliged to present, and when this was the case it was from behind a laptop. This is where it would have been good for me to be in an earlier stage forced to get to the point or essence of your ideas in a convincing and condensed pitch. I often was either telling too much or too little as I was afraid that I wouldn't get a sensible discussion out of presenting research findings.

Project management

By trying to work effectively and disciplined I am quite satisfied with the project in terms of time, amount of work executed and the achieved result. I have noticed how I as a designer could benefit from a more proactive attitude in consulting others as I tend to have the desire to remain in a comfortable position in which I try to figure everything out on my own.

Industry Experience

The amount of visits to Germany being limited to only one, to an office that was largely empty made this thesis goal the least accomplished one. In the design department I would probably be too academic, and in the limited Forschung und Entwicklung team I sometimes had the feeling that I was too much of a designer for the more engineering oriented discussions that took place. As confidentiality did not allow me to take a look in other departments such as design and styling, I still have no clue what it is like behind those doors. As I prefer to keep an overview of a holistic design, the idea of a strictly structured 'pass on' design process between departments that do not interact with each other seems limiting and ineffective. It is however very motivating to hear how your ideas are appreciated and what a company with such vast resources could do with these ideas.

34 Reflection

Result

Finally, I am most content with the things I learned and the people I got to know and have shared this project with. It was the first time that I seriously put time into designing an interior and definitely the longest solo project I have executed. It made me realise that on one hand I like to work alone but on the other hand I can not wait to get things done with a team of nice colleagues again. The next time I design an interior or car, I would probably do more than half the things differently than I have now, which proves the valuable learning experience of this thesis. However, with the (limited) obtained industry experience and insights, I am still not sure about my place in a large car company. We will see what the future holds in store.

References

Apart from vivid discussions and advice that lead to considerations and choices, a vast amount of knowledge has been retrieved via additional sources. The references that were consulted can be found in this section.

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