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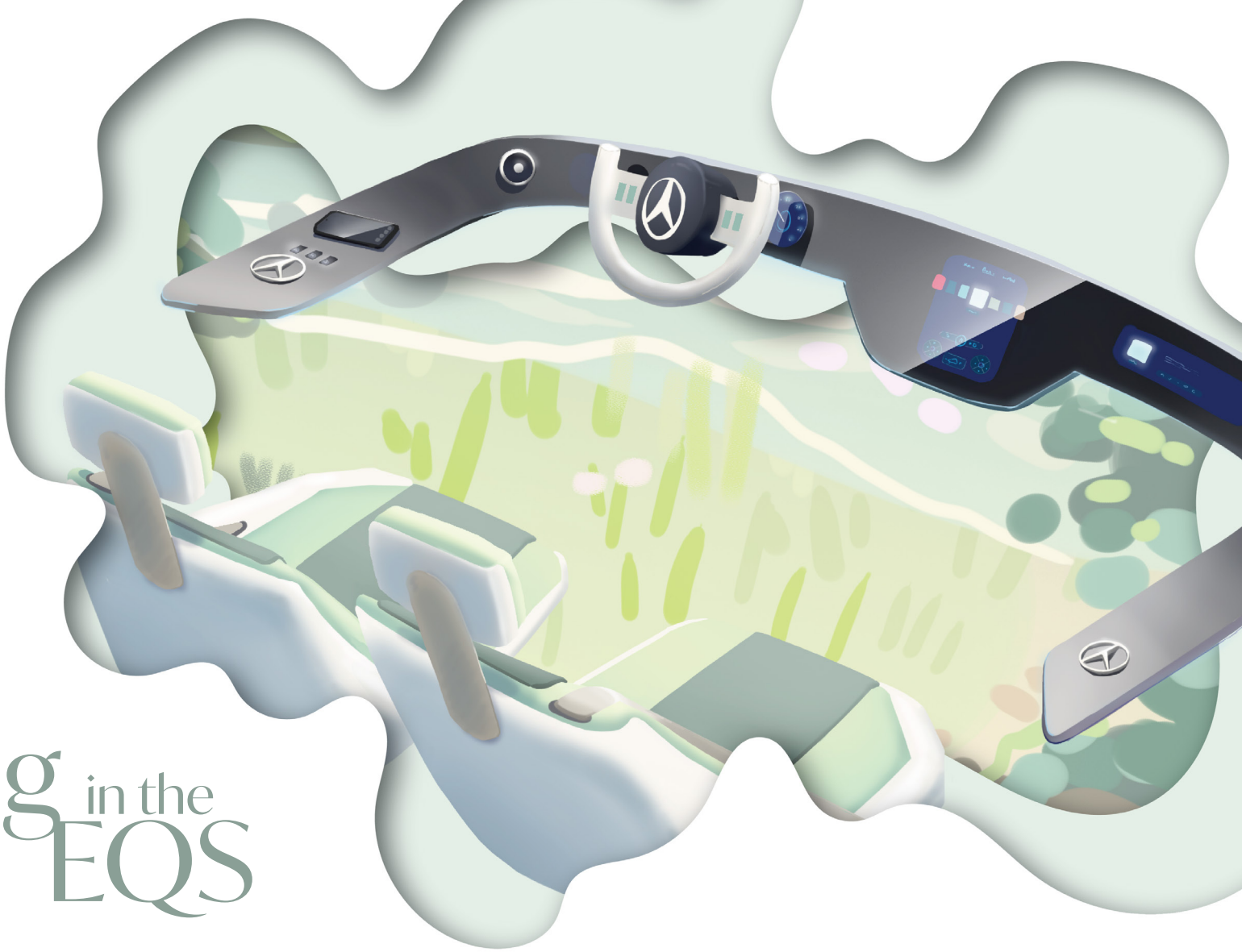
Master thesis Design for Interaction

TU Delft | Mercedes-Benz
April 2023



Wellbeing in the EQS

CREATING A VISION AND DESIGN FOR THE 2030 MERCEDES-BENZ EQS THROUGH APPLICATION OF 13 FUNDAMENTAL NEEDS AT THE FRONT END OF THE DESIGN PROCESS.

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07 April, 2023

"Neither revolution nor reformation can ultimately change a society, rather you must tell a new powerful tale, one so persuasive that it sweeps away the old myths and becomes the preferred story."

- Ivan Illich [1]

[1] "Storytelling or Myth-Making? Frank Viola and Ivan Illich,", July, 2007

EXECUTIVE SUMMARY

This thesis is conducted with the interior development department of Mercedes-Benz. Two activities form the core of this thesis: interior design for the 2030 EQS, and implementation of Fundamental Needs in the process. The final desgin is the Daedalus: design for the sweet spot between focussing on your tasks and on the surroundings.

The first approach is to understand the context in 2040, to iterate back towards a 2030 intermediate design.

Fundamental Needs

In this thesis the theory of Fundamental Needs by Desmet & Fokkinga (2020) is applied. This theory borders between design and psychology, and explains why we as people function the way we do.

The theory explains that every human being has 13 Fundamental Needs, and by fulfilling all of them we achieve wellbeing. Fundamental Needs will always stay the same over time: this provided a starting point, and an idea to design a tool.

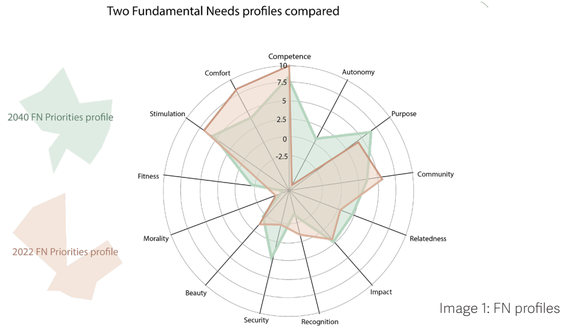

Image 1: FN profiles

The 2040 needs

Seven ways are found to work with these 13 needs, the approach changing every time due to different conditions and goals. The tool I used for external research with Fundamental Needs is tested and led to a quantification of the time between today and the intended future. This method is applied (image 1) and showed the needs for Autonomy and Security will be more relevant in 2040.

The 2040 context

Simultaneously, a Vision in Product design research is conducted, revealing that in this future, people expect things to be explained to them. This led to interaction qualities of 'Quiet' and 'Synergy'.

This 2040 concept is designed for an intuitive interaction between person and algorithm in the vehicle through the blue ribbon (see image 2).

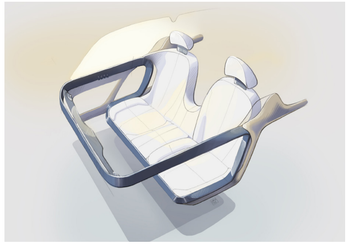

Image 2: 2040 concept

Validating the concept

This concept is validated in a user test with sensitizing in the Mercedes-Benz interior labs. The usertest showed interest in communicating with the car, and confirmed the importance of control and understanding in this 2040 future vision. Participants asked the AI many questions with varying intentions.

The Daedalus

These results provided focus for the last iterative step towards a 2030 design: the Daedalus. It revolves around finding a sweet spot between focussing on your task and enjoying your surroundings.

Fundamental Needs in the process

Wihtout applying Fundamental Needs this design would not have been possible. The clearest advantage is the communication offered by Fundamental Needs: user experiences are always subjective, but Fundamental Needs are relatively objective, making them suitable to communicate findings, goals and ambitions. Another strong point is how the needs create a focus in a very complex future scenario.

The Mercedes Moment

The Daedalus can share Mercedes Messages with: this means the user can choose between the Fundamental Needs of Security, Comfort and Stimulation, the choice itself providing Autonomy. Mercedes Messages are not limited to the vehicle: they can be taken into shared mobility or the train. This design captures a moment of synergy, control and understanding that was experienced by participants during the user test, to recreate a valuable Mercedes Moment.

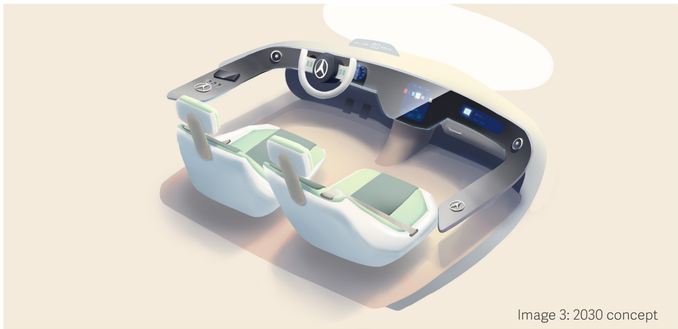

Image 3: 2030 concept

Source: Estúdio23

PREFACE

This master thesis is led by a passion for two things: people and movement. As I am writing this introduction, I am in a high-speed train travelling to Stuttgart. With me are hundreds of people, also travelling south. Each of these people has unique reasons for being in this train, each one of them has preferred modes of transport. Some of them, like me, will enjoy the train ride. Some of them may not. My focus is on finding what Fundamental Needs drive people to move, and how to optimise this nomadic experience.

I do this because I believe travelling is a part of human nature. Even after the rise of the home-office, even after years of perfecting deliveries on our doorstep, we will continue to spread our bodies and minds to new places. To new places for us as individuals, and as humanity. However, looking at upcoming (climate) changes in our world, our movement patterns are facing disruption. How will we prepare ourself for low-energy transportation? How will we learn to travel differently, and less?

This thesis is done with the Mercedes-Benz pre-development interior department. I moved to Stuttgart for five months to experience the Mercedes processes in real life. This offered opportunities to learn from the design and research practice, and allowed this thesis to be rooted in a vast amount of new and already built knowledge. Because of this head start, I could quickly jump into the designing of new theories, new worlds, and new movement.

The goal of this thesis is to implement fundamental human needs towards an interior design, and through this practice, give a strong recommendation on how these needs can be implemented in the design process.

I believe we should start asking why something is important to people, and use that knowledge to create better stories, and better design. Once we do, we might find new solutions for the problems at hand.

I hope you enjoy reading this thesis, and I hope you find something of value to you in the story I am telling.

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GLOSSARY

These are important concepts and abbreviations in the technical and design field used in this thesis.

TECHNICAL CONCEPTS

Internal Combustion Engine (ICE)
Engine used in for example non-electric vehicles.

Electric Vehicle (EV)
Vehicles that are propelled by an electrical system.

EASCY
This concept is said to be the future of mobility (de Jong, 2019), more about this can be found on page 20.

Level 4 automation (Level 4)
This term is a part of the six levels of automation (SAE, 2018), it means the car drives autonomous for parts of the trip, and the driver takes over control for other parts.

Artificial Intelligence (AI)
This is a term used for algorithms able to 'learn' from data they receive. More information can be found on page 24.

Augmented Reality (AR)
Projecting a digital image into reality using digital solutions, often a camera and a screen.

Shy tech
Using materials or designs to make technology less visible or sometimes even hide it.

Mobility as a Service (MaaS)
With MaaS, mobility is considered a part of a bigger system. An example is a OVbike from the Dutch public transport system, next to trams, trains, and buses, all available through the same service.

DESIGN CONCEPTS

Fundamental Needs (FN)
This is a theory created in 2020 by Pieter Desmet and Steven Fokkinga at the TU Delft where 13 Fundamental Needs are used to explain and understand what people need. To read more about them, see page 33.

Vision in Product Design (ViP)
The Vision in Product design approach (Hekkert & Van Dijk, 2016) It is explained on page 56.

Emotion Mapping
A research method to understand and uncover Fundamental Needs and their fulfilment in a certain situation, explained on page 89.

Wellbeing
Fulfillment of all 13 Fundamental Needs (Desmet and Fokkinga, 2020).

Sensitizing
A way to prepare test participants for a usertest.

User
In this thesis 'user' refers to someone who owns, shares, rents or borrows a Mercedes-Benz as a Mercedes-Benz user.

Wizard of Oz
A prototyping technique where a model is used to mimic functions of the actual design.

DEPEST
Research areas for literature research, applied for ViP, see page 60.

INTRODUCTION

This thesis and contents are designed, tested, discussed, and made alive together with the RD/KII Mercedes-Benz interior development department. The project consists of a combination of two activities going hand in hand: interior design of the 2030 EQS, and an implementation of Fundamental Needs into the design process.

The theory of Fundamental Needs is made by and for designers. It is a theory that borders on psychology and design, and that alone already sparked interest: how to design for people, if you look at people from a scientific point of view? What could that combination bring in a design process?

Two approaches

This thesis follows a dual approach, and has a **dual outcome** for Mercedes-Benz: on one hand there is the interior design track, and on the other is the Fundamental Needs track.
The FN track is used to get started on a design direction, and the results of the design process are used as input for my FN activities. The design continued through the Vision in Product design method (see image 4).

This dual wielding of design and process creates a **design with a story and an interesting set of findings on the process side.** On the other hand, it impacts the focus of this thesis to switch from design to theory and back again.

Starting statement

Then the question remains: who was first, the design, or the process? The first statement of this thesis is: how Fundamental Needs be implemented into the design and process over time in a Mercedes-Benz EQS interior? **The goal is to provide Wellbeing through Mercedes-Benz interiors, the FN are the means.** This thesis starts with he FN process, and then iterated to a design.

For my design the first **focus is on 2040,** to find a future vision and design, and work backwards towards an intermediate design that is most advanced, yet acceptable to **implement in 2030**. For the process I focussed on how that can be achieved with Fundamental Needs.

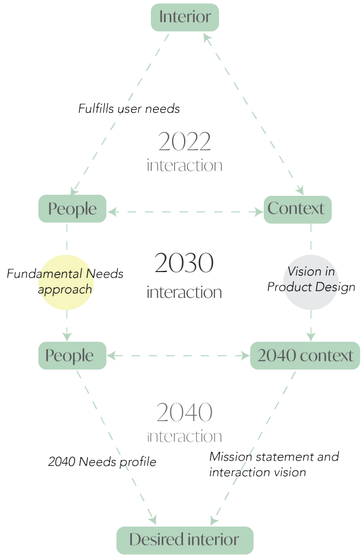


Image 4: Two approaches

STRUCTURE

Interior design track

The interior design track generally follows a Product Innovation Process cycle (Buijs, 2012), the full process is shown on the next page. The pages that lead up to the final design are white and green.

Fundamental Needs track

The Fundamental Needs track of this thesis takes place on a 'meta' level compared to the other track: it discusses how we should design. The pages on these topics can be recognised by the yellow paper graphics, placed behind the white pages.

THE PROCESS OVERVIEW

The process followed in this thesis is generally summarized in the image on the right.

The backbone of this design process lies in the Product Innovation Process (Buijs, 2012). This is a process overview that brings structure in internal and external analysis, a valuable structure for the complexity of this thesis. Implemented to that are the Vision in Product Design (ViP) method (Hekkert & Van Dijk, 2016) and the theory of Fundamental Needs (FN) (Desmet & Fokkinga, 2020).

This thesis is structured following the steps shown in image 5 on the right.

Legend

The light green circles contain activities, the dark green boxes show deliverables to the company for feedback. The yellow circles show the FN track, the grey circles the ViP track.

FN and ViP in the process

There are three exploration levels shown at the top and bottom of the image: FN for internal application looks at how can FN be applied internally, to help with internal processes and workings. FN for external analysis looks at how can we understand the world better through Fundamental Needs. Vision in Product design follows the steps of this design method.

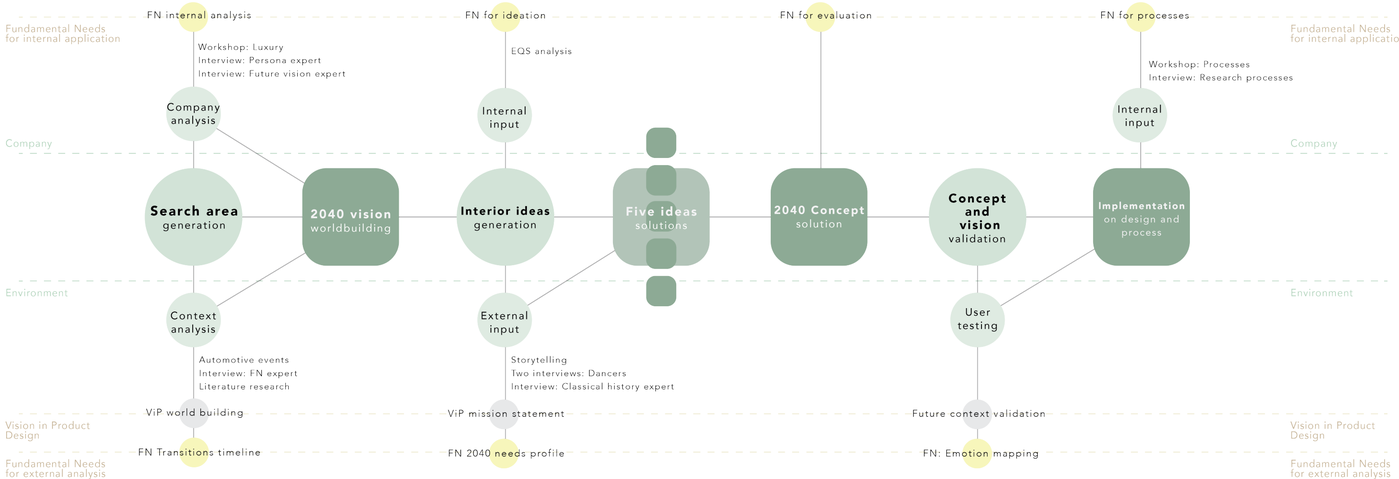


Image 5: Process overview

INITIAL RESEARCH

CHAPTER 1: SEARCH AREA GENERATION

INTRODUCTION

This project starts with a large and broad project brief, a lot of information is necessary to build a fitting design later.

To find as much relevant information as possible, a broad lens and scope is chosen for the initial research phase, summarized in the map of literature research on the next page.

CONTENTS

In this chapter I will explain the starting point, the directions, and the findings from my initial research phase, as well as discuss the impact of stakeholders.

I will first explain what topics are researched, then what research questions are used to get started. Then, I summarised my findings on the topics from Automotive research, Sustainability, Evolvability, and Artificial Intelligence. Research into Fundamental Needs and the company are covered in chapter 3 and 4.

LITERATURE RESEARCH

Approach: Literature Research

Literature research is conducted through online research, reading papers and books, asking colleagues and experts for tips and collecting all data per topic to find out what the information means for my thesis.

Below in image 1.1 are all the directions the literature research branched into. To guide this process, a set of inspiring and steering research questions are used, shown on the next page.

The findings from the wellbeing research are shown in Chapter 3. DEPEST research is not applied in this chapter, but used as input for the ViP approach in Chapter 5, and the data from this research can be found in Appendix H.

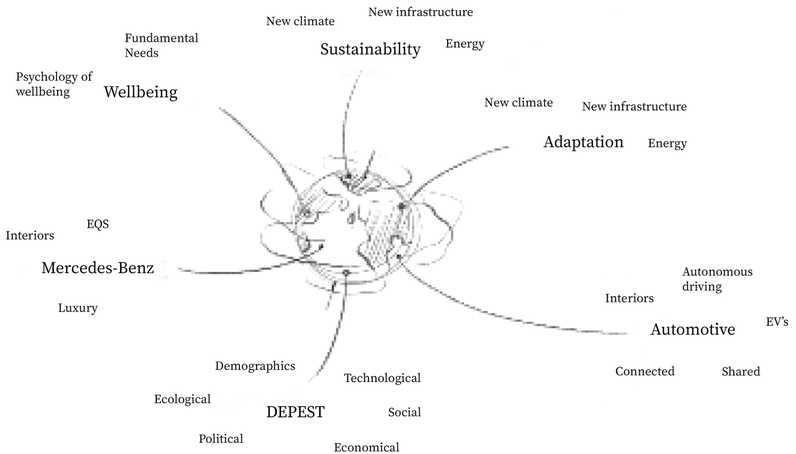


Image 1.1: Map of literature research

INITIAL RESEARCH QUESTIONS

These are the initial research questions leading the first steps of the literature research. Keep in mind these questions are a starting point for the literature review, and the findings entail much more than this.

Automotive research questions

- What does electrification mean for the industry?
- What does autonomous driving mean for the industry?
- What does shared mobility mean for the industry?
- What does connected mobility mean for the industry?
- What does yearly updated mobility mean for the industry?
- What are past updates in cars, and how did that affect the experience?
- What are current activities in the field of customer experience in car interiors?
- What are the expected upcoming changes in the automotive industry?

Sustainability

- How will our future climate affect car use and infrastructure?
- What changes will the industry be forced to make due to the environment?
- How is transportation designed sustainably?

Wellbeing (see Chapter 3)

- How are interiors currently designed for wellbeing?
- How is a space in general designed for wellbeing?

Adaptation

- How are vehicles currently adapting to the user?
- How are other areas adapting to the people that enter them?
- How can adaptation be used to accumulate more wellbeing?

STAKEHOLDERS

The stakeholders of this thesis can be divided into three broad categories: the automotive stakeholders, the public stakeholders and the people stakeholders. An overview of all stakeholders can be found in image 1.2.

Automotive stakeholders (blue)

The Mercedes-Benz stakeholders envelopes everyone at the Mercedes-Benz company. In the case of this thesis, the focus is on the RD/KII team I am a part of, and to design something that fits their goals.

There are other automotive stakeholders like competitors and part makers, playing a role in for example Mercedes-Benz competitor research, marketing and manufacturing processes. Their influence on this thesis is limited, and mostly relevant for research purposes.

The public stakeholders (brown)

These stakeholders consist of governments, municipalities, but also public transporters and other companies or organisations that are in touch with Mercedes-Benz creations. The importance of these stakeholders will rise in a more-designed future: think of the involvement of Vehicle-to-grid connections, more legislation on carbon emissions, and smoother transitions between different transport modes. Therefore, this is an important stakeholder to keep in mind.

People stakeholders (green)

These stakeholders consist of all the people involved with Mercedes-Benz that are not part of making them. This includes the users, drivers and passengers, but also other traffic users, pedestrians, and cyclists. To close, this also involves those in the social circle of the Mercedes-Benz user: family members who are impressed by the car, and neighbours who look up to the users.

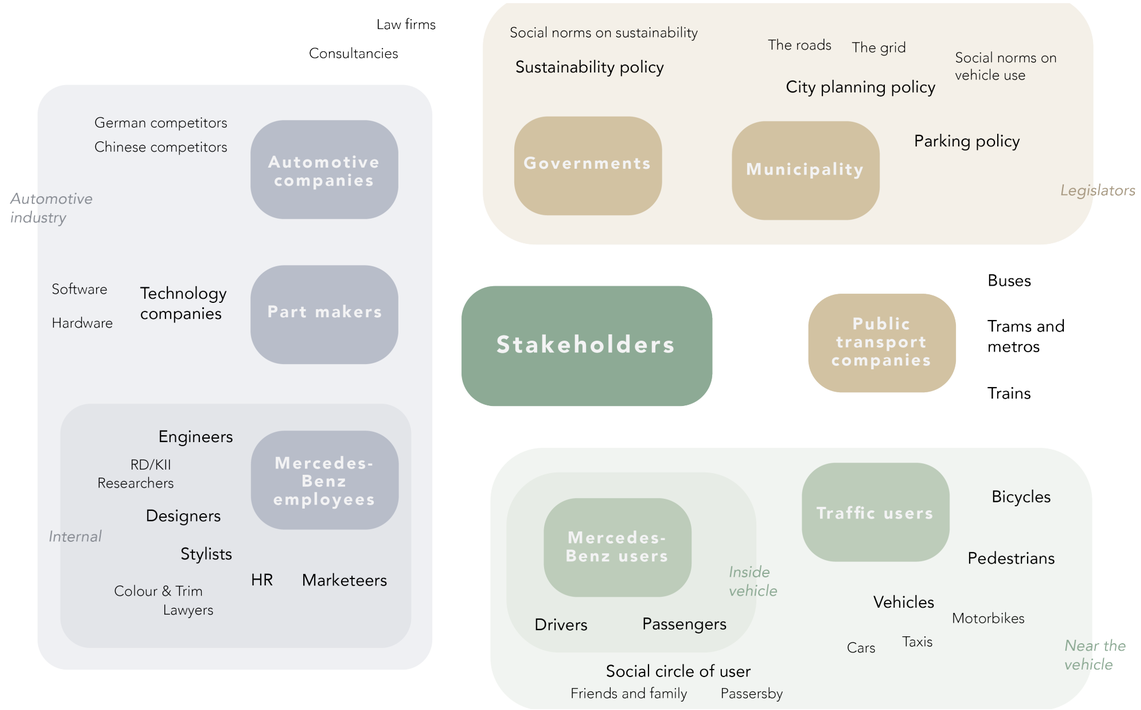


Image 1.2: Stakeholder overview

EASCY

EASCY (de Jong, 2019) is a widely accepted acronym discussing the five points of the automotive future: Electrified, Autonomous, Shared, Connected and Yearly updated. Below each point and its relevance to this research is discussed.

ELECTRIFIED

The question is not if most cars will be electrified, but when. Expected is a decrease in ICE car sales of 16% in 2040 compared tot 2019 (FEV, z.d.). In 2040, I assume **new Mercedes-Benz cars are electric**. This means the focus will be on the Mercedes-Benz EQS. I assume this electrification will be fully accepted in society by then.

AUTONOMOUS

The idea of autonomous driving is as old as the car itself: with motorised vehicles came accidents, providing a push for safer travelling since the 1920s (Maurer, 2015). We have been waiting for 100 years due to challenges in technology, and a fully autonomous and road-proof car is still years away.

Some degree of car autonomy is already implemented in modern cars, and research from the Society of Automotive Engineers (SAE, 2018) pitched the idea of a gradual degree of steps in car autonomy. Although full autonomy may be far away, more autonomy can be expected.

For the human-centered approach, designing an autonomous car largely means that the expectation the user has of the technical system should fit the machine's functioning (Maurer, 2015).

SHARED

At least 10 percent of the vehicles worldwide will be used for mobility services by 2030 (FEV, 2019). An important theme suggested by this shared mobility is the notion of ownership- if the client does not own a vehicle but only buys transportation, who owns these vehicles? Or, applied to this thesis, who will be the clients of Mercedes-Benz? And how does non-ownership relate to luxury?

It is an interesting concept that future clients are (in bigger numbers) not only individuals, but also other (public) transport companies, or even governments. This could lead to different selling points of a car, perhaps paving a way to more value in an interior.

CONNECTED

'Connected' is another future buzzword, entailing all kinds of connectedness. There exists Vehicle-to-Vehicle (V2V), Vehicle-to-infrastructure (V2I) and the encompassing term V2X.

There are many other modes of Vehicle-to-something connection, but for this thesis the human-centered side of connectedness is in focus. What would you expect from a car when it's connected with everything? What would be your mental model be of such a car? And most important: how would that affect your Fundamental Needs in that moment?

YEARLY UPDATED

This point of being yearly updated is not included in every automotive future overview. From a human-centered perspective this is an interesting societal change: how do we behave if we expect everything to evolve with us? How will we match the yearly-updating software of the car with the unchanging hardware of the car?

SUSTAINABLE DESIGN

WHY IS THIS IMPORTANT?

As a designer I have a responsibility learn about the climate crisis and develop design in the right direction. The climate crisis has **two relevant sides** for the automotive industry : the **energy use**, and the **material use**. To make such a wicked problem workable in this thesis, the following assumptions are followed:

The energy problem

1. Transport accounts for one fifth of global CO2 emissions (Ritchie, 2020).
2. Therefore, electric mobility is key to rising clean energy use (World Energy Investment 2022, 2022).
3. But reducing clean energy costs clashes with rising material prices. (World Energy Investment 2022, 2022).

As a conclusion, a solution is use less energy. In the next decade we need a 2/3 reduction in the impact of consumption in wealthy parts of the world (Take The Jump - The Science, z.d.). This might mean change to a different mindset. One solution for this is **more efficient mobility**, or **limiting use of energy consuming mobility**.

The material problem

1. Since the 1970s more and more electronic systems are embedded in cars (Bertoncello & Wee, 2021).
2. Sales of EVs more than doubled in 2021 and are continuing to rise strongly in 2022 (International Energy Agency, 2022)
3. EVs use over 4 times more minerals (in total) than ICE cars (Gabbatiss, 2021).
4. There are supply chain issues and semiconductor shortages (J.P. Morgan, 2022).
5. It is therefore uncertain whether automakers can keep up with EV orders,. (World Energy Investment 2022, 2022)

As a conclusion, a solution would be to **design vehicles for less material use**, to **design vehicles for longer and more extensive use**.

EVOLVABILITY

ADAPTATION

Adaptation fits with the Yearly Updated aspect of the EASCY acronym (De Jong, 2019). Literature research into automotive adaptation shows a division in two categories: Pre-sale adaptation, and in-use adaptation .

Pre-sale adaptation

This category of adaptation is about **mass-customization before buying**. The options are provided by the company or retailer and the choices are often limited. This form of mass customization is expected to become more popular (ShapeDiver, 2021)

In-use adaptation

This refers to small things that can be altered **during use**: choosing a seating position, changing the air-conditioning, or switching on a light mood. Recent options increased the personalisation of your car with driver profiles. This form of adaptation is often researched with car sharing trends (FEV, 2019).

EVOLVABILITY

Four years ago, a paper was published into the field of product longevity (Haines-Gadd et al., 2018). As we see on page 22, longevity is a sustainable approach. One of the results of this research is Evolvability, "Breaking our perception that interactions with products are static so we can **truly embrace time as a design factor**" (Haines-Gadd et al., 2018).

When looking at adaptation, it is clear that car interiors are now designed for static changes in interiors: change this from state A to state B. This breaks with the design goal of evolvability mentioned before: embracing time as a design factor.

I will try to take that one step further, and approach the design from an interaction that is flowing, instead of one that is abruptly switching between use cases. **I aim to bring flow during the longer timespan of owning a car**.

ARTIFICIAL INTELLIGENCE (AI)

In the 2040 future, artificial intelligence will play a large role in society. Mercedes-Benz cars are premium luxury, and are therefore expected to contain cutting-edge technologies. This means AI will play a role in the future of Mercedes-Benz.

What is AI?

Artificial Intelligence (AI) is the name for algorithms that **learn from data that is provided to it**. After AI is trained on data it can perform various tasks: for example recognising animals, moving robotic arms, playing chess and more recently also writing stories.

How does it work?

How it works is best explained by Ed Burns et al. from TechTarget: "In general, AI systems work by **ingesting large amounts of labeled training data, analyzing the data for correlations and patterns, and using these patterns to make predictions** about future states." (2023).

Training

AI can learn from an enormous amount of data and understand complex correlations, for example when providing suggestions for online shopping (Western Governors University, 2022). This complexity also means it can be very complicated to understand the decision making process of an AI based on input data.

AI and sustainability

With a bigger dataset, the chance of an accurate algorithm increases (Ansaldo, 2022). One of the drawbacks is that training such an AI program comes at a cost: it uses a lot of energy. Hau (from MIT Technology Review) states: "Training a single AI model can emit as much carbon as five cars in their lifetimes" (2019).

Automotive AI

Artificial intelligence adoption has more than doubled since 2017 (The state of AI in 2022, 2022). Today, in 2023, many cars already contain AI-based features like lane assistance and computer vision. This is also relevant outside the software environment of your car brand: other big tech companies like Google and Apple are already competing to be the 'soul of your car' (Mims, 2022).

Automotive AI of the future

It is not only through driver support or autonomous driving that AI will take a place in the car: AI in the form of **voice assistance** is expected to be in 90% of new vehicles sold globally by 2028 (Abuelsamid, 2019). This means AI will play a role in how we as humans communicate with machines. The form (and tone) of communicating with for example Alexa is already part of the public debate (Dolan, 2023).

COMPANY ANALYSIS

CHAPTER 2: ANALYSING MERCEDES-BENZ

INTRODUCTION

Finding the core of the Mercedes-Benz mindset: that is the goal of this research direction. I analysed the company through various approaches, some from inside-out with interviews and workshops, and others from the outside with online research.

I learned that no matter the department, there are some commonalities of what everyone thinks Mercedes-Benz is, but larger differences in what they think Mercedes-Benz should do.

CONTENTS OF THIS CHAPTER

In this chapter I will explain the Mercedes-Benz design guidelines, the company process and luxury.

The chapter shows findings on Mercedes-Benz and shares possible implementations. An internal company process is created for the front end of design, a piece of information I will on page 39 combine with Fundamental Needs research. Lastly, the results of an internal Luxury workshop I organised are shared.

APPROACH

Literature research
For this chapter I also analysed documents, websites, books and films to collect information on the industry and company.

Interviews
For this chapter, many interviews are conducted with colleagues in the company, on all different levels of formality. The results of these interviews are implemented through the different pages and the notes can be found in the Appendix A.

Workshops
To gather and share information in Mercedes-Benz, I organised a workshop with our small team about Luxury. The results are implemented in the Luxury chapter.

“AS YOU’RE USED TO FROM MERCEDES-BENZ, YOU CAN HAVE EVERYTHING”

-CHRISTOPH STARZYNSKI, CHIEF ENGINEER EQS

The Mercedes-Benz company culture is rich, and impossible to grasp within six months. On this page you will find the results of this research: guidelines for automotive design with Mercedes-Benz for this thesis.

It must be luxury
One word that echoes through the office all day long: “**luxus”.** Luxury is the core of what Mercedes-Benz offers people. Findings on luxury can be found on the next page.

Focus on interiors
McKinsey&Company shows that the interior experience will become more important in the future (The future of interior in automotive, 2021). The core value of luxury fits with this trend: the goal will be to create a luxury interior experience.

The Mercedes-Benz Vision AVTR: a concept car that embodies many characteristics that Mercedes-Benz stands for: it is Luxury, it is future-proof, the space portrays a feeling of safety, and it has a story that sticks.

It must be future-proof
In such a large company as this, it is relevant to look **further ahead in the future**, to make sure the design will still be relevant in 20 years.

It must be safe
Of course Mercedes-Benz offers safety to their clients. Not just safety on paper with numbers, but real safety that is felt, tested, and for everyone. This company made a lot of safety innovations in the past and strives for more.

Requirements for implementation
First of all the design must fit the luxury quality of Mercedes-Benz, the framework of which is created on the next page. Second, the idea must fit the platform that is already there. To get something implemented, the idea must fit in the existing structure, both in the process as well as in the design.

Last is the **story**. In order for an idea to work, it must have a story that sticks. The story must be told well to create an immersive and convincing experience. This story should stay with them so they talk about it, remember it, and bring it up at the next important meeting.

THE MERCEDES-BENZ PROCESS

In order to effectively incorporate Fundamental Needs into the company, I created an overview of the company processes at the front end of design.

Interviews

To create this overview interviews are conducted with a colleague. We interviewed three employees, and created a general overview of company processes at the front end of design. We also inquired to learning how these seven approaches can best be implemented in the company.

The company process

Relevant to note is the circle in research. I learned that research is an iterative process, especially in large organisations. All processes shown in this image also contain multiple iterations within themselves, and many are interconnected.

Implementation

Here I learned that implementing these needs is complicated and a long process. I now know this does not need to be the focus of my thesis.

The FN process

In this image I also show the seven applications of Fundamental Needs, and where they could fit within the Mercedes-Benz process. It is interesting to note that the strongest applications are on the research and strategic parts (market input, product mission) making this method very suitable for the front end of design.

Throughout this thesis I will reflect on all seven aspects of the FN applications at the end of corresponding chapters, and a process recommendation can be found on page 120.

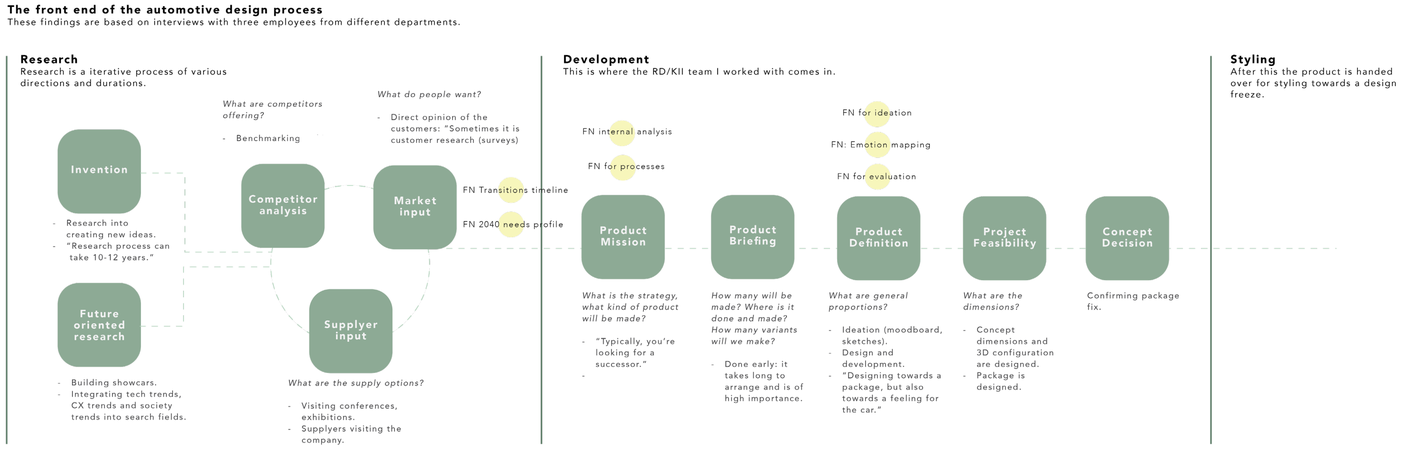


Image 2.1: Visual overview of the Mercedes-Benz company process. Four colleagues provided input.

MERCEDES-BENZ LUXURY

LUXURY RESEARCH OVERVIEW

All Mercedes-Benz colleagues seem to have a high affinity with their **own version of luxury**. The words 'own version' are key here: **everyone has a different understanding and application of luxury**. This chapter explains how Mercedes-Benz luxury is researched to find requirements for the interior design.

Luxury workshop

I organised a luxury workshop with four participants to become aware of our view on luxury. After two brainstorm sessions, we found that our idea of personal luxury differed greatly from our idea of luxury in society.

Luxury literature review

A literature review is conducted for this topic, to find out that a lot of factors influence the perception of luxury.

Results from the workshop and literature are visualised in image 2.2.

WHY DO WE WANT LUXURY?

So, if we all see luxury as a different thing, why do so many people want it? That explanation is also complicated, depending on multiple drivers leading to different forms of luxury. What is interesting is that, according to Dubois (2020) most of this boils down to a need for **status**, something that can be found in the framework of 13 Fundamental Needs: Recognition.

According to Wiedmann (2007) the perception of luxury is affected by: the **price, the function, your view and the social concept** of luxury. These, together with discussions with colleagues brought me to the following conclusion: Luxury within the scope of this field of study can be divided into four concepts: **Quality, Status, Authenticity, and Simplicity**, see image 2.2.

Quality and Status

Authenticity and Simplicity are not the core of the Mercedes-Benz luxury: the cars are not handmade, and they do not come with a driver. Therefore, **the focus will be on the quality and status aspects of luxury** in the design process.

Luxury in the future

Quality and status are both relative terms. Therefore, the current view on luxury might not hold in the future: the luxury market is increasing (Costello, J. 2017) and luxury is easy to mimic in a digital world. The boundaries of luxury will have to move, or luxury will be come a meaningless concept. **Where will Mercedes-Benz be in this new luxury**? That is a question ViP and FN research will work with.

Image 2.2: Luxury visual summary

FN Transitions timeline

13 FUNDAMENTAL NEEDS

CHAPTER 3: THE THEORY

INTRODUCTION

The decision to work with Fundamental Needs is led by my personal ambition to find complicated problems and quantify them in something understandable. And this is exactly what I started to do in this chapter: using Fundamental Needs as a lens to analyse people, to allow for a framework of Human-Centeredness that fits with the company.

CONTENTS

In this chapter I will explain Human-Centered design, what Fundamental Needs are and how I plan to apply them in this thesis.

First I will explain what the 13 Fundamental Needs are, where they come from, and shed some light on the choices made for Fundamental Needs throughout this thesis. Then I will elaborate on where in the Mercedes-Benz process from the previous chapter I applied this theory, and lastly I will show findings from an internal analysis application of this theory, and reflect on it.

HUMAN-CENTERED DESIGN

APPROACH

Literature research

For this chapter I analysed existing literature within this topic, using various sources. I was switching between the field of psychology, design, and business analysis disciplines.

Interviews

Interviews are conducted with experts at TU Delft and at Mercedes-Benz for this chapter.

WHAT IS HUMAN-CENTERED DESIGN?

Human-Centered design (HDC) is a broad design approach that aims to improve usability, accessibility, and user experience (E. Grondelle, personal communication).

Human-Centered design is built on understanding: how do people interact, experience, express, overcome, affect and live in the world around them? This leads to designs that fits: "The idea [of HCD] is to build things that aren't just advanced but also readily acceptable" (MacDonald et al., 2020). Next to empathy and research, involving target users into the design process is also an example of HCD.

Human-Centered design in automotive

For over a century the concept of cars has roughly stayed the same. The meaning of cars changed radically over the past century. A part of Human-Centered design is to address the full experience designers are responsible for, and as cars have become more than just movement, this asks for more complexity when applying Human-Centered design.

Cars used to be made from a technology push (and market pull) perspective, an approach that is changing towards Human Centeredness (Gkatzidou et al., 2021). The industry seems dominated by the question: "what happens if..." to innovate and find new technical solutions. When applying this Human-Centered design approach, it is important to put people into these research questions, and ask: "What happens to the people if..." .

Why is this relevant?

Currently, if Human-Centeredness in the future is sought after, it is distilled from a future context. This future context is made up of research in the current context. The current context contains people. This often means **you take the person of today, you teleport them 20 years into the future context, and say: "you are now the person of the future"**.

This approach might work to transport plastics, metal, tape, houses, books, and many more objects to the future, but does it work to transport people? To properly design for the person of the future, the **time in between** has to be considered.

This can be done by asking the same question as before: What happens to the people in those 20 years? What do they experience in the meantime, that can change their needs for a design?

13 FUNDAMENTAL NEEDS

In order to make the broad approach of Human-Centered design more practical, 13 Fundamental Needs are applied.

WHAT ARE THE 13 FUNDAMENTAL NEEDS?

The theory of Fundamental Needs by Desmet & Fokkinga (2020). borders between **design** and **psychology**, and explains why we as people function the way we do.

The idea behind the theory is that **every human being has 13 Fundamental Needs**, and by fulfilling all of them we achieve **wellbeing**. There is no option to overcompensate one need to fulfil another. With FN, the chain is as strong as the weakest link: if one need is not fulfilled, you can not achieve wellbeing. All 13 Fundamental Needs are shown in image 3.1 on the right.

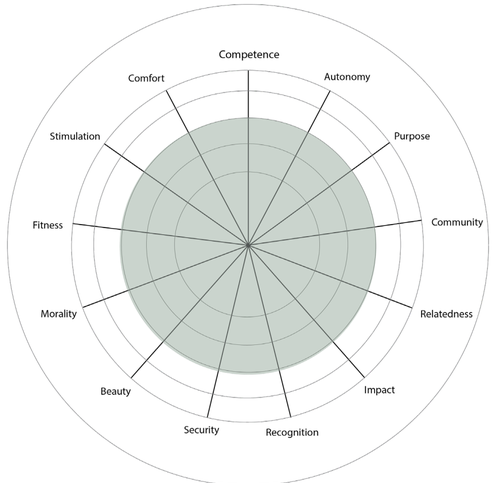


Image 3.1: The 13 Fundamental Needs

Priorities

Why does one person look for Relatedness, and the other for Stimulation in their behaviour? To keep it understandable for this thesis, this is explained from a Fundamental Need perspective: behaviour is prioritization to which FN you fulfil first. Behaviour means making a choice, and making a choice means prioritising.

It is your context that greatly impacts your behaviour (Smith, 2015). This entails your context in both space and time. An example of **spatial context** is when you see cake you want to eat it, prioritising comfort. An example of **temporal context** is if you recently had a family gathering, you will likely not have a high need for Relatedness the moment you return home, perhaps prioritising Autonomy.

When working with Fundamental Needs, it is important to **take priorities through space and time in to account**.

Other factors on behaviour

There are other factors than context affecting your behaviour: something more constant is for example your personality through various personality traits explaining your behaviour (Stangor, 2014). Your conscious thinking also affects your behaviour, for example through setting intentions (Ajzen, 1985). For the scope of this thesis, **This thesis will focus on the context in combination with FN fulfillment only**.

Purpose, Impact and Fitness in automotive

Some Fundamental Needs are not very applicable to car interiors: Purpose, Impact and Fitness do not lie within most of the use-cases of a car. The vehicle can be a means-to-an-end for such a FN, but is not easily the need fulfiller. For example, Fitness can be fulfilled by taking the car to the gym, but the car is only a means-to-an-end. A critical stance is needed towards these three Fundamental Needs in assessments.

FUNDAMENTAL NEED APPLICATION

These Fundamental Needs can be used in many different ways in a design process. Through trial and error in this thesis **seven applications** of the 13 FN into the Mercedes-Benz company process are explored. These seven applications can be seen in the process overview of this thesis on page 13, and are labelled in the company process (from page 29) in the image on the right.

Fundamental Needs Processing

There are various parameters relevant to take into account when processing fundamental needs. Throughout this thesis **Various ways to implement, convert, count and work with these 13 needs are found**, the approach changing every time due to different conditions and goals. The processing methods are explained at every FN reflection.

Summative or Binary processing

By studying data analysis, two ways of working with Fundamental Needs are found: Summative FN processing, and Binary FN processing.

Summative FN processing counts every FN mentioned for example during an interview, or counts every FN that is affected over time, and adds them together. This is found to be applicable when more mentions of a FN means more of that FN is harmed or fulfilled.

Binary FN processes is where every FN counts once (as a "yes" or "no") per participant, moment or test. This is found to be useful when directly using interview data: some people can voice their affected FN more easily than others, for example due to varying shyness or self-awareness.

Fulfillment or Priorities

There are two linked scales to interpret FN with, and both can be portrayed in a spider chart.

FN **fulfillment** explains what someone experienced in the past, so where do they stand now, looking through a **aetiological** lens. This can be used for small changes (how snacking harms fitness) or longer term fulfillment, making it easier to use.

FN **priorities** explains what FN someone will want to fulfill first, looking through a **teleological** lens. This can not be used for small changes and always needs a holistic approach of the full set of FN, as the prioritised need value is not absolute, but dependent on the other FN values. This in creases complexity, but the outcome might be easier to understand.

FUNDAMENTAL NEED PROFILE

To start the development of a tool to work with the 13 Fundamental Needs, I needed a tool to capture and quantify these needs: a visual representation of wellbeing.

The Fundamental Needs profile:

To map the effect the context has on your FN fulfillment, I designed a **circular representation** I will call a FN Profile. This choice is made because of two reasons: first, personal traits are more often portrayed in circular representations, already making them intuitive. Second, spider charts are fitting tools for displaying differences and similarities between datasets (Wikipedia contributors, 2023).

An example of such a summative FN profile is shown on the right in image 3.2. This is a FN profile from a person who is in a new S-class. They experience fulfillment of Stimulation and Comfort through a massage seat. Level 4 automation harms their needs for Stimulation and Autonomy, but fulfills Comfort.

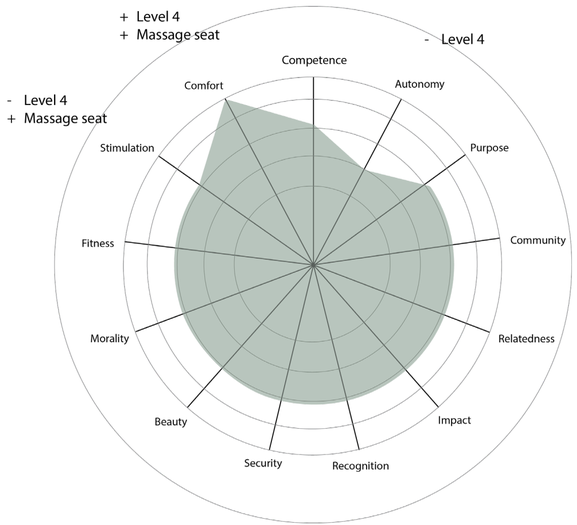


Image 3.2: example Fundamental Needs fulfillment profile

COMPANY FN ANALYSIS

In order to learn what Fundamental Needs Mercedes currently designs for, a colleague and I analysed a part of a creative innovation platform.

To keep it feasible I only included ideas about the design of the car exterior or interior. It is important to note that we had access to only a small part of the platform and assessed 45 ideas.

This data is combined to the S-class profile, a dataset from current need priorities. More explanation of this dataset can be found on page 50, Dataset A. The result shows the areas where the current ideation is lacking in terms of FN, and in what areas the current ideas are plenty.

With this overview I already have a design focus on a few of the fundamental needs, and I now know I can let some needs go in my ideation phase. I especially know I should **not focus on Beauty**, as there is an extensive amount of ideas already focussed on Beauty. The areas to keep in mind are Purpose, Impact, Community, Competence, Stimulation, and Relatedness.

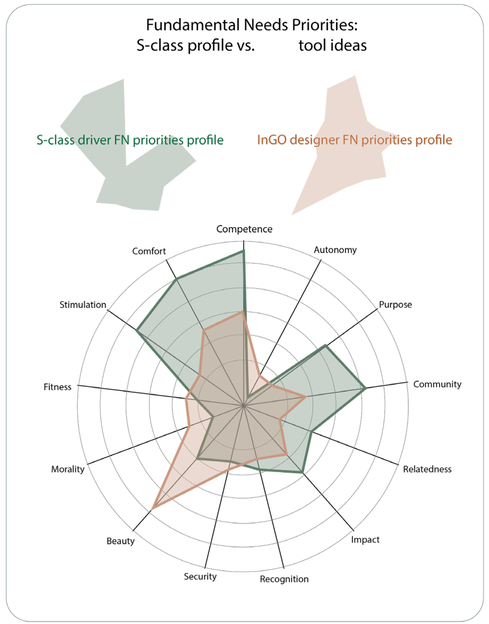


Image 3.3: S-class profile vs. tool ideas

FN internal analysis

FN REFLECTION

ON FUNDAMENTAL NEEDS FOR COMPANY ANALYSIS

As the first application, Fundamental Needs are used to analyse the internal context, to find a result that is valuable for the company. This is a short assessment and analysis.

Advantages of application

The data collected shows if ideas are focussed on a certain need fulfilment, offering **strategic information** if done on a larger scale.

Another advantage is that if this data were retrieved and later on combined with other types of FN research (for example the future oriented research) a clear ideation strategy, concept direction or even mission can be established based on this **complete set** of data.

Disadvantages of application

The disadvantage of this specific application is that the database was very small. This limits the accuracy of this method for a company analysis.

Another disadvantage is that ideas are difficult to assess properly and holistically. Most ideas are framed in the positive sense only, and as these are concepts, it is difficult to assess needs that are harmed to them. That depends on the (yet undesigned) implementation of the idea.

Recommendations

There is added value of a thorough FN company analysis to make the final S-class interior provide not only some need fulfillment, but make the interior provide **wellbeing,** especially if a larger data set could be used.

FN Transitions timeline

FN 2040 needs profile

THE 2040 NEEDS

CHAPTER 4: FN FOR CONTEXT ANALYSIS

INTRODUCTION

Once I understood what the options were with Fundamental Needs, I realised there was an uncovered problem: **people change over time, and this has to be taken into account when designing for the future.**

Not only the context changes, but the people change too. How to design for this? What is needed to understand the person living 20 years from now, based on knowledge and perhaps even data? This is the question set out to answer in this chapter.

CONTENTS OF THIS CHAPTER

In this chapter I will explain how the theory from Chapter 3 is applied to create a future vision.

First I will explain why transitions are used for this approach. Then I will elaborate on the tool itself, how it is tested it twice, and how it is adjusted. After that this chapter elaborates on the data used as input and the concluding design direction following this approach.

THEORY BEHIND TRANSITIONS

The saying goes that people never change. And at the same time, everyone changes on a daily basis. How to design for such tumultuous people over a timespan of almost 20 years?

THE FIRST IDEA

Is there a method to design for the person of the future?
This is the question for start of this FN implementation. Multiple conversations are conducted (see Appendix A) and the finding is clear: **no, there is no method for that yet.**

What role can FN play in this research? One of the pillars of the Fundamental Needs theory is that FN will always stay the same over time. This provides a fixed parameter in a melting pot of changes over time. This starting point became an idea to implement Fundamental Needs as a foundation for future Human-Centeredness.
Through research the impact of **transitions** on the priorities in your need fulfilment came forward.

THE THEORY BEHIND THE APPLICATION

Research and ideation led to a quantification of the time between today and the intended future, and later on that quantification is made into a story, a vision, or a design.

It is possible to quantify the time by mapping what events affect the Fundamental Need fulfilment of the target group in the selected time period. Then, by assessing which FN are affected by the transitions and adding these together, a list of relative FN changes is created. Using the aforementioned FN Profile (page 38) these relative changes become a new FN priorities profile of the future.

2022 FN PROFILE
+ RELATIVE TRANSITIONS FN PROFILE
= 2040 FN PROFILE

This approach is visualised in image 4.1.

This theory behind the application is visually summarized in the image on the right.

Relevance
This theory is especially important for the target group of Mercedes-Benz: the average driver is 51 years old (Appendix A). The Mercedes-Benz driver in 2040, assuming the Mercedes-Benz user is still 51 in the future, will have lived through multiple transitions.

Shortcomings
This approach takes only needs into account, and does not involve for example the other factors impacting personality from page 36.

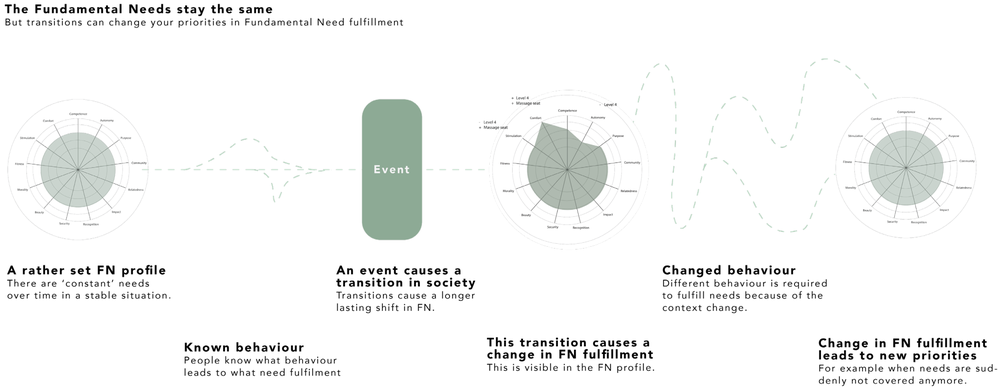


Image 4.1: Visualisation of transitions approach

TESTING THE TOOL

The approach taken is similar to the basic design cycle: ideate, design, build, validate, refine and then iterate.

To come up with a theory is one thing, to **validate** that it works is another. Applying this theory will take up time, so a test is needed to see if it actually works. To challenge the theory the following research questions are tested:

Here, R1.1 is testing the new theory, using transitions from 1950-2022 to predict 2022. R1.2 is the null hypothesis the results of R1 will be compared to. The test is conducted with the target group for the tool: other designers from TU Delft and Mercedes-Benz.

Pilot test

First, a pilot test is conducted with two colleagues and chair, all with more automotive design experience, to find if it is possible to come up with transitions on top of your head and link them to Fundamental Needs that have a predictive value. Results of this test can be found in Appendix D.

Conclusion

The test results looked in favour of this application of FN thus far. A few changes will be implemented in the next test: there is a need for a **more restricted framework for the tool**, as some participants interpreted 'transitions' as experience, others thought more practical about the interiors. **More definition of what is 'then'** and what is 'now' is also needed.

RESEARCH QUESTIONS

R1: When a car interior from 1950 is compared to a car interior of 2022, does the change in interior match the sum of transitions, when evaluated by FN?

- R1.1 What is the sum of transitions and how are they described in FN?
- R1.2 How did the interior change 1950-2022 and how is that described in FN?
- R1.3 How do these two FN profiles compare to each other?

Improvements

To improve the tool, 1950 and 2020 are chosen as times in-between which the transitions should have taken place. The number of transitions is also set: four, to start with the seatbelt example as it is a clear example with an obvious double FN fulfilment and harm.

Testing the tool with updates

After implementing the changes from the pilot test, the target audience has to be found. For this tool, as it will be applied for this project, I am the target audience. The participants in the test are therefore, 50% colleagues from Mercedes-Benz, and 50% Industrial Design Engineering students with experience in the automotive field.

SETUP

To make it easy to understand what expect, the layout from image 4.2 is used by participants to fill out a timeline and the FN.

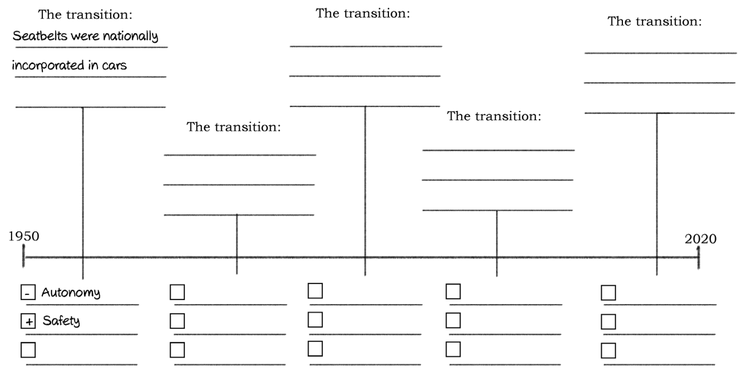


Image 4.2: Layout ToT pilot test

RESULTS

R1: When I a car interior from 1950 is compared to a car interior of 2022, does the change in interior match the sum of transitions, when evaluated by FN?

For 8 out of 11 transitions, the change visible in the interior fits the transitions that designers and design students mention about that time period. In graph 4.1, you can see the comparison per Fundamental Need in the different profiles.

The answers of the sub questions R1.1, R1.2 and R1.3 and all raw data can be found in Appendix D.

CONCLUSION R1

An 8/11 similarity in FN changes is considered a match. This means **transitions are as a tool to find design directions**.

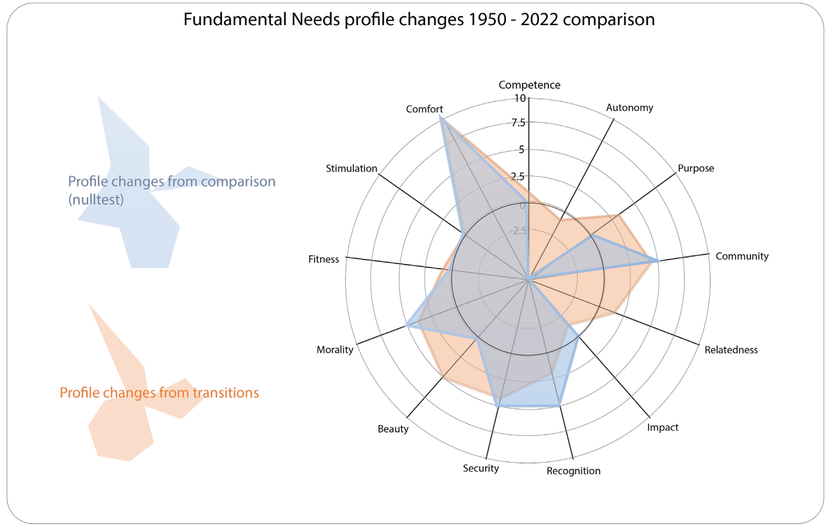
DISCUSSION

I already experienced throughout the testing that positive changes are much easier to come up with than negative, which is explained by the fact that most transitions are designed (and are told with a story) to make something better.

The main shortcoming of this test is the lack of freedom in test answers. These transitions are presented as a point in time, and limited the options for participants to name long-term transitions. Some participants tried to catch transitions in a more generic (trend-like) manner, others focussed solely on one-time transitions in the interior. I found the sweet spot to be somewhere in the middle: Taking both 'over-arching' transitions into account, and taking the sudden and short transitions into account brings the richest world view.

Three of the FN did not have very high or outstanding scores in the test data. These are Purpose, Impact, and Fitness, also mentioned in page 36 as FN that are hard to evaluate when it comes to the automotive field. This is why I decided to leave them out of the test results.

Interesting to consider is that none of the test participants experienced **all** transitions themselves. This might lead to a shallower 'designer centered' theory that works on paper, but not in practice. The difference would be interesting to study for further research.



Graph 4.1: Results ToT pilot test

Notes on reading the spider chart

Keep in mind that the order of the FN on the circle can insinuate false results. For example, I evaluated the interior low on relatedness, while the test evaluated it positive. But because of impact next to relatedness, which both scored low, the spider charts look similar, although the test results do not correspond.

FINDING THE 2040 PROFILE

After the ViP research, the six clusters provided a lead to start with these transitions, and the factors are re-used for this analysis. The process of finding transitions was one of trial and error. **The purpose of this tool is to inspire for a future proof design.**

Framing the transitions

Transitions are framed like newspaper headlines, because they are easy to understand and because it is clear from the tone that it is intended to inspire the right feeling, not to necessarily contain all information.

Assessing FN to transitions

The assessment is done through projection: how would I feel as a person in this future, after this thing happened? Some transitions found from factors could not be linked to any Fundamental Need, for example "Urban planners standardize powering technologies". These transitions are not directly linked to people in their everyday life after the transition, and therefore they do not immediately affect FN fulfilment. These transitions are left out of the final timeline.

Reading the timeline

The results of the research are shown in image 4.3: the timeline for transitions. The timeline is split in 'turning point' transitions (above the timeline) and gradual transitions (below the timeline) following the findings of the test.

Discussion

The main shortcoming of this test is that the assessment is subjective, as it is done by one person. It would be very interesting to test how the assessment changes if done by multiple people who have different viewpoints regarding the upcoming transitions.

Next steps

The FN assessment as shown in image 4.3 on the right can be added up to create **a set of Fundamental Need changes over the 20 year timespan**. That is the basis for the assessment of transitions dataset from the next page.

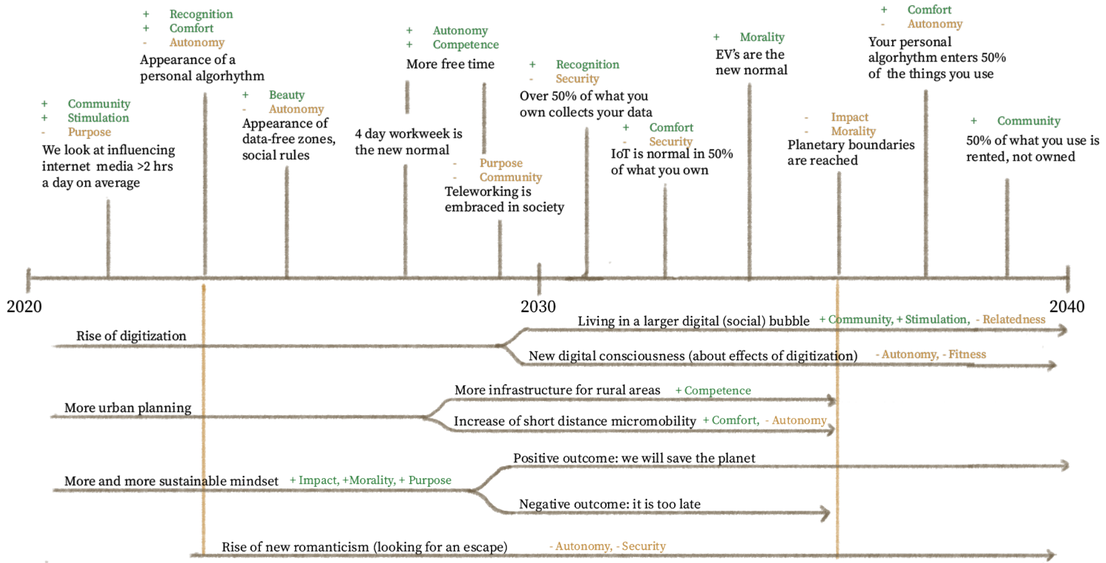


Image 4.3: Timeline for transitions

DATASETS

In order to conduct this research, two things are needed: a profile from 2022, and the transitions between 2022-2040. For that I looked for datasets that I could assess FN to.

Acquiring datasets

For building this tool a dataset is sought after that represents best the FN fulfilment of the people of today in the interior of a Mercedes-Benz.

DATASET A: ASSESSING FN TO PRIORITY QUESTIONS

What do S-class drivers prioritise?

This is a secondary dataset assessed by me and a colleague. The assessment is done on value statements in a questionnaire, evaluated on their FN fulfillment.

Shortcomings

The shortcomings of this dataset are that this is only a list of what they value, and therefore what they actively prioritise. Another shortcoming is that this information is gathered through a long questionnaire I had no chance to influence the questions of. That means it might be that a lot of questions were simply directed towards Competence.

Dataset A and E

	Assessment of values	ToT analysis	ToT analysis priorities	2040 priorities
Dataset contents >	A_priorities. What do S-class drivers prioritise?	E_fulfillment: What changes in FN fulfillment will occur before 2040?	E_priorities: changes in FN fulfilment into priorities	Dataset A. and E. combined: what will FN priorities profile look like in 2040 in the S-class?
Autonomy	-2	-5	5	3
Beauty	2	1	-1	1
Comfort	9	4	-4	5
Community	7	2	-2	5
Competence	10	2	-2	8
Fitness	0	-1	1	1
Impact	4	0	0	4
Morality	-1	1	-1	-2
Purpose	6	-1	1	7
Recognition	2	2	-2	0
Relatedness	3	-1	1	4
Security	1	-3	3	4
Stimulation	8	2	-2	6

Table 4.1: Dataset A and E

DATASET E: ASSESSMENT OF TRANSITIONS

What changes in FN relevance will occur between 2022 and 2040?

This primary dataset comes from the re-use of ViP factors, approach and findings are explained on page 48.

Shortcomings

The shortcomings are that the factors were selected for ViP, although with this purpose in mind so selection is broad and future-oriented. This makes it possible that the data I used to base this FN assessment on, is still not broad enough, or too focussed on the automotive industry.

METHOD AND RESULTS

Method

For all datasets, a **summative approach** is used to add and subtract positive from negative FN. This is done to keep the research feasible within the timeframe. Final results are created through summation of dataset A and E, following calculations on page 42.

Results

In graph 4.2 the profile of today is shown in brown, and the profile of 2040 after the transitions are applied in green.

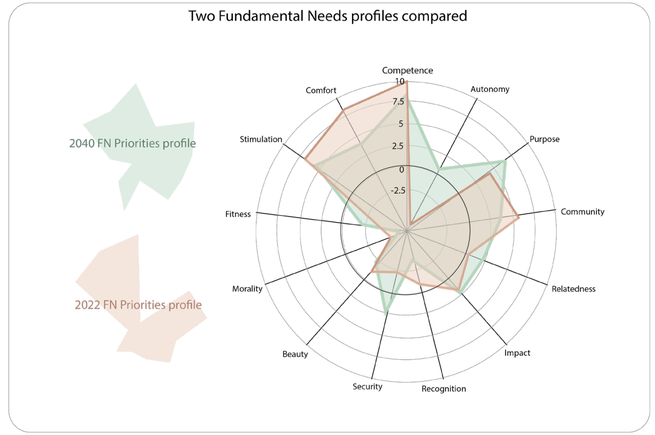
Conclusion

This comparison makes it clear that there are two points where more design is needed for FN fulfilment: **Autonomy, and Security.** It also shows FN of less interest to design for, for example comfort and competence.

Discussion

The main discussion point here is the validity of the datasets. With more accurate data from my own questionnaire instead of a secondary questionnaire, the results might be more accurate. With a better assessment on transitions, for example through more data points, the results will also be more accurate.

THE TWO PROFILES



Graph 4.2: Two profiles compared

How to read this chart

The interesting points are found in the relative differences between the graphs. The two largest outliers are Autonomy and Security. This means those needs will be more prioritised in 2040 than it is in 2022. The other way around, brown outliers over green, for example with Purpose and Relatedness, means those needs will be less prioritised in 2040 than in 2022.

From the results in Graph 4.2 it is clear Autonomy and Security will be two Fundamental Need focal points for the design. What exactly are Autonomy and Security?

What does Autonomy mean in this future?

Autonomy means freedom of a choice in a world where most choices are made for you. It means feeling control over AI, and having agency over your time.

If you drive a Mercedes-Benz, it must always feel like you made final decision. This means having all relevant information to make a decision, this means knowing and understanding what must happen, and it means having the power and control to make your decisions reality.

What does Security mean in this future?

Security means being protected and in a stable environment, and believing in conservation of the things value. It is trusting both yourself and society to continue thriving. In a complex society, this has to lead to blind faith, as it is near impossible for one person to understand everything.

In that situation, if you drive a Mercedes-Benz, it must feel like the vehicle can be trusted, and it shelters you from all the rapid, loud changes from the world outside. It means being able to look away, close your eyes, and have confidence.

FN Transitions timeline

FN 2040 needs profile

FN REFLECTION

ON FUNDAMENTAL NEEDS FOR CONTEXT ANALYSIS

Throughout this chapter Fundamental Needs have been used as a guideline for analysing the 2040 future context.

Advantages of application

The advantage of this FN context analysis is that all needs are looked into for this analysis: this achieves a holistic human-centered focus into the analysis phase.

Disadvantages of application

The disadvantage of this application is first of all the **subjectivity of the data analysis and FN assessment**. The data analysis subjectivity is a common one in any literature review: there is not enough time to read everything, and choices have to be made. However, the subjectivity in the FN assessment is a bigger challenge: how to assess a need to a transition? Are we looking through a aetiological or teleological lens? Some of these disadvantages might be solved through further research.

Another obvious disadvantage is that the real feedback on this application will arrive in 17 years- only then can it be tested if the timeline and profile are accurate.

Recommendations

A lot more research is necessary before this approach can be turned into a repeatable tool. Psychological knowledge of human behaviour through transitions and a past analysis on human responses on intrusive transitions can support objectivity of the FN assessment.

Currently there is not much methodology to guide future-oriented human-centeredness, I therefore suggest to research **other applications than just these 13 Fundamental Needs** as well: using emotions to translate to the future, or using another division than these 13 Fundamental Needs.

2040 vision
worldbuilding

THE 2040 VISION

CHAPTER 5: WORLDBUILDING

INTRODUCTION

Now that I had a means to describe the person of the future, this person had to be placed in the context of the future as well. To define this context I applied the Vision in Product design method (Hekkert & Van Dijk, 2016). It is a method that fits the automotive industry well: first, it offers a known structured approach to envisioning the future. Second, it is also relevant that ViP offers an extensive research phase and a broad yet detailed future vision: both of these might be repurposed into the Fundamental Needs approach.

The context and the person of 2040 tell a story of what kind of society that will be and how it will feel to live in it. The design that will emerge from this will fit not only the context of this world, but the people that live in it too.

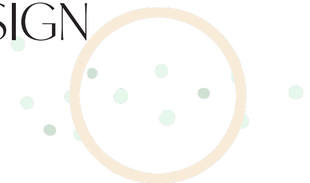
CONTENTS

In this chapter I will explain how I applied the Vision in Product Design method to build a future context and an interaction vision.

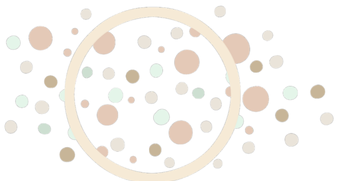
First I will explain what the Vision in Product Design method is. Then I will discuss the chosen domain and the factor collection. Factors and clusters are shown in Appendix E and H, but the six most relevant clusters are discussed in this chapter. Next, I share my statement and metaphor and I will analyse that metaphor through a user journey. Lastly, I will decide on a human-product interaction to implement in the design.

VISION IN PRODUCT DESIGN

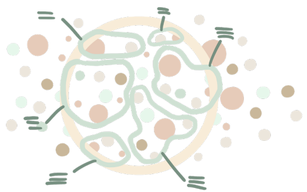
DOMAIN



FACTORS



CLUSTERS



WHAT IS VISION IN PRODUCT DESIGN?

Vision in Product Design (ViP) is a context driven design method by Hekkert and Van Dijk (2016), created for designers to work with complex future visions.

Domain

One of the interesting ViP points is that it does not make use of Personas. Instead, it uses a domain, allowing for an open approach of the target audience. This helps with designing for the people that could use the design in the future, not for the people that use it today.

Factors

ViP works through collecting bits of information for that set domain called Factors. This is a very time-consuming approach, and in this thesis the factors are selected very broadly so they do not only fit this ViP research, but also fit the FN research that makes use of the same factors.

Clusters

The factors are puzzled together, and overarching meta clusters are found. These clusters cross boundaries of topic and type of factor.

The mission statement

Meta clusters shape a future worldview that inspire the designer to take a stance: what is the mission in this future?

The interaction vision

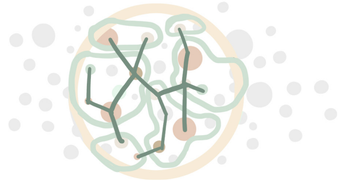
The interaction vision is a metaphor of what the future interaction should feel like from a human point of view. This interaction vision is then analysed to find interaction qualities, the qualities the design should provide to offer value for the domain in that future context.

Design

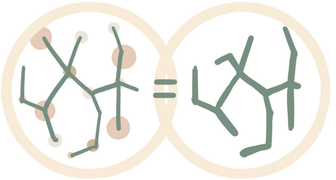
With the interaction qualities ideation starts to create a design fitting the interaction, and therefore fitting the future context and domain.

Testing

The future context can be used for more than inspiration only. I have also applied the future context in the user test, using it for sensitizing and creating a test setting. More on this can be found on page 85.



MISSION STATEMENT



INTERACTION VISION

DESIGN

TESTING

Image source: Friedrich Kessler

THE DOMAIN

Instead of a demographic target group, the ViP method uses a domain to aim for an audience. In this case, this audience is very broadly defined from the ViP side. This is done because simultaneously to ViP, I conducted research into the Luxury Customer of Mercedes-Benz, offering me a stronger direction of a target audience.

To decide on the ViP domain, I started with the most basic project brief from Mercedes-Benz: design an interior inside a vehicle providing luxury in 2030. After multiple iterations, I decided on the following domain:

EFFORTLESSLY BEING A TRAVELLER IN 2040.

Effortless

The effortless comes from luxury: All four luxury qualities are done effortlessly. So whatever interaction is designed, for the person involved it must be effortless.

Effortless by the person and conducting by the company goes well together: when Mercedes-Benz conducts the user not only the physical but also the mental load is lightened.

Being

In being a traveller there is a sense of identity and mindfulness, a fit with modern luxury (see page 30).

The sense of identity is important because I want Mercedes-Benz users to proudly link their sense of identity to how they travel. The sense of mindfulness is important because I believe that we as humans can and should travel mindfully- both for our own sanity, and for the environment.

A traveller

In the future, you might not be a traveller, but you will be travelled. You will be travelled by the train, the bus, by shared cars. You will be travelled by your colleagues on your commute to work, or travelled by your autonomous car. You will even be travelled online through zoom, through immersive Augmented Reality, and through social media on your smartphone.

In this future you will always be part of a bigger system, but there is a difference between being a traveller and being travelled: one of them has control. In this Mercedes-Benz future, you are the traveller.

FACTORS AND CLUSTERS

Factor collection is done through literature research, reading newspapers, going to lectures, watching documentaries, and conversations with experts and colleagues.

DEPEST+

This tool gives six areas for factor collection: Demographic, Economic, Political, Ecological, Socio-cultural, and Technological. To fit the scope of this theses Mercedes-Benz, Wellbeing, Adaptation and Automotive are added to the DEPEST areas.

In these topics I found 129 factors in total. The full list of 129 factors can be found in Appendix H.

CLUSTERING

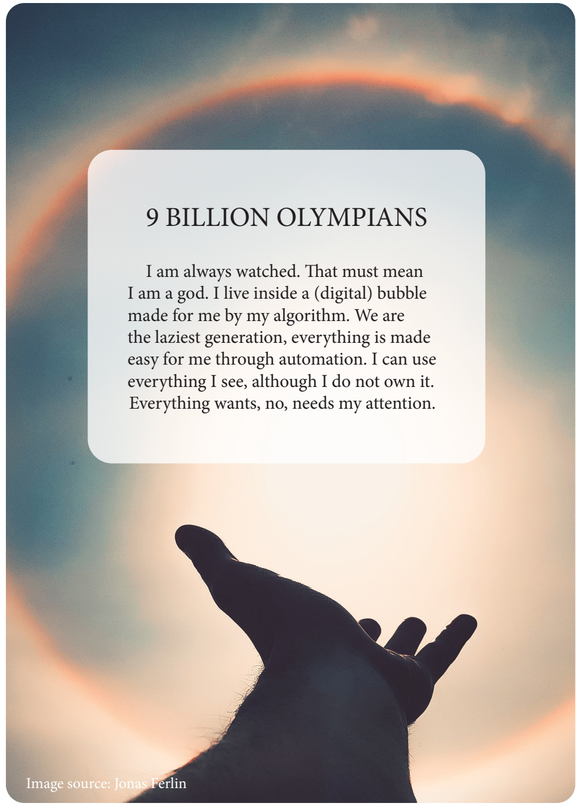
Clustering is done through post-it collections, conversations and discussions with colleagues, and various rounds of restructuring. This intermediate step is shown in Appendix E.

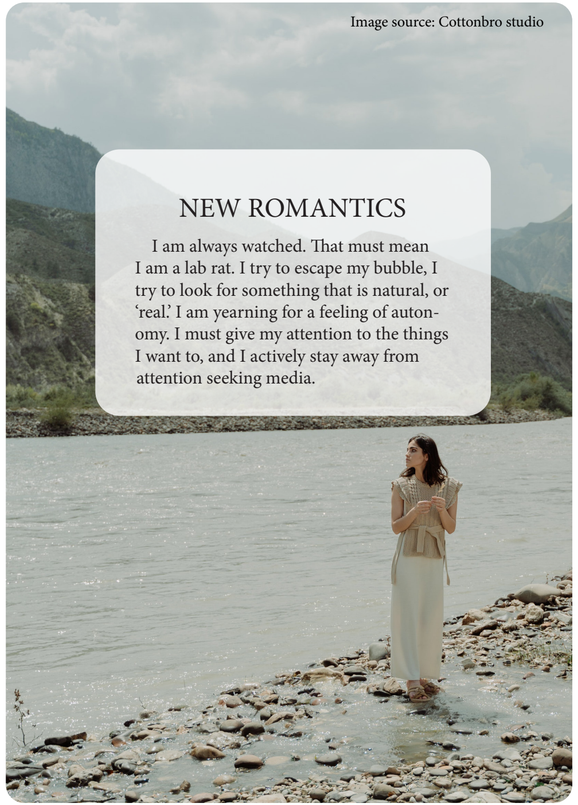
CLUSTER SELECTION

From all these clusters, six overarching meta clusters are extracted. These are selected based on:

- Relevance: are the clusters relevant to the domain?
- Balance: does the set of clusters as a whole create both balance and paradox?
- Resonance: does the feeling behind this cluster match with what I feel, knowing about all factors?
- Originality: is there something in this cluster different from today?
- Truth: does the cluster match the facts I have found during my literature research?

With these selection criteria, I came to the following six meta clusters, shown and told on page 61-63.





THE QUANTIFIED WORLD

I am always watched. I am always modelled. My data is collected where possible, and that data is used to predict my behaviour and that of my surroundings. I have a personal algorithm that knows and models me best. I feel inclined to behave like I am modelled.

Image source: Cottonbro studio

ARTIFICIAL IS THE NEW FAKE

Everything around us has reached so much 'fakeness' that the claim of something being fake is even more meaningless than it is today. A fake image will be an artificial filter. Sharing will be artificial ownership. Cars will become an artificial extension of my body.

Image source: Tara Winstead

GUIDE ME, PLEASE

I don't understand digitization and I am not trying to. I am told what to do and like, and I want to be guided in my choices. Making choices for myself is tiring work after all. Deep down I feel my algorithm knows me better than I do. I experience loneliness. I want strong leaders to look up to.

Image source: Pixabay

THIS PERSON IS MEDITATING

I have the luxury of looking at myself. I pay attention to myself. This is a new zen. Not paying attention in a attentionalised society is a rebellious act, and I can afford it. I am part of the up tempo society, I just decide to slow down from time to time.

Image source: KoolShooters

THE FUTURE CONTEXT

To get a better feeling for the context, Image 5.1 is created to show future predictions. Multiple storytelling threads to make this world come alive for me as a designer. From that point, the mission statement is deducted.

THE MISSION STATEMENT:

In the domain of effortlessly being a traveller in 2040, Mercedes-Benz wants to quietly reassure people they conduct the interior like the back of their hand.

Quietly?

Quality is never screaming. There are plenty of things screaming for attention in 2040, and this car, if luxury, should not be one more. This reassurance should be found if needed, and should be hidden if not needed. Mercedes- Benz luxury is experienced in silence.

Reassure?

I don't want the car to explain. Those who get in are looking for luxury, not a lecture. The passengers in the car experience god-like luxury and they don't want to get the feeling they need to learn or do something or that who they are now is not enough.

Conduct?

I want people to know they are in control, and what they can do with that control. In order to feel that, they must control and steer the machine with flow. During this flow they can be quiet, they can be at peace, then they can do something else.

Like the back of their hand?

This English proverb is not only fitting because it stands for an abundance of understanding, but also because it refers to the car like a part of your own body. That is what I think it must feel like: an extension of yourself.

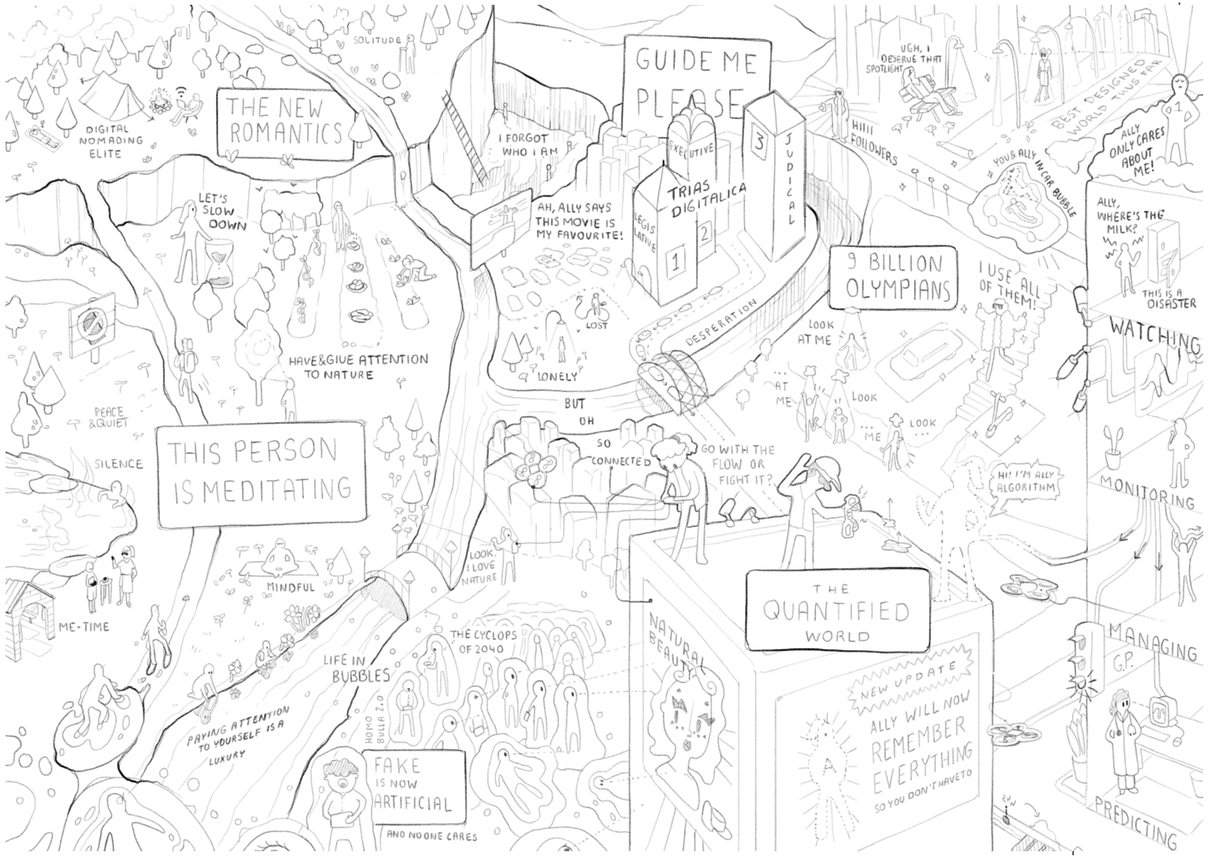


Image 5.1: future vision

Like dancing a perfect waltz with someone you just met.

There is rhythm. There is guidance. It has to be done quietly, as you are dancing, and you cannot speak. It is movement. It is fun. It is enjoyment.

You are being watched, but you are mindful, and being watched does not scare you. You demand to take up space. You need the room, the center specifically.

There's a language, a mutual understanding in knowing which steps to take. It happens subconsciously. It is sexy.

And once you are done with the dance, there is nothing more to see. You walk off.

It is quiet synergy.

Image 5.2: dancing analogy

ANALYSIS OF THE WALTZ

To learn more about the dancing analogy, two dancers are approached for interviews (see Appendix A) and research is done. The findings are shared here.

Dancing follows certain rules: for example, participants are expected to look clean, and there is a shared language of how to kindly accept or reject dancing offers (Abraham, 2023).

Rising and falling in the English Waltz

A beautiful flow is created in the English Waltz by what is called 'rising' and 'falling' (D. Fisher, 2021). The flow, the elegance and the decent tempo of this Waltz led me to design for this dance in particular.

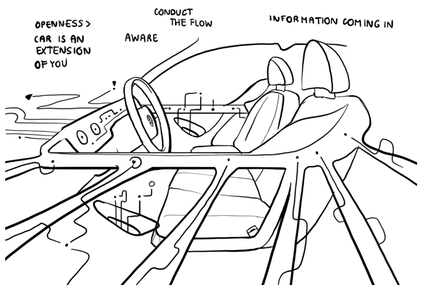
The English Waltz is also fitting in the sense that the follower looks against the direction of movement most of the time, something that requires trust. And once they look at the same thing, they portray synergy.

Rising and falling in an interior

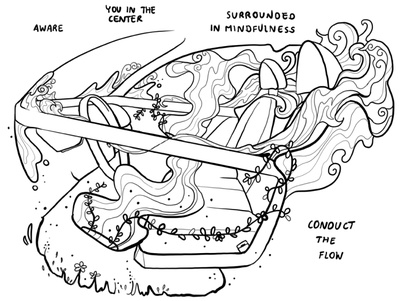
The new analysis of the Waltz led to an idea of a moment rather than an interior. The rising and falling flow of the dance is used as interior design inspiration as can be seen in image 5.3. This also draws back to the Fundamental Needs: Autonomy could be linked to rising, having an overview, being aware, in control. Security could be linked to falling, being centred and mindful, understanding where you are going, and trusting.

Next steps

This sketch led to understanding of the balance between the Security and the Autonomy, for example by focussing on fulfilling the needs one at a time in these two extremes. This design iteration is used as input for the next chapter, the 2040 concept.



AUTONOMY INTERIOR - RISING



SECURITY INTERIOR - FALLING

Image 5.3: implementing the Waltz into an interior

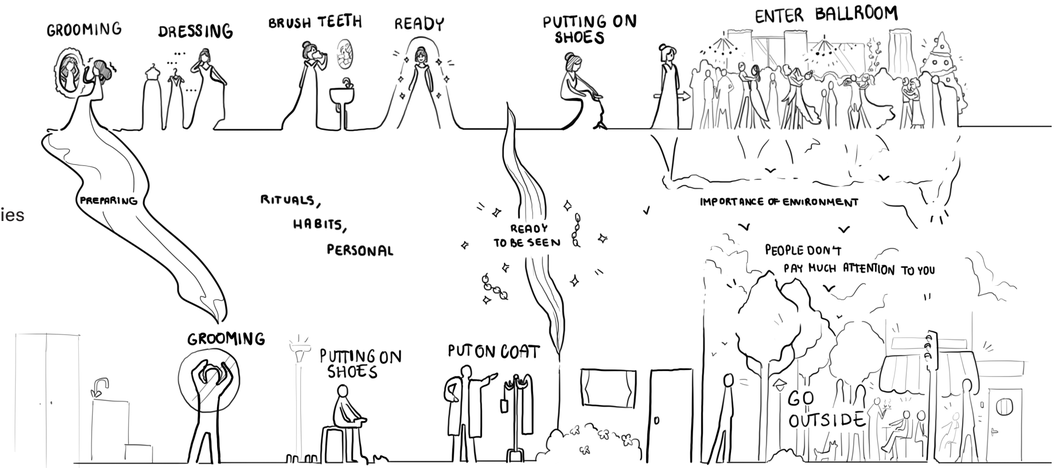
THE USER JOURNEY

What is a user journey?
A user journey is a visual way of exploring an interaction, and it is used here to explore the journey of a person in 2040 travelling compared to a follower dancing a Waltz.

THE 2040 USER JOURNEY COMPARED TO THE WALTZ

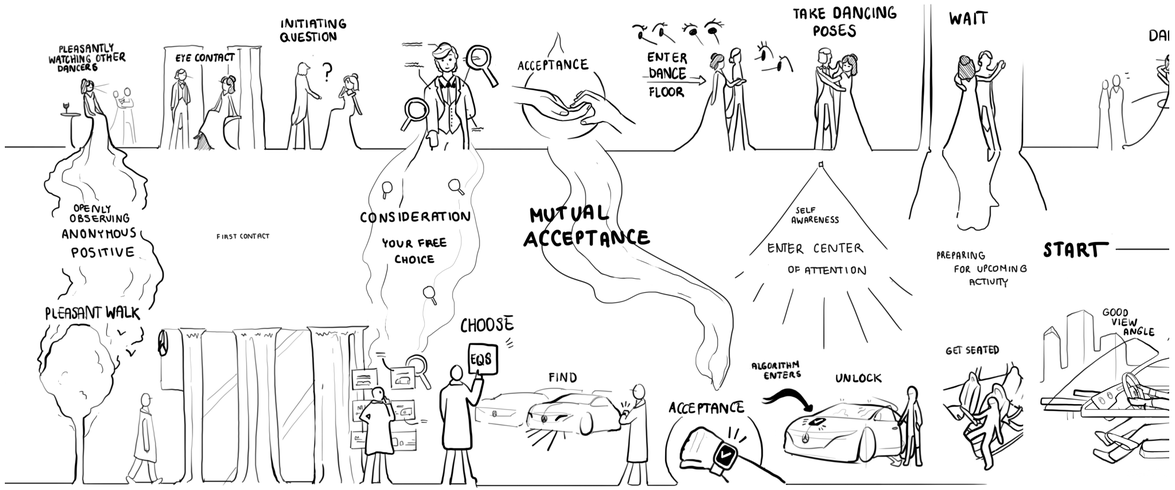
With the interaction vision implemented

The action
The Waltz
Interaction qualities
The action
The journey
The emotions

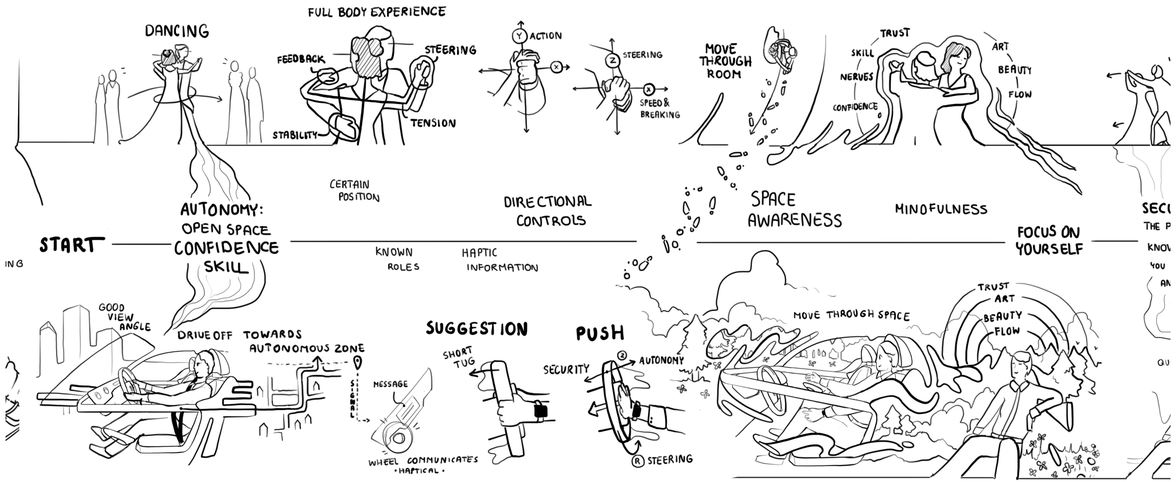


Patient — Confident — Prepared — Optimistic — Excited

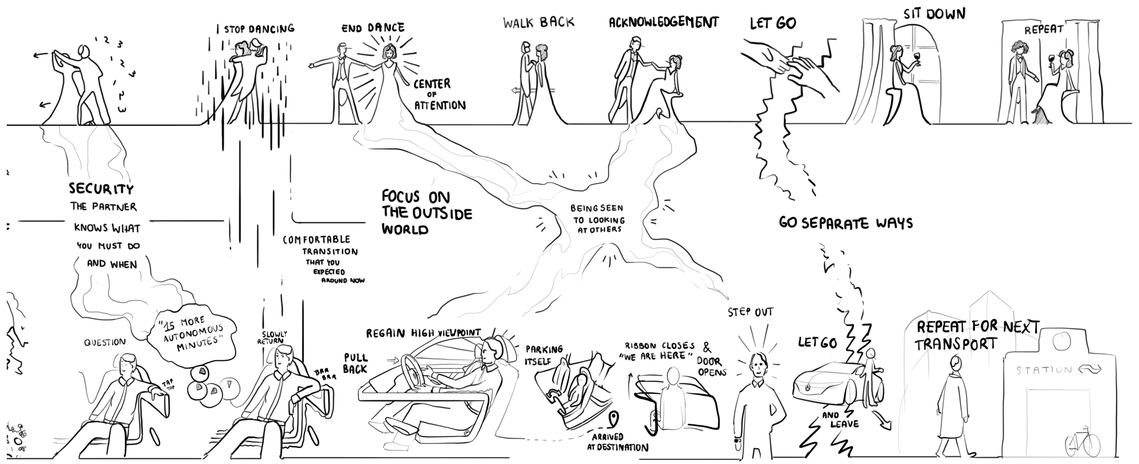
Image 5.4: User journey



Curious
Acknowledged
Surprised
Inquisitive
Trusting
In control
Nervous
Determined



Confident
In control
Intimate
Courageous
Mindful



Successful | Valued Proud | Gratitude | Acknowledged | Content

Lotte Peeters Weem
Master thesis
2023

Dancing a waltz is a learning process. This learning process is also needed for the introduction towards autonomous driving.

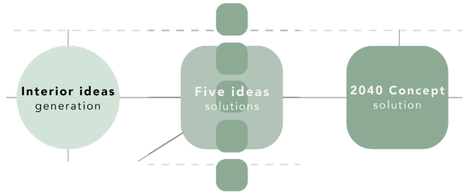
The update

After comparing the journey of the Waltz to the interviews, I came to understand I had left out a very important part of the dance.

During this entire thesis, I have been trying to bring **time into the design**. And for the Waltz, time means **practicing the steps until it can be done quietly and in synergy.**

The action	Enroll for dancing classes	Follow classes for the first time	Practice... (1 day)	Practice... (1 month)	Practice! (6 months)
					
The emotions	Determined	Curious Unsure	Challenged Motivated	Proud	Confident Free

Image 5.5: Practicing user journey



THE 2040 CONCEPT

CHAPTER 6: IDEA GENERATION

INTRODUCTION

Ideation is a process that starts on the first day, and is only finished on the last. I have gone through various rounds of ideation, at different points in my thesis. Some ideation rounds are done to start on an interior, most are done in order to iterate.

Ideation in this research happens with four goals in mind: Autonomy, Security, quiet and synergy. This made it challenging to find one design that fits well, a problem solved by creating one design with five features. The usertest in the next chapter will show the next steps in the process.

CONTENTS

In this chapter I will shortly go over various ideation sessions and explain how I found focus towards a concept.

First I will explain what ideation is done, then I will talk about decision making and step by step walk through the iterations towards a final concept. Then I will show what the 2040 concept looks like.

IDEATION

Various rounds of ideation are done in this thesis over a longer timespan to ensure a wide range of ideas. All ideation material can be found in Appendix G.

Brainstorming
Brainstorming is the technique applied in this ideation session. It includes activities like rapidly inventing, collecting and combining ideas on post-its. I used this technique through prompts (like 'Autonomy') and through association.

Ideation before context
This ideation is done during the research period. The ideas created in this part of the thesis are broad, uncoordinated, but also inspiring for later stages, shown in Appendix G.

Ideation after context
This ideation is done later in the process. This ideation after context creation led to a shallow but goal oriented ideation session centered to finding an applicable solution for both the company and the context. This is shown in Appendix G.

Clustering ideas
These ideas are clustered to find a direction in ideation. Through clustering I learned the ideas behind **trust**, **honesty**, and I **am welcome in this space** fit best with the four targets; quiet, synergy, Autonomy, and Security.

Ideation after understanding
Due to the complexity of the future context, it took time to understand what the 2040 context meant. After philosophising more on the context, ideation is more focussed, as can be seen in Appendix G.

Other activities
Various creative exercises are applied: case studies at the Stuttgart zoo, designing in an EQS, seeking out Autonomy, and more. These are shown in Appendix B.

USER JOURNEY FOCUS

The 2040 direction has to turn into a design, together with the key concepts of Autonomy, Security, quiet and synergy.

These four concepts give a good start to find a focal point for the design. The most harm to Autonomy and Security in the interior is currently done in the steps shown in image 6.1 below: the point where control over the car is being taken away, and given back.

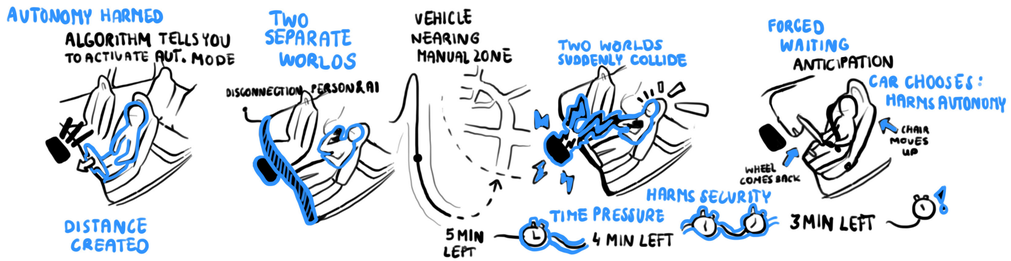


Image 6.1: Harming autonomy and security

DECISION MAKING

The four directions are leading in the decision making process: quiet, synergy, Autonomy, and Security.

Based on these four aspects, I picked designs that fit all of them, and tried to puzzle piece them together until I found a set of ideas that worked together. From there on, I started ideating through sketching interiors, and finally I landed on a 2040 interior design.

Image 6.2 shows an example of the ideation combinations during the decision making process.

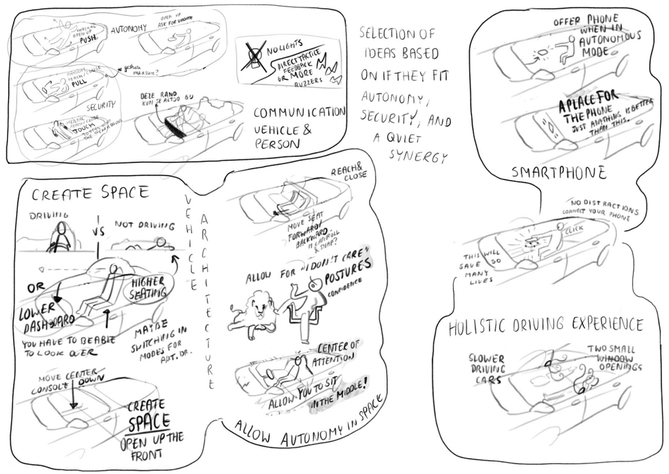
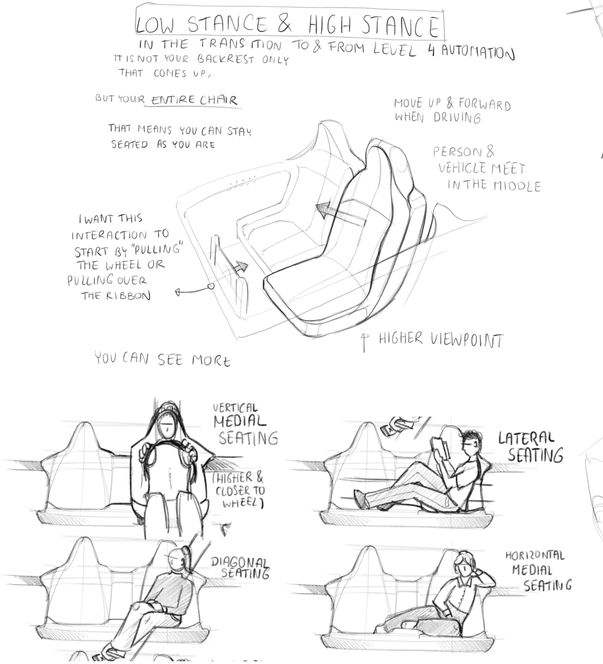


Image 6.2: Collection of selected ideas into the four directions.



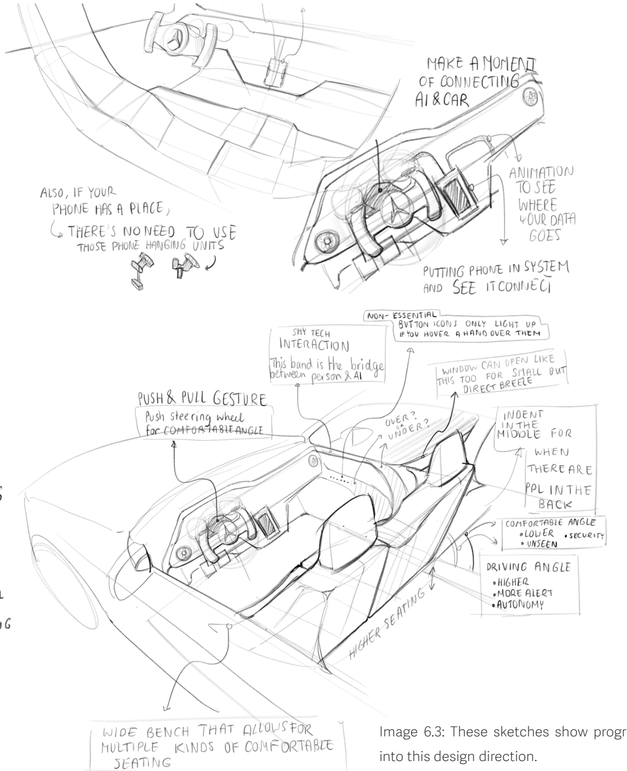
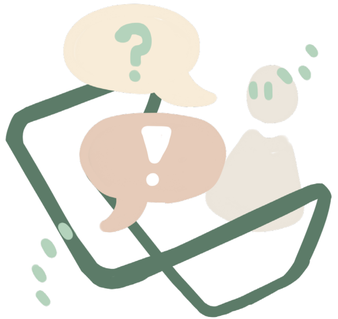


Image 6.3: These sketches show progress into this design direction.

FIVE CHOSEN IDEAS

After selecting through the ideas that fit with the four directions, five ideas are found and merged into the concept of the interior. On this page I shortly touch each idea.



The Ribbon

The Ribbon consists of an encompassing interaction band that provides necessary information to the person, allowing someone to take their eyes off screen.

The Sofa

The sofa consists of one large sofa instead of two chairs. The receding center console will allow this, and the extra space will be used for more comfortable seating.

The Throne

The throne is an idea where a chair shape rises from the sofa to rise the person in the driving position higher when they require a higher viewpoint, for example during driving.

The Pedestal

The pedestal is a set location to place a smart device where all notifications are muted and the vehicle filters relevant information. Can also be used to show how information is used.

The Fan

The fan consists of a second for a window to open, near the B-pillar. This allows clear air to flow in (from all electric highways), improving the mindfulness of a trip.

THE 2040 CONCEPT

On the right a visual 6.4 and 6.5 shows the 2040 concept with the five concepts integrated together.

Design for free seating

The sofa allows for movement space. The Ribbon has a shape that it can be touched through every seating position, offering Autonomy in the seating and Security through the contact. The idea behind the Ribbon is that it can be tapped to get answers to your questions from the algorithm (your personal algorithm) in the vehicle. The fan is positioned at the window. The pedestal at the screen, and the throne is hidden in the chair.

Together with Mercedes-Benz, it is decided all concepts will be tested, and the Ribbon will have the focus in the usertest.

Towards the usertest

This leaves a very important question for the usertest: what do people want to know when they touch the Ribbon? And where do they touch the Ribbon?

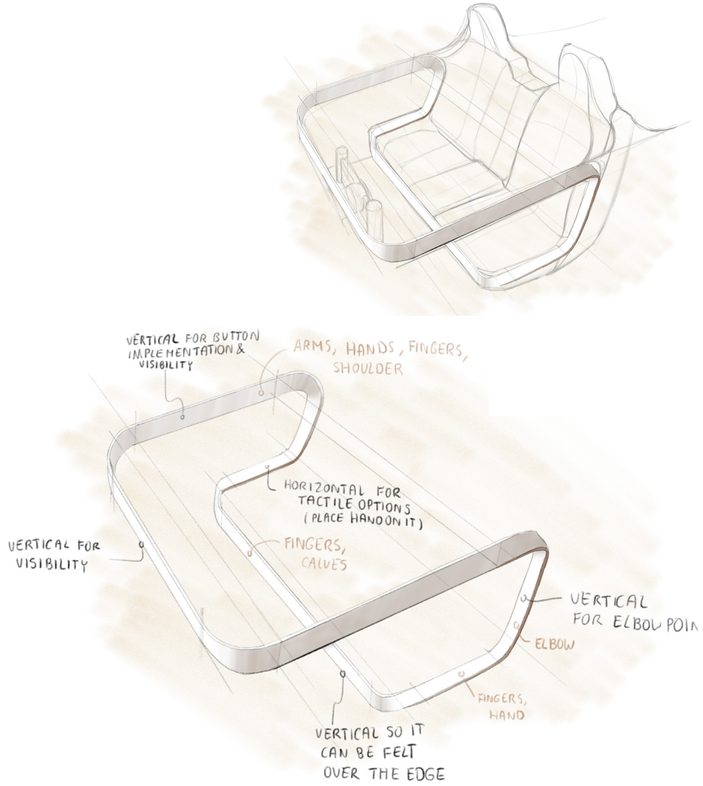
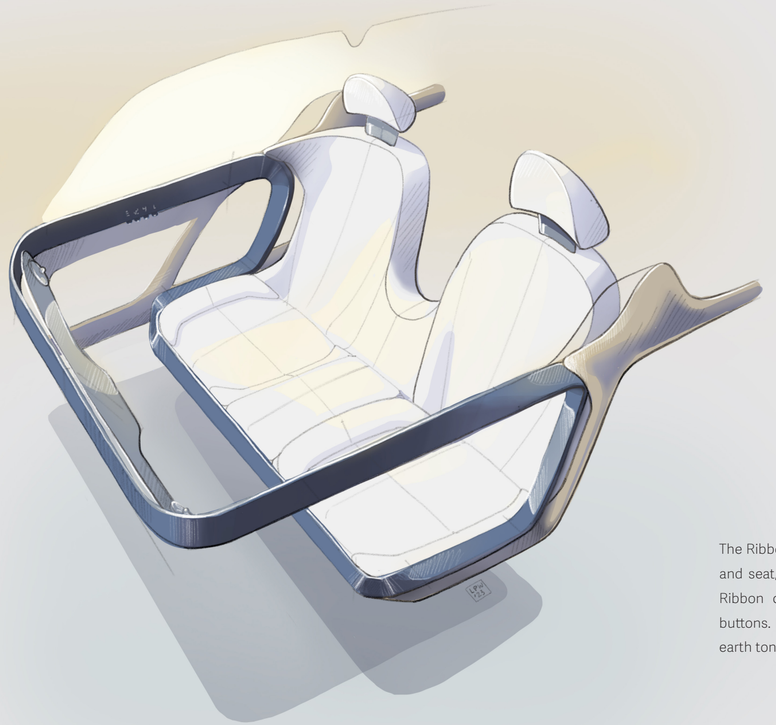


Image 6.4: Ribbon design sketches



The Ribbon wraps around the hyperscreen, doors and seat, creating a holistic interior design. The Ribbon can also provide a good location for buttons. For this sketch I decided on blue with earth tones to fit the Mercedes-Benz image.

Image 6.5: The 2040 concept design

FN for ideation

FN for evaluation

FN REFLECTION

ON FUNDAMENTAL NEEDS FOR IDEATION AND EVALUAITON

Throughout this ideation Fundamental Needs have been used as inspiration for ideation sessions. They are applied through brainstorms and wordwebs.

Advantages of application

The advantage when ideating and designing with Fundamental Needs is that the ideas created are a large step in the right direction, limiting the filtering and selecting that might be done afterwards. Another advantage is that FN allow a designer to look at a problem not from a problem-solving approach, but from a context aware design approach. By holistic approach I mean that the understanding of 'taking away the wheel (-Autonomy) can be compensated by providing Autonomy in another way.

Disadvantages of application

The disadvantage of ideating with Fundamental Needs is that the strong focal point can limit creative freedom. Another disadvantage is that when aspects of a FN are not understood, especially of the depth of a FN is off, the ideation will never be complete.

Recommendations

I think further research is necessary, especially comparing various creative methods, to validate added value by FN.

I also recommend that, when working with FN, to first make sure all designers involved fully understand what every FN means and how they play a role in the current context.

Concept and vision validation

VALIDATION

CHAPTER 7: TESTING THE CONCEPT AND VISION

INTRODUCTION

At this point I know what the people in my 2040 context need, and I have decided on a design direction. As the design is built with Fundamental Needs, I also want to validate with Fundamental Needs through a method called Emotion Mapping (page 89). To fit this method to my thesis I designed a sensitizing experience starting five days before the usertest. This allows the usertest to not only test the concept, but test the future scenario as well.

Storytelling plays a large role in this chapter: from asking participants to share stories, to sensitizing stories, the personal aspect of doing a usertest made this a very valuable source of knowledge for my final design iteration in the next chapter.

CONTENTS

In this chapter I will explain the test setup, results, conclusions and recommendations on the user test.

The research questions will be guiding for this chapter. I will explain how I set up the lab and selected participants to best answer these research questions. Then I will talk through the sensitizing and Emotion Mapping approach step by step, and discuss a setup update I did during the test.

The second half of this chapter contains the answers to all research questions, the other findings and recommendations on the user test.

RESEARCH QUESTIONS

WHY VALIDATE NOW?

To learn what direction I should forward this concept in, I wanted to test before finalizing the concept.

I learned what people in my 2040 context need, and I'm aware of multiple design directions that would increase wellbeing in mobility in this context.

But there are still many unanswered questions: Is the 2040 analysis correct? Does my design achieve the intended interactions? And what parts of my design direction are most advanced, yet acceptable to the people today?

To answer these questions, I conducted a user test.

These are the research questions that I will answer through a user test. For the research questions answered through literature review and interviews, please see chapter 1.

Question 1: The interaction

1. Does the concept achieve the intended interaction?
    - 1.1 Does it feel like dancing?
    - 1.2 Does it feel like quiet synergy?

Question 2: The Fundamental Needs

2. Does the concept achieve the intended need fulfilment?
    - 2.1 Does it provide Security?
    - 2.2 Does it provide Autonomy?
    - 2.3 What other needs play a role?

Question 3: The ribbon

3. Do people have a need to reach the car when they are unsure of what is happening?
    - 3.1 How do they reach out?
    - 3.2 What do they want to know?

Question 4: The opening

4. How do people feel about the door openings?
    - 4.1 About seeing the road?
    - 4.2 About the wind?

Question 5: The sofa

5. How do people use the sofa?

Question 6: The future context

6. How do people respond to the future society?
    - 6.1 Do they feel a need for Security?
    - 6.2 Do they feel a need for Autonomy?
    - 6.3 What other needs play a role?

SETUP

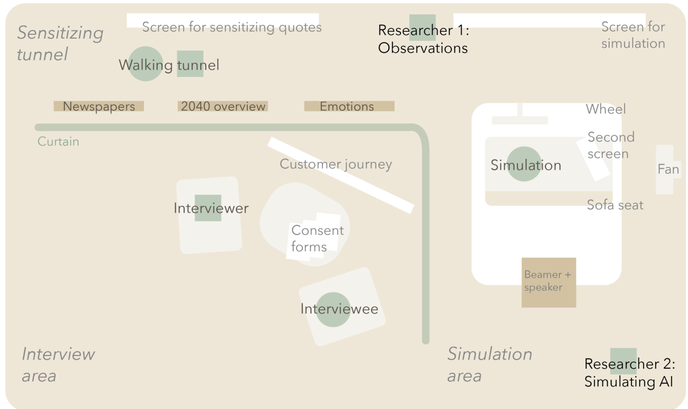


Image 7.1: Lab setup

The test is conducted in the RD/KII Interior lab in Sindelfingen. The lab is reorganised using as much in-house material as possible. The layout is shown in image 7.1.

Pictures

Pictures of the setup and simulation are shown on page 92.

PARTICIPANTS

For the test, participants are invited from a broad demographic group in age, occupation, nationality and gender All are Mercedes-Benz colleagues from different departments. The test took 30-45 minutes, and is planned for 10 participants, but conducted with 9 participants in total due to unexpected illness. Two of these participants are a couple often driving together, and to collect as many experiences as possible, I asked them to conduct the test together.

SENSITIZING

Sensitizing is a tool to make people more susceptible for certain types of research. This can be done through various mediums, and for this research storytelling and provoking questions are emailed to all participants on the five consecutive days before the test.

These stories take place in my ViP future context, and are written in an immersive way with the goal to provoke people to think about what this context would mean to them. The sensitizing texts can be found in Appendix I.

Why is this tool applied?

In this research sensitizing is applied to bring people into the 2040 future context so I can have **more accurate test results**. After all, this design is highly dependable on how people feel in this future, and I can test this better when people have the mindset of 2040.

The steps of sensitizing

The stories told are based on my tools of transitions timeline (page 49), using these transition events as happenings in the story. For other, smaller elements ViP factors are used to include as much new and exciting details in the story to bring it to life.

Sensitizing during the test

The test starts with a short 10 minute interview where their first feelings are discussed about the sensitizing. Before the simulation, they walk through a sensitizing tunnel where the feeling people experienced while reading sensitizing emails is recaptured. The participants physically walk through this tunnel to reach the simulation area. This tunnel consists of three parts.

First, there are **newspapers written about the similar events** as discussed in the emails. Participants are asked to pick one newspaper they feel something with. This is done invite them to skim over all headlines, thus remembering the topics, and for me to know what topics they value, as this might impact the test results.

Second, there is an A0 image of my 2040 context (from page 64). Here, I ask people **where they think cars could play a role**. This is done to learn how much of the impact of mobility they understand, information that helps to interpret their emotions during the test.

Lastly, all participants are asked to share **how they would feel in this world**. This is done to make them aware of their emotions at that moment, something they will need to do during the next part of the test.

For the participants that did not read or finish the sensitizing texts, a video shows various quotes from the emails, so they could see what the events and feelings of the test are.

EMOTION MAPPING

Emotion mapping is a tool to research the Fundamental Needs of the testing participants. Depending on how it is used it can uncover the fulfillment or unfulfillment of the current needs.

Why is this tool applied?

This tool is applied to research if Autonomy and Security play a role in this future scenario, and if so, what that role is. This is done to **validate the future context**. Also interesting is how the participants respond to the 2040 design, which is introduced during the test.

The steps of an Emotion Map

An Emotion Map consists of asking people **how they feel while in a certain situation, and after the situation ask why people felt that way to uncover their fundamental needs in an interview.** The steps will be explained on the upcoming pages.

Shortcoming of an Emotion Map

An Emotion Map is a tool that needs **time** to work properly: the participant needs to dive into how they are feeling about a certain thing, and the researcher needs to fully understand the participant's reasons for feeling that way.

THE SIMULATION

After the sensitizing tunnel, participants could for the first time see the simulation area, see image 7.1 on page 87. This area consists of an adapted car interior without a roof and equipment for the tests. The choice is made to not use VR, because it is relevant to see expressions and communicate with the participant in the next step. The room will be darkened as the goal is to create an unknown atmosphere, to fit with what people would be feeling the first time in a semi-autonomous vehicle.

To introduce the simulation, a small introduction is shared about what they can expect, who they are, and where they are going to. This text can be found in Appendix I.

Inside the simulation

The simulation takes 8 minutes in total, and includes an immersive driving experience. It starts with around 2 minutes of driving, then around 5 minutes of autonomous time, and then 2 minutes of driving.

During the simulation, there are various points the participant can interact with. There is the sofa seat, and the steering wheel to drive. There is the extra screen, the fans, the music, to create an immersive experience. And there is the AI, according to the story their own AI that they can communicate with. To create the immersion, I asked the participant what the name of their AI is and use it in the AI voice lines. **This AI is in fact controlled by a test helper behind a computer invisible to the participant during the test.**

Wizard of Ozzing

The setup in image 7.2 on the left page shows how Wizard of Ozzing is used to simulate reality. A light band is used to mimic the Ribbon looks as well as the speech function.

Data collection

During the simulation transcript notes are taken on paper and emotions are captured on Emotion Capture Cards (see image 7.3). These cards are filled out by looking at the expressions of participants, and asking how they are feeling. The cards are the backbone of the interview after the simulation.

Next to the cards, to answer all research questions, I also took notes on users' postures, what they were touching and holding, and other notable reactions.

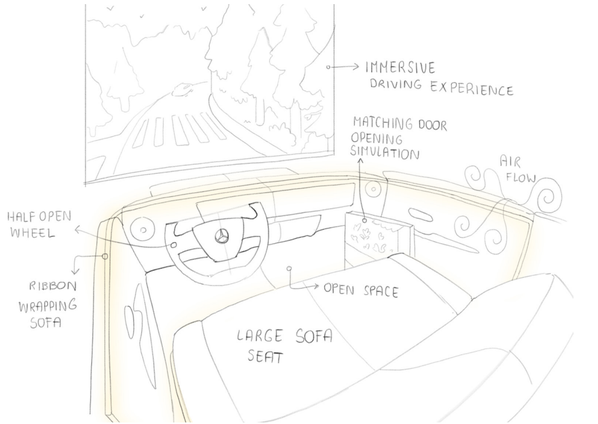


Image 7.2: Simulation

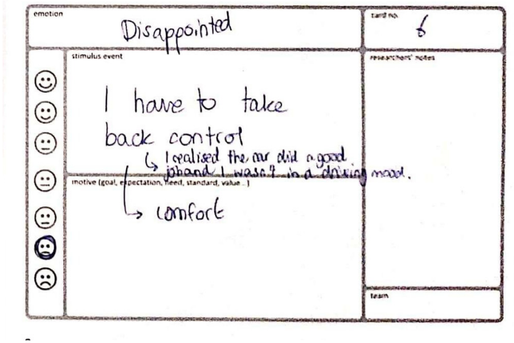


Image 7.3: Emotion Capture Card example

Questions during the test

The list of questions can be found in Appendix I.

It is important to note that **not every question was asked during every test.** This decision is based on the researcher's intuition: **as time is limited, it has to be decided what is worth diving into during the test and interview.** What sparks emotions can differ greatly per participant, and some participants showed large interest in the AI interaction, and others showed interest in the nature drive. To create data that is as rich and inspiring as possible in the end, I made the decision to follow participant's interests.

Deep dive interview

After the simulation, the test continues with a deep dive interview in a comfortable setting. Here the laddering technique is applied among other questions to deduce FN fulfillment.

LADDERING

Laddering is an interviewing technique to learn what Fundamental Needs lie behind emotions. When applying laddering in an interview you discuss why people had certain emotions, asking the questions 'Why did you feel that?' and 'Why is that important to you' at different times and in different forms. Here is a simple example from my test:

Triggering event: entering autonomous area.

"I feel disappointed"
"Why do you feel disappointed"
→ "I want to look at my partner"
→ "Why is that important?"
→ "I want to look at my partner and talk about my day"
→ **Relatedness**

Laddering shortcomings

These ladders can often be interpreted in various ways, and the interpretations depend on personal factors (depending on the focus points and concentration of the interviewer) and context related factors (depending on the mood and willingness to talk of the participant, and the simulation quality). In this case the extensive ViP research helped to find the right focus points for the interviewer, and the in-depth sensitization helped the interviewee with minimizing the risk of ineffective laddering.

Wrap up

After the deep dive interview, participants are done with the test and are thanked and asked for final remarks.

RESULTS

All test results can be found in Appendix I. In the next pages only relevant analysis of the data is discussed to answer research questions, referencing to related results.

HALF WAY UPDATE

Halfway through the tests I already made an iteration on the test design: the participant experience the most emotions with the Ribbon.

The goal of the test is to find inspiring results, and at the start it was know the testing would be split in two days. This break in between offered a chance to **revisit the focal point of the test. Having a focus increases the quality of test results in this Emotion Map, as that allows for more thorough questions and research.**

This is why after analysing the first set of results, based on Question 3, Question 4, and Question 5, the test is updated. The results can be found in Appendix I. For this test, that means focussing on the Ribbon and algorithm.

RESULTS AND CONCLUSIONS

The upcoming pages show the results and conclusions of the usertest. Different questions are of different interest in data collection, analysis and results, and therefore the chapter lengths will differ.

QUESTION 1: THE INTERACTION

1. Does the concept achieve the intended interaction?

1.1 Does it feel like dancing?

This simulation and interaction was only able to test the journey part of the test. It has been established through the customer journey that dancing in the moment feels:

Confident **Intimate** **Mindful**
In control **Courageous** **Successful**

To answer this question, I read through the transcript of the test to see if these emotions were present in the interactions or not. I will count the amount of participants (n=9) that mentioned this emotion or something that referred to this emotion.

To start with assessing these feelings, I followed the following meaning for each concept:

Confident - do you have faith in yourself? Are you so sure of yourself that you do not need to be reminded?

In control - do you believe that you have something to say? That your wishes are heard and granted?

Intimate - do you confide in the other, do you make yourself dependent on the other, and are you aware of that?

Mindful - is there a moment where you were in the flow, and were completely aware of your own body and (simulated) surroundings?

Courageous - does the passenger feel like they are doing something out of their comfort zone, and are they aware of that? And do they feel empowered in the process?

Results

The results are summarized in table 7.1 on the right (complete result overview can be found in Appendix I. I counted a 'yes' when participants mentioned these emotions a synonym, or a linked activity.

Results six aspects of dancing

Confident	7/8
Understanding	6/8
Mindful	6/8
In control	5/8
Intimate	5/8
Courageous	3/8

Table 7.1: Summary of results Q1

Conclusion

For confident, understanding and mindful, I assume these aspects of dancing are there. For intimate, it is clear participants who are assessed with 'no' are lacking trust, or awareness. For control, the answer is unambiguous between participants. For some participants having control over the AI also fulfills the feeling of being in control. For others, lack of understanding was in the way of feeling control in the car regardless of the AI control. Courageous is experienced by less than half of the participants.

To summarize, this concept feels like most of the aspects of dancing. I will take the affirmative and negative findings with me in the final chapter of this thesis to iterate towards a fitting 2030 design, and especially iterate on a way to provide courage.

1.2 Does it feel like quiet synergy?

To answer this research question, I will not dive into the numbers, as I do not think it is possible to answer this research question within the usertest I have done.

For this question, I will reason the answer through test observation. No, the concept is not quiet, as people will have to talk. Yes, the concept is synergy, as all participants after the sensitizing seemed to understand there has to be a form of synergy between the person, the machine, and the algorithm. I found this through their actions (asking what the other is doing), through their commands (demanding one of the two others to do some kind of thing) or through the interview after the test.

QUESTION 2: THE NEEDS

2. Does the concept achieve the intended need fulfilment?

This question is hard to answer as participants who have their Security need fulfilled will not mention it being there. I first looked at if the need was there. In Table 7.2 and 7.3 on the right you can see that six participants did show a need for Autonomy, and four participants show a need for Security. **So yes, during the simulation, the needs are there.**

To find these answers, I looked for notions where people mentioned or showed my concept gave them that FN in fulfillment. These results are shown in table 7.2 and 7.3 on the right.

2.1 Does it provide Security?

From the four participants that had a need for Security, two of them experienced fulfilment from the design. This is not a complete fulfilment.

2.2 Does it provide Autonomy?

Five participants experienced fulfilment of Autonomy during the test. These are not only the participants that also experienced a need for Autonomy. I consider this fulfilment of autonomy for the final iteration on design.

2.3 What other needs play a role?

Stimulation happened to play an important role. By taking away the steering wheel, there is a need for Stimulation by four that was fulfilled in some occasions by the interaction with the AI.

Participant Fundamental Needs (binary)

	6 Autonomy	4 Security	4 Stimulation	3 Comfort	2 Relatedness	1Recognition	1 Fitness	1 Competence	1 Community	0 Beauty
P1	X									
P2	X		X							
P3	X	X		X				X		
P4	X	X								
P5	X	X		X						
P6	X		X	X						
P7			X		X				X	
P8,P9		X	X		X	X	X			

Participant FN fulfilment (binary)

	5 Autonomy	2 Security	5 Stimulation	1 Comfort	1 Relatedness	1 Recognition	1 Fitness	1 Competence	0 Community	1 Beauty
P1			X							
P2	X		X							
P3								X		
P4	X	X	X				X			
P5	X		X							
P6				X						X
P7	X	X	X		X	X				
P8,P9	X									

Table 7.2 and 7.3: Fundamental Needs and their fulfilment during the usertest.

QUESTION 3: THE RIBBON

3. Do people have a need to reach the car when they are unsure of what is happening?

These results are based on the transcript in Appendix I. Multiple participants reached out when they did not understand what was happening. Once they noticed that I would not provide an answer, they turned to the car. Most of these participants understood they had to tap before the car listened. All participants tapped the ribbon on top of the door, see image 7.5.

3.1 How do they reach out?

By talking directly to the car, or by tapping the ribbon. Not every participant liked to tap the ribbon, and based on their reaction I think this might be because they understood how the test worked and felt silly. Other participants kept on tapping the ribbon so often that the test helper (behind the talking computer) was struggling to keep up with the response.

Questions asked to AI during simulation analysed

Type of question	Amount	Fundamental Need	Notes
Grey: Test related questions	3	-	These are addressed to the researcher
Blue: Practical questions	12	Security, Comfort	Looking for knowledge about the trip, asked from uncertainty or curiosity
Green: Questions about safety on the road and at home	5	Security	They want to know if they are safe, and if they left their house properly
Yellow: Questions about facts in the surroundings	9	Stimulation	These questions are asked out of curiosity
Red: Entertainment questions	3	Stimulation, Autonomy	These are asked to provide entertainment

Table 7.4: Questions asked to AI during simulation analysed

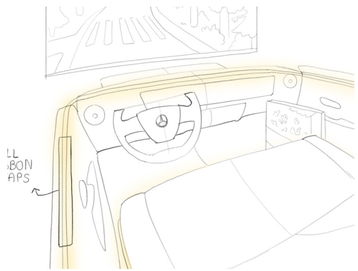


Image 7.5: ribbon tap locations

3.2 What do they want to know?

Table 7.4, a summary from Appendix I, shows that most of the questions are asked to gather information on the trip (blue) and asked to gather information on the environment (yellow). Interesting is to see that 17 questions in total are asked towards security, and 12 in total are asked towards stimulation.

Practical questions were asked during manual and autonomous modes, questions about the environment were asked during autonomous mode only.

QUESTION 4: THE OPENING

4. How do people feel about the door openings?

4.1 About seeing the road?

Of the first five tests, as can be seen in in Appendix I, not one of four participants that noticed the screen (or were asked about it) had a positive reaction outside of curiosity. Most participants were confused with the function, or simply did not want to be distracted, see the example result in table 7.5..

4.2 About the wind?

None of the participants commented on the fan in the test. They did not notice, or they found other parts of the simulation more interesting to discuss.

Because of the answers to these subquestions, I answer Question 4 with: people feel negative about the door openings.

How are you feeling about seeing the road on your right?	This is interesting to see more, but you might get stressed. I like to concentrate on one thing, because I think that's good. It's very near. I do have to concentrate and looking at more than one thing is stressful.	"Is this drivers assistance? It's a weird place, long way to look. I would rather have it in my dashboard."

Table 7.5: Example of results of question 1 P1,P2

QUESTION 5: THE SOFA

5. How do people use the sofa?

In the Emotion Capture Cards I took note of seating positions if they were anything other than sitting in a straight driving position (Appendix I). As can be seen in the data, no participant used the full space of the sofa at one point during the test. Some participants changed to more comfortable seating, and some participants mentioned moving to more comfortable seating over a longer time. One participant mentioned they liked having the space, but they would not use it.
As can be seen in Appendix I, the participants did not have strong feelings towards the space they were given through the sofa.

Most participants did not find it a notable difference.

Emotion 1 - Comfort - Getting seated
Nice to know I'm not in a small space. There's a lot of free space in front of me.

I wouldn't use the space if it was there. It's practical for tall people. I just want to see everything.

Quote participant 3

Emotion 2 - Comfort - Driving
For longer drives, stretching is awesome or some other position, to get more comfortable.

Being comfortable is important, because it helps me with trusting.

Quote participant 1

QUESTION 6: FUTURE CONTEXT

The test is as much a question of how much do people respond to this society, as is the question how they respond to my design. To answer this question, a FN assessment is done of the starting interview, see Appendix I. Here, an evaluation is made of which FN are present and seem relevant or unfulfilled in the conversation through laddering and researcher intuition. An example of the ladders is shown below.

For these questions, only the results of sensitized participants (n=6) are used. I decided to find the answers of the questions by counting whether a participant mentioned something about the FN, not taking into account multiple mentions.

I don't like the transparency with the neighbours
> I want privacy
> I (...) don't want him to know about me
> you don't know if he's a criminal
> Security

Laddering example Security

6. How do people respond to the future society?

6.1 Do they feel a need for Security?

6/6 of the sensitized participants mentioned a need for Security during the interview. So yes, participants felt a need for security.

6.2 Do they feel a need for Autonomy?

4/6 of the sensitized participants mentioned a need for Autonomy during the interview. So yes, participants felt a need for Autonomy.

6.3 What other needs play a role?

Surprising are the four mentions of Morality by three participants, I suspect this is because people look at the future context with their moral framework of today, and those do not fit together. I am also surprised by two participants mentions of Relatedness.

"You know a scary thing? A while ago I used ChatGPT to write a story, and then ChatGPT named the main character of the story [participant's name]. It was spooky, and I thought: why would you do that? "
> Security

Researchers intuition example Security

OTHER FINDINGS

On this page I will share other interesting findings that I took to the final iteration stage. Quotes supporting these findings can be found below.

Findings from usertest

Apart from the statistical answers to this research, there are many findings between the lines that interest me. What interests me was the communication between participant, machine and AI, and the notion of control between the three, also shown in example quotes in image 7.6.

Control

Many participants showed unease when control was given away, and I found a lot of hints in expression, body language and form of speech when they found out they now controlled the AI instead of the steering wheel. One participant even literally mentioned they just wanted control over something, and that something could be the wheel or the AI or the parking place. They communicated their wishes through speaking, a very intuitive and clear way for them.

Response to AI

The response to this communication was the biggest surprise of my research findings: all participants were thrilled by this. Everyone asked the algorithm questions they would not that easily ask people (they used the algorithm as a tool), but the questions were actually key to helping achieve my goal.

What I ended up designing for my usertest was not a concept, not a ribbon or a sofa, it was an open opportunity to ask questions. It was a moment of curiosity, a moment of interaction with the world and the algorithm as a translator. It was a Mercedes Moment of mindful interaction.

Directness

I found that test participants addressed me differently from the AI, even though they were aware that there was a person behind the computer. Where they addressed me very respectfully, they ordered the AI around to do things for them in a very direct manner. This directness is found to be part of the public debate in literature research on page 24.

"The AI makes me more confident, because then I can ask"
- Participant 5

"Spontaneous finding new things is a lot of fun."
- Participant 2

"Once the confidence is there I'd always choose the five minutes for the autonomous car, and therefore 5 minutes for myself."
-Participant 4

Image 7.6: quotes user test for other findings

DISCUSSION ON USER TEST

Participants

For this usertest it was not within the limits of this thesis to do a usertest with a large group of participants with a diverse background. Even though participants are of multiple nationalities and departments, all participants are still linked to Mercedes-Benz. This might nudge results in to a direction that is too positive, or very focussed on topics that interest the Mercedes-Benz employee.

Many focal points

One of the shortcomings of this test, is that a lot of small changes were introduced at once. This was solved after the first testing iteration, where some aspects were not asked after or used anymore. But still, in the first tests, it is possible that in the limited simulation time of 10 minutes, participants had to choose what part of the test they would focus on. This was done deliberately, trying to find what experience resonated the most when sensitized for this future world, but this could have led to ineffective feedback on some aspects.

For example, no participant responded negatively on the sofa. But, because every participant was more thrilled about the verbal interaction with the AI than they were about the sofa, I did not get proper feedback on the sofa design, except that I can conclude that people did not actively dislike it.

This shortcoming could be prevented by eliminating such parameters by testing multiple times: once for the AI, once for the seat, etcetera.

Stimulation

Also interesting is the need for Stimulation during the simulation. Most participants were looking for Stimulation not in media consumption or smartphones, but they found stimulation in the newness of the AI interaction and in curiosity for their environment. I suspect this is partially due to the novelty of the simulation and the testing environment, and when in an actual autonomous car in 2040, people might grab accessible entertainment more than they did in my test.

Simulation length

Another difficult point is the length of the test: the simulation took 10 minutes, and for a car ride that is a very short time span. When car rides take longer and especially for autonomous drives it would be very interesting to see how this changes behaviour in the interior, as Participant 1 mentioned:

"For longer drives stretching is awesome, or some other position to get more comfortable."
-Participant 1, simulation test

More participants hinted they would behave differently if the ride took longer. It would be interesting to test to what extent that is true.

FN: Emotion mapping

FN REFLECTION

ON FUNDAMENTAL NEEDS FOR VALIDATION

Fundamental Needs are used as a tool to collect data through emotions, and as a lens through which data is analysed.

FN FOR COLLECTING DATA

Advantages of application

Emotion mapping uncovers FN in a structured way. The advantage is that not only expected needs are found, but if the interview is conducted through a FN lens of the researcher, unexpected findings can be recognised and explored during the test itself, leading to a rich dataset.

Disadvantages of application

It is time consuming, either leading to a very long test or allowing for only a few focal points.
This method works best when there are multiple touchpoints that evoke an emotion. When the experience is too 'normal', finding emotions can be difficult.

Recommendations

This research method is useful when a FN profile with many inspiring data points are relevant, for example through a user journey.

FN FOR ANALYSING DATA

Advantages of application

The advantage is that data analysed through a FN lens can turn a rich dataset into inspiring research: in this research there was rich qualitative data turned into a visual spider chart that gave me, a visual design thinker, a very interesting understanding of what people in the usertest were after.

Disadvantages of application

This method is very subjective, and especially the combination of subjective data and a subjective analysis can cause inaccurate findings.

Recommendations

This approach of analysing data can lead to very interesting outcomes that speaks to designers in a new design brief in an inspiring way they understand. The strength in this analysis lies in preparing this data to be input for a design phase, not necessarily for answering a hypothesis. It would be interesting to see how designers from different departments (e.g. interior, exterior, colour & trim) use these visual representations.

Implementation
on design and process

IMPLEMENTATION

CHAPTER 8: FINDING A 2030 DESIGN, PROCESS AND RECOMMENDATIONS

INTRODUCTION

All information on the table, and in this last chapter I will put it together into a 2030 EQS concept and process. In this chapter the concept is seems to be there, waiting to be found. Using various visuals and overviews, I will explain the steps to find it in this chapter.

As there is a lot of data gathered, I start this chapter with a collection of it, to explain why this design evolved in this direction.

CONTENTS

In this chapter I will show the final steps towards a 2030 intermediate design.

The user test led to a list of findings on page 106, and the context analysis from the ViP method and the Fundamental Needs leads to a storytelling conclusion on page 108.

All these findings together led to the design of the Icarus: the 2030 Mercedes-Benz design, with a highlighted feature about Mercedes Messages. I will elaborate by comparing the 2020, 2030 and 2040 designs, and then share the recommendations on design.

I also show the other result: implementations on the FN processes, and recommend further research there.

DESIGN GUIDELINES FROM USERTEST

In the final iteration, I will translate the design from 2040 (see page 75) to 2030, taking out the aspects that are too advanced and not yet acceptable. I will also implement my findings from the user test. From all data gathered I set up the following guidelines for my design.

In general:
- Allow design for mindful luxury not by physically bringing the outside in, but by emotionally bringing the people outside.

Safety:
- Lack of understanding harms the need for Security. Therefore, people have to understand the vehicle. Understanding the vehicle is possible through communication.
- When communicating, most questions fall in one of these categories: practical questions, safety questions, and exploratory questions.

Autonomy:
- People want to control something, but that does not necessarily have to be the steering wheel.
- Giving control over the AI fulfils Autonomy.
- When talking to the AI, people always tapped on the door, nowhere else.

To keep (for mission statement):
- AI: leads to confidence
- Level 4: leads to mindfullness
- Trust: leads to intimacy

To implement:
- Next to Security and Autonomy, also implement Stimulation (see page 101).
- From the mission statement: the interaction could use more control and courage (see page 94).

To remove:
- The opening in the door (see page 99).
- The sofa (see page 100).
- The full ribbon (see page 98).

THE 2040 INTERACTION

After all the research questions are answered, I sketched image 8.1 to portray the feeling of the 2040 interaction, using the usertest to support the story.

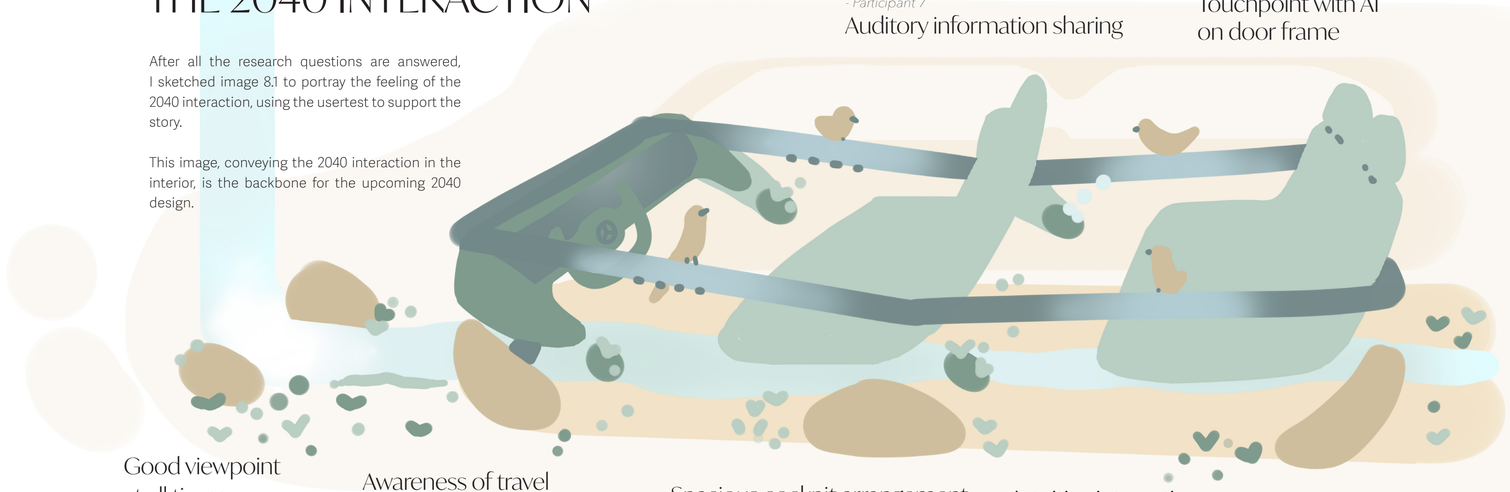
This image, conveying the 2040 interaction in the interior, is the backbone for the upcoming 2040 design.

"I would like to hear facts on the environment."
- Participant 2
If I see something I would ask something about it."
- Participant 7

Auditory information sharing

"The AI makes me more confident, because then I can ask"
- Participant 5

Touchpoint with AI on door frame



Good viewpoint at all times

"I want to be able to see the road"
- Participant 3

Awareness of travel environment

"In the city I wanted to pay attention to the surroundings. Now I can watch the nature."
- Participant 5

Spacious cockpit arrangement & No dividing center console

"Nice to know I'm not in a small space."
- Participant 2

Intuitive interaction between user and vehicle

"If it reacts to what it sees I would feel a connection."
- Participant 3

Image 8.1: 2040 interaction visualisation

FROM STORY TO DESIGN

Storytelling
Using research findings from the ViP method, the FN application and usertest.

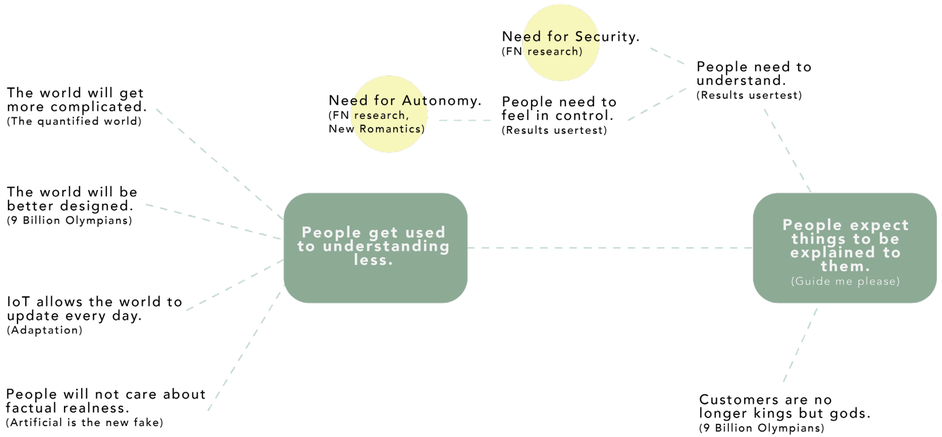


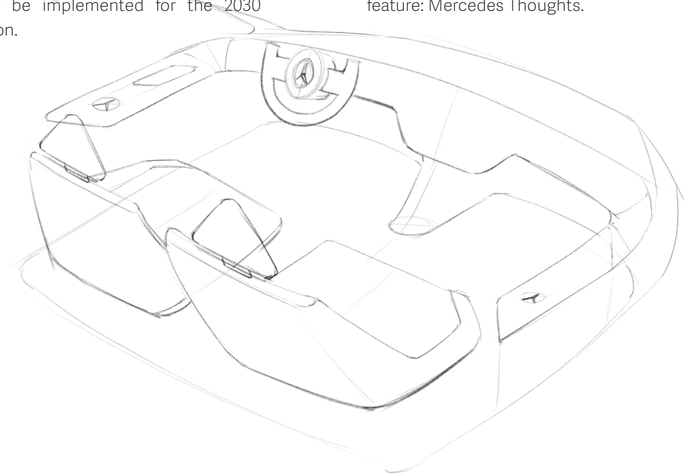
Image 8.2: the story

The story
The usertest filled out the missing pieces of information to tell a coherent and based story to Mercedes-Benz. This story is shown in visual 8.2.

This is the story from the future, predicted towards 2040, and to prepare the people for the future world this will be implemented for the 2030 recommendation.

The design
This story together with a list of implementations from the usertest is implemented into the design for a final recommended interior design.

The recommended design consists of an interior impression with a recommendation on one feature: Mercedes Thoughts.



THE 2030 DESIGN: DAEDALUS

The design guidelines from the last few pages are implemented into this 2030 design: the Daedalus.

Why Daedalus?

Daedalus is a mythological figure, a skilled craftsman and the father of Icarus. It is called Daedalus because it revolves around finding a sweet spot between focussing on your task and enjoying your surroundings: something Daedalus succeeded in flying underneath the sun.

How are design choices made?

Explanation of the design is shown in image 8.3 on the right. Implemented are parts of the previous design and design conclusions from the user test.

The interior design and the focal feature

Implementing the test results, a full design is made. However, a lot of test results are implemented on a physically small feature in the interior: the Mercedes-Benz star at both sides of the interior.

This is the Mercedes-Benz way of explaining.

People expect things to be explained to them.
(Guide me please)

This star contains a button, where three modes of messages can be controlled from the AI in the vehicle. In abstract terms this means the user can choose between the Fundamental Needs of Security, Comfort and Stimulation. More information on this feature is provided on the next page.

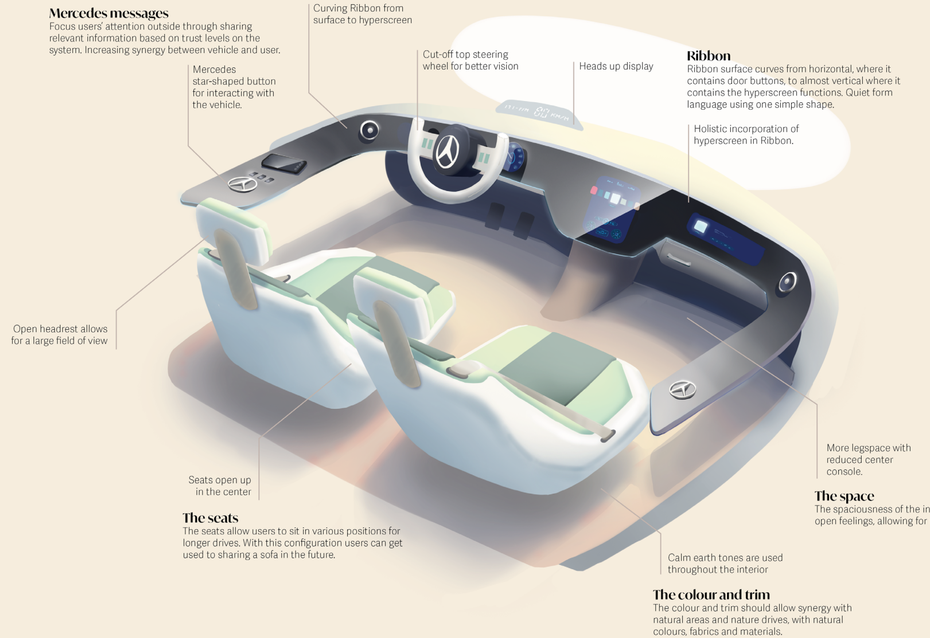


Image 8.3: Daedalus interior

DAEDALUS EXTERIOR

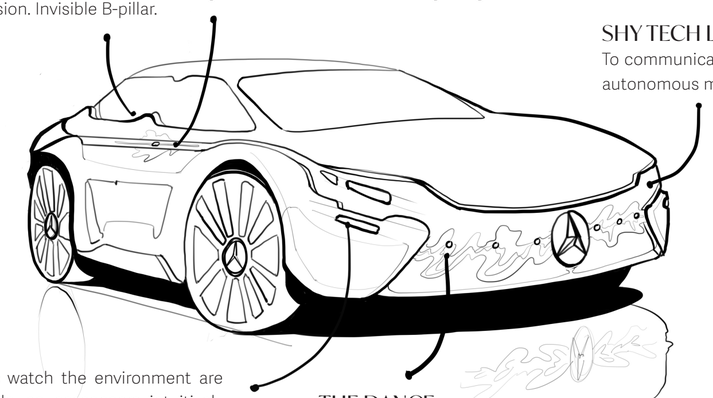
The Daedalus exterior is designed around the interaction vision as can be seen in image 8.4 and 8.5. Vision lines are shown in white.

This exterior is an example of what could fit with the interior in the context of 2030.

HIGH WINDOWS
For good vision. Invisible B-pillar.

AI TOUCHPOINT
Outside the vehicle to connect personal algorithm to the vehicle before getting in.

SHY TECH LIGHTS
To communicate with other traffic in autonomous modes



THE VISION
The sensors used to watch the environment are visible on the outside, so passengers intuitively understand the vehicle can 'see'.

THE DANCE
Entry ritual when the vehicle recognised the algorithm

Image 8.4 Daedalus exterior

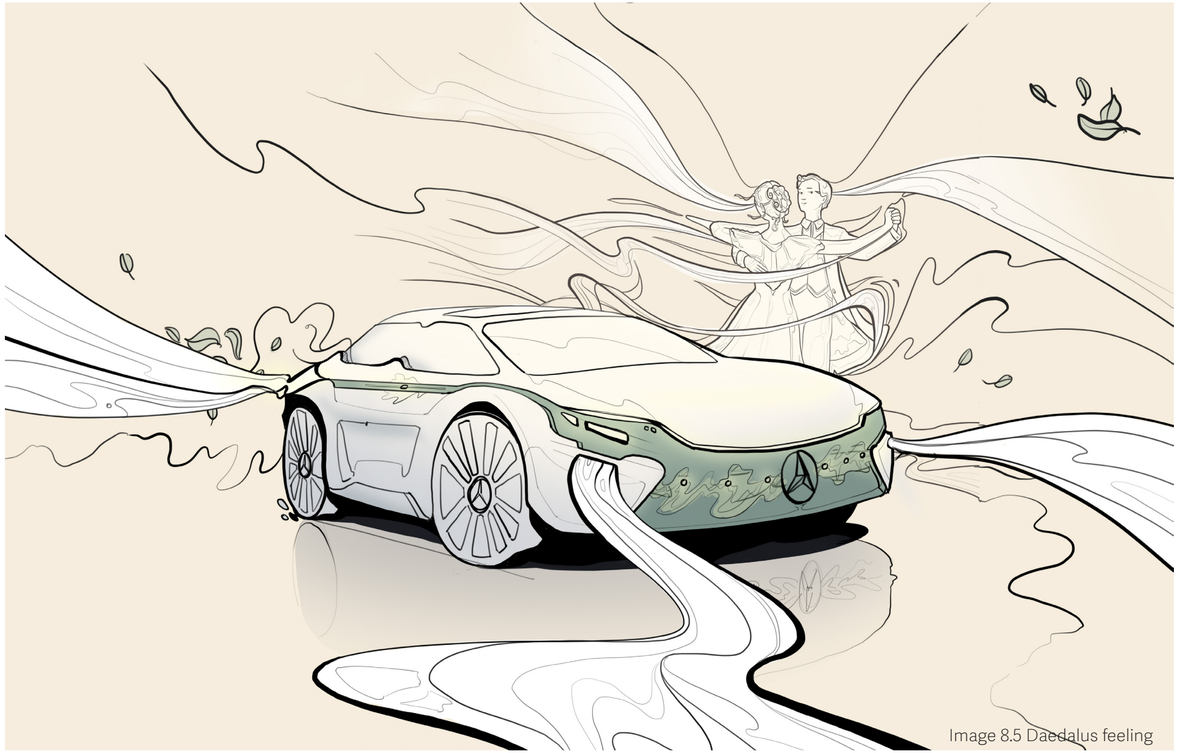


Image 8.5 Daedalus feeling

THE FEATURE: MERCEDES MESSAGES

You are stepping into your new level 4 S-class. You are not aware of the working of your new prized possession. After entering your first Autonomous area, you are reluctant to let go of the wheel. The Mercedes talks and says: "If you are curious to know what I see, press the top of the star to hear the car thoughts."

Car thoughts mode: Top

This mode offers information fulfilling the need for Security. The car explains through the built-in speakers:

- What it sees and registers, for example other cars, bends in the road.
- What it will do, for example that it will change lane, or that it will steer to the right.
- Practicalities: the tolerance, speed, etcetera.
- Route properties that involve what is expected.

You are stepping into your now familiar level 4 S-class. You have been driving around for a month. When you enter, the Mercedes says: "If you no longer have a need for car thoughts, press the bottom left button to learn how I can help with peace of mind."

Route properties mode: Bottom left

This mode offers information fulfilling the need for Comfort. The car explains:

- Expectations of the driver in time: when to drive, when to let go.
- Arrival time of the route.
- Traffic conditions.

You are stepping into your trusted level 4 S-class. You have been driving in it for 6 months, and you happily use the route properties in autonomous areas. When you enter, the Mercedes says: "If you are ready to be surprised during your autonomous drive, press the star on the bottom right."

Exploration mode: Bottom right

This mode offers information fulfilling the need for Stimulation. The car explains:

- Information on surroundings. These can be extracted from the internet.
- Over time Mercedes-Benz might create their own information collaboration with experts and companies that fit with the lifestyle of the Mercedes-Benz users.

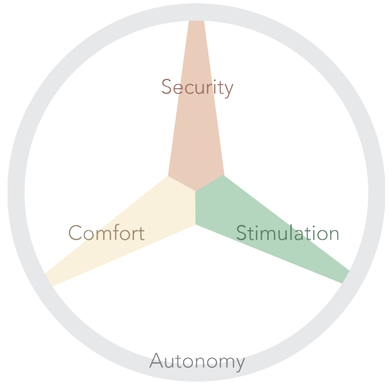


Image 8.6: Find Security, Comfort and Stimulation through communicating with the Mercedes-Benz star. Find Autonomy in your control over the AI.

Entertainment mode

For this design recommendation I decided to leave out the answers to the entertainment questions participants 8 and 9 asked during the usertest. This is done because this feature demands communication between the person and the AI that might currently cause frustration due to the low level of successful AI interactions.

Further research

For the Exploration mode specifically, it would be very interesting to look at a collaboration with a company that has GPS data about interesting locations so that thrilling facts and stories can be shared at the right time.

Another option to fit with the luxurious image of Mercedes-Benz is to ask intellectual experts to voice their stories and opinions on the locations the Exploration mode talks about.

THE MERCEDES MOMENT

WELLBEING

Through this design, I captured the moment of synergy, control and understanding that was experienced by participants during the user test. I aim to recreate a valuable Mercedes Moment.

Step towards Wellbeing

This will be a moment of mindfulness in a busy world, afforded through control (Autonomy), understanding (Security) and curiosity into the surroundings (Stimulation). This is a moment that will bring the Mercedes-Benz user of the future closer to wellbeing.

Image 8.7 captures the feeling of this moment in the interior.

SUSTAINABILITY

The research into sustainability (page 22) shows that a different mindset might be necessary in the automotive industry. The Mercedes Moment might be a stepping stone towards that mindset.

Limiting use of personal mobility and designing cars for longer use is a partial solution for the climate problems (page 22). This Mercedes Moment can help users take the step out of their comfort zone towards shared mobility.

The role of Mercedes Messages

The Mercedes Messages are designed in such a way that they do not have to be limited to the interior of the car. The Mercedes Messages can be taken with users into other vehicles. This could be shared mobility, using your personal Mercedes Messages in a different car, learning if that car sees different things than your own. Or perhaps even using Mercedes Messages in the train, learning about the environment of the train ride.

The message modes are designed in such a way that they offer valuable information regardless of what mode of transportation is used.

Step towards MaaS

I believe Mercedes-Benz users **deserve a Mercedes Moment** when they make a **sustainable choice** by taking the train. The understanding and control provided in the Mercedes Moment can broaden horizons and invite users to take the train.

This could be a step towards seeing mobility as a system that embraces sustainable choices.

Image 8.7 Daedalus interior feeling

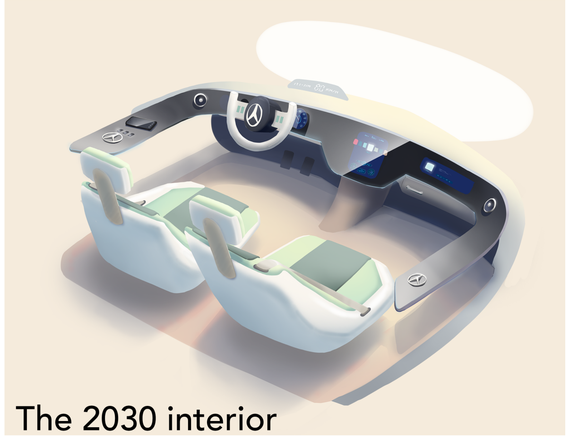
COMPARISON

The three images on the right show the flow from the 2020 interior, to the 2030 interior, to the 2040 interior. This shows that the 2030 interior is a step between the busy and stimulating interior of 2020 and the calm and elegant 2040 interior.

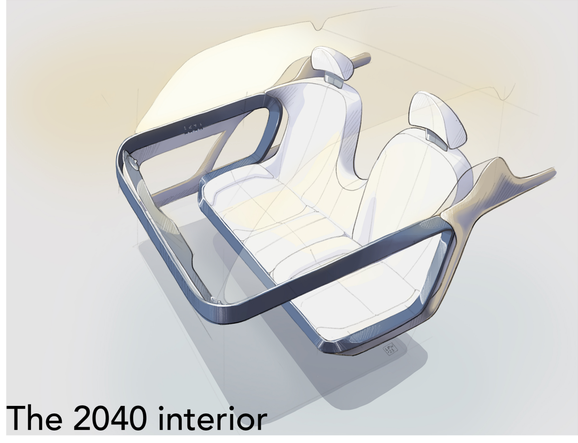
The Mercedes-Benz interior design over time

The 2020 interior, 2030 interior and 2040 interior.

The 2020 interior contains lots of stimuli in the form of light, textures, and spacing. The room feels small from the waist down due to the present center console.



The 2030 interior moves towards an interior with less stimuli, for example through a simpler curving hyperscreen. The center console is replaced by open space to move. The two separated chairs show unity in their shape.



The 2040 interior is elegant and allows for a focus on the trip and surroundings. The busy and present stimuli from the 2020 are reduced to a simple and calm form language through shy tech. The entire cockpit area is now open, and the two chairs are merged together.

Image 8.8 Interior comparisons

FN REFLECTION

ON FUNDAMENTAL NEEDS FOR PROCESSES

Fundamental Needs are used at mutliple points in the design process. What are the advantages and disadvantages of multiple FN applications in one process?

Advantages of application

Using FN at multiple points first has the simple advantage of a better skilled researcher at the end of the process: each time the needs are applied, skill and understanding increases.

The clearest advantage I experienced is the communication that is offered by Fundamental Needs. User experiences are always subjective and can differ from user to designer to manager, but Fundamental Needs are relatively objective, making them suitable to communicate findings, goals and ambitions to other designers, researchers and colleagues.

Another advantage of applying Fundamental Needs is that earlier data can be used to compare and re-evaluate missions, strategies, and guidelines. This is what I did multiple times in my design process when the focus shifted from a set of needs to another one. For example, at the end of this thesis, Stimulation turned out to play a role in my test. Instead of starting anew, or instead of just changing a small thing, from the perspective of a designer I could re-evaluate the synergy between the three FN (Autonomy, Security and Stimulation) and adjust with a clear goal in mind.

Disadvantages of application

The disadvantage of this application lies in its subjectivity and time consuming nature. The subjectivity leads to low repeatability from a scientific point of view. The large time frame that is needed for implementing FN can be sped up with experience, but the user testing cannot be done faster. This might make other methods better fitting when the project is on a tight schedule.

Recommendations on the full process

The time consuming nature of this application through the entire process is, in the end, a case of money and efficiency. Then the question is: can the relatively large amount of time spent on this approach be spent another way, with the same inspiring and accurate outcome? This would be a case for further research. It might be that other, faster, UX research might inspire just as well.

Recommendations on possible focal point

If I were to recommend one focal point for FN research for Mercedes-Benz to look into, I would recommend using FN to predict the needs profile of the future. That is the FN application that gave me a head start on what to design for, and if I missed that step, I think I would not have been able to create a story with such resonance to the context.

2030 DESIGN RECOMMENDATION

The 2030 design is research-based with multiple iterations and one thorough user test. There are points of this design that could be researched or tested further, and I will get into them on this page.

Buttons (modes of communication)

Based on the future research in to future FN priorities, Stimulation will already be fulfilled of the people of the future. Based on the ViP approach tactile information is preferred over pure audio or pure visual information. These two factors together make it interesting to research how the amount of physical buttons and options could be optimised.

One suggestion is to redesign the car to contain more physical buttons at places that enforce haptic and intuitive use, like the knobs on the sides of chairs do now. Or perhaps investigate the use of invisible haptic knobs linked to shy tech that visually portrays what the button does.

Surroundings

This design is tested in a usertest where I learned that the environment greatly affects how curious people are on the environment. Most participants responded positively on looking outside when driving in the nature area, the same time most participants started asking questions about the surroundings.

What would happen if the drive takes place in a busy city, or an industrial area? Would people even be tempted to learn about their surroundings? Perhaps users of the vehicle are not at all interested in looking outside. This is a situation I have not tested, but the results could be valuable to strengthen the implementation of mindfullness in the interior.

Mercedes Messages feature

I defined four question categories in my usertest and decided to focus on three of those for the Mercedes Messages feature design. However, the usertest took place in a short timespan, with a small participant sample.

It could be interesting to see if people who are in the car for longer, ask different questions. Or if people from other cultures want to know different things before trusting the car. I would also suggest researching the timespan between going from one message mode to the next, or if some people would rather stay in one message mode once they understand it well.

Applying AI

The last recommendation is on using the users' AI to increase the accuracy of the messages once the exploration mode is achieved: does the AI people have in 7 years time already have that kind of information? Is it legally and socially acceptable to implement that knowledge in the use of the car?

PERSONAL REFLECTION

After designing, learning, and practicing with Mercedes-Benz for the duration of this thesis, I curated a set of personal findings and opinions I will share on this page.

Wake up call

In this thesis I argue the future of mobility is electrified, autonomous, shared, connected and yearly updated (de Jong, 2019). After writing this thesis, I know that this is a half-truth: the future of mobility might be all those things, but most important: the future of mobility will be **less**. Less driving, less cars, less energy consuming mobility. Along that line I argue the future of mobility might even go through a wire: we can already host meetings through the internet, why not go on a digital vacation? In my opinion, defining 'movement' as vehicles is a limited view on what movement means, and how it might be designed in the future. Personally, **I will be more aware of the needs people have that are being met by movement**, not just vehicles, to broaden my design horizon.

Future orientation

Next to the sustainable point of view, I also believe research into the future and basing designs on facts is essential in any industry. Especially in the automotive industry with long manufacturing times, predicting ahead is key to create fitting design.

This experience has shown me that future oriented research, especially when also taking HCD into account, is the exception in the industry. I believe that futureproof and human-centered design leads to a better world, so I suggest: let's design for the real stakeholder for the EQS right now: the Mercedes-Benz user of 2040.

I now know that my passion lies with finding facts in a situation that is as complicated as predicting the future, and in my next project I will be more prepared for convincing others of it too.

ACKNOWLEDGEMENTS

I would like to thank Jan from Mercedes-Benz for the philosophical input and the motivational push any student wishes for in a client. I would like to thank Alissa, Laura and David to be the peers to have discussions with that get the design process going. And last, I would like to thank the RD/KII team for offering support and the warm welcome into the German culture.

I would like to thank Elmer and Susie for the support, the tips, the push I needed and the open approach to all my plans.

Lastly, Simon and Judith, thank you for being such cheerleaders. This thesis would not be here in such a good looking state without you.

Appendix A: sources
Appendix B: project brief

APPENDIX A
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APPENDIX B
Project brief

DESIGN FOR our future

TU Delft

IDE Master Graduation
Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Peeters Weem
initials:
student number:
street & no.:
zipcode & city:
country:
phone:
email:

Your master programme (only select the options that apply to you):
IDE master(s): IPD / DfI / SPD
2nd non-IDE master:
individual programme: (give date of approval)
honours programme: Honours Programme Master
specialisation / annotation: Medisign / Tech. in Sustainable Design / Entrepeneurship

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: E.D. van Grondelle — dept. / section: HDC/DA
** mentor: S.C.M. Brand-de Groot — dept. / section: HCD
2nd mentor: J. Fischer
organisation: Mercedes-Benz AG
city: Sindelfingen — country: Germany
comments (optional):

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v.
Second mentor only applies in case the assignment is hosted by an external organisation.
Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

TU Delft

Procedural Checks - IDE Master Graduation

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair E.D. van Grondelle date 22 - 11 - 2022 signature

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 37 = 37 EC
Of which, taking the conditional requirements into account, can be part of the exam programme: 32 EC
List of electives obtained before the third semester without approval of the BoE:

YES all 1st year master courses passed
NO missing 1st year master courses are.

name C. van der Bunt date 02 - 12 - 2022 signature

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: V APPROVED / NOT APPROVED
Procedure: V APPROVED / NOT APPROVED
comments

name Monique von Morgen date - KE 13 /12 /2022 signature MvM

Initials & Name C.E. Peeters Weem Student number 4536185
Title of Project Designing adaptive interior for wellbeing in the mobility of the future

TUDelft

Personal Project Brief - IDE Master Graduation

Designing adaptive interior for wellbeing in the mobility of the future — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 05 - 10 - 2022 — 20 - 03 - 2022 end date

INTRODUCTION **
Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money, ..), technology, ...).

When designing a vehicle we only have a limited chance to make it a good and fitting design. Once the vehicle is on the road, the design is done. I think in the future, this idea will be old-fashioned. The design of the interior should be adapted to the passenger, not only once by the designer, but continually, through the life cycle of the car.

This idea started with a software-inspired change in consumer expectations, where services continually update to fit new trends, new users, and a new world. Such a service continually evolves and adapts around the person using the product. Think about what that could mean- if we adapt a car interior we can increase the lifespan of a car, increasing the sustainability. It can mean new business models. New ways of travelling. But how can we use some form of interior adaptation to actually mean more wellbeing for the users of the Mercedes-Benz? Image 1 shows an example of multiple needs a Mercedes-Benz can fulfil at different points in time.

My goal is to create the adaptive interior of the future, designed for wellbeing. I design for the mobility of the future, with a final focus on the year 2030. To do my research, I will look further into the future. Of course the main stakeholder will be the Mercedes-Benz driver, about whom I learned they value luxury. This luxury, or how I know this luxury right now, consists of details and the atmosphere of the car, and the high quality with which it is produced. The driver is closely linked to the company as a stakeholder: Mercedes-Benz. With their brand image they affect the people inside the car, and the brand image itself is affected by the design of the interior, and this should therefore be taken into account.
The other important stakeholders are passengers in the Mercedes-Benz cars and traffic users (see below). Interesting is how these passengers affect adaptation in the vehicle: who makes the choice for adaptation when multiple people drive in a car, and how does adaptation affect the other passengers?
There are of course more stakeholders- other traffic users, I will research their impact on my thesis during the process. See image 2 for a visualization of my stakeholder boundaries during this thesis.

I hope to bring something new by thoroughly researching updates and adaptations in the interior, together with human-centeredness. That way, I bring a novel viewpoint rooted in knowledge. There are many limitations, first of which being the physical package of the car, but also the safety rules, the money it costs to update an interior and keep the high Mercedes-Benz quality, and I will definitely find more.

For the technological opportunities, I do wish to look further than just software. I think only designing adaptation in software, e.g. a customer profile, is not enough.
The time for the final design is approximately 2030. This gives me a large solution space when it comes to time. I will design for a platform and whether the technology will be designed for an S-class or another will be decided later on, making money not a very limiting factor. An important thing to keep in mind is that I have to keep the luxurious atmosphere within the Mercedes-Benz vehicles intact, that is a challenge I accept.

space available for images / figures on next page

TUDelft

Personal Project Brief - IDE Master Graduation

introduction (continued): space for images

image / figure 1: People need different things based on their needs, and their needs change per year, month, day.

image / figure 2: Included and excluded stakeholder overview

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Personal Project Brief - IDE Master Graduation

PROBLEM DEFINITION **
Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The problem statement is, in short: design for wellbeing applied in a car interior, using a short version of VIP as a solid foundation.

The clearest scope of my project is the interior of the car. The red line through my graduation is the Design for Emotion mindset that I will bring onto the table. The interior of the car has to add an intended emotion to the experience one of the passengers has. I will not limit my scope of the project to one of the passengers now, but it might be that I only focus on the driver or certain passengers.

Another limitation on my scope that I will soon learn about is the Mercedes-Benz driver and passenger. The boundary between driver and passenger might change quickly in the future, and I will have to research what fits best as a focus for my thesis.

The solution space is also to be found in this interior intrinsically or will be interacted with in the interior of the car. However, a car interior already contains a lot, and I do not necessarily intend to add another product. My solution might also turn out to be an idea, a different orientation or application of already existing parts of the car.

The solution space of this project will be a concept that is verifiable. I will not build a full render if that is not necessary to test the concept. The concept will viable, desirable and feasible, but depending on the concept I might not even build a complete or lookalike prototype. I do aim for building a model, but only if the chosen design direction fits that. If what I design is service-based or digital, I will prototype in such a manner that the solution is clear for the audience and testable for participants in my user tests.

ASSIGNMENT **
State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas. ... . In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

I will research mobility of the future, many years ahead and after that with a focus on 2030, in a large context using a version on VIP with extra focus on wellbeing and adaptation. I will research how this is currently used in interiors and new ways this might be possible. I will research how wellbeing is currently applied in the industry, and how wellbeing and vehicles affect each other. I will generate a large variety of ideas from day one on, and I will create future visions.

I aim to deliver a product, or a product-service idea, or a concept about a new coherence in a car interior. The solution I expect will be fitting to the Fundamental Needs of the Mercedes-Benz user. I do not aim to deliver a solution that is software-only.

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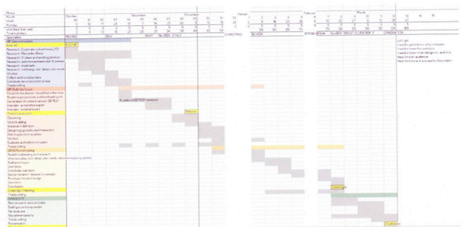
Personal Project Brief - IDE Master Graduation

PLANNING AND APPROACH **
Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 5 - 10 - 2022 — 20 - 3 - 2022 end date



This is my current GANTT chart. I will update this chart weekly or bi-weekly.

TU Delft

Personal Project Brief - IDE Master Graduation

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

Primary learning objectives

1. IDENTITY SKILL: I want to be worthy of the title: future mobility designer. For that, I want to learn to function well within a large, professional corporate environment. I want to learn to pitch ideas professionally. To achieve this learning objective, I moved to Sindelfingen to learn as much as possible from as many automotive designers as I can.
1. METHOD SKILL : I want to improve my skill to apply VIP and EM research on my own. I am eager to learn what it means to be a researcher on your own for months. To achieve this learning objective I will spar with other students over time to see if there are any gaps or things missing in my research.
2. MANAGEMENT SKILL: I want learn manage a project, be it my own, smoothly within a short timespan. This does not only mean time-management, but this also checking my wellbeing, networking, and generating enough interesting work. To achieve this learning objective I will spend one hour each week to reflect on my work.
3. WORK WITH STRENGTH: I want to develop my skill to create a 'goosebump moment'- a story, a render, a VR experience, a model, a drawing, anything will do but I can do more than just drawing nice things and I will prove it.
4. WORK ON WEAKNESS: I want to develop my prototyping skill by working with and like other testers. I want to see how professionals build test models and tests. To achieve this, I will build and use a network to learn from.
5. WORK TO SHOW: I want to develop the skill of creating an end result that I can show in my portfolio and use to network with or prove my skills with. I want to be proud of because it fits the vision and context of use well.

Secondary learning objectives

1. IS MOBILITY FOR ME: I want to learn more about real automotive design- what is the hardest about the design? How does the job change over the timespan of designing a car? I want to learn whether this industry fits me.
2. SUSTAINABILITY: With this project I will bring sustainability and especially the short life cycle of cars to the table and hopefully probe ideas for cars to last longer through a life-cycle. I am eager to learn how to convince others to join me in this goal and to support my direction for graduation.
3. VISIONARY VIP: I want develop the skill to use VIP in a more visionary perspective. I want to learn how to build visions and how to put them to use.
4. GET TO KNOW JOBS: I need to find out what job fits me best after graduating. I have already seen what working in a small company is like with my internship. Now, I want to learn what a large company is like. I also want to learn about working as a consultant, and to get to know more I want to plan interviews with people in various consulting positions. I also want to learn how I feel about doing research on my own, as I am also interested in doing a PhD.
5. NETWORKING
I want to develop my networking skill in a big company and I want to start building my network in this industry. I think I need to learn a lot about networking, and I will spend a few hours each week finding conversations with colleagues to practice networking.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

I have moved to Sindelfingen, Germany for this internship. This means I will spend time to get to know the new corporate culture, the language, and my way around the company and my new (temporary) life. I am sure this immersion will affect my design in a positive way.

Initials & Name C.E. Peeters Weem Student number 4536185

Title of Project Designing adaptive interior for wellbeing in the mobility of the future