Master Thesis

Porsche sports car mobility in a future, heading towards automation

A 2035 vision, answering to a mobility paradigm shift

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Delft, December 2018

Delft University of Technology
Faculty Industrial Design Engineering
Master Integrated Product Design

Porsche Sports Car Mobility in a Future, heading towards Automation

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Disclaimer

This master thesis is written in context of the master Integrated Product Design at the faculty of Industrial Design Engineering at the Delft University of Technology in The Netherlands.

Delft, December 2018

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TU Delft PORSCHE

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Preface

In front of you lies my master thesis, which I wrote in context of my graduation project for the master Integrated Product Design at the Faculty of Industrial Design Engineering at the Delft University of Technology. Due to the fact that I had the opportunity to gain valuable industry experience through an internship at Porsche's design studio in the six months prior to my Master Thesis, I created a well considered opinion on how projects are structured and approached. Next to that, I learned about the way people work and interact with each other in the design studio. Without questioning Porsche's great output-quality, I noticed that within bigger projects, design phases sometimes (in my opinion) have a lack of overlap. Subsequently, the danger exists that teams fail to pass on (and preserve) all knowledge gained to each other. Inspired by this observation, I saw an opportunity to implement the 'ViP-Method' (Vision in Product design) into my project and Porsche's design studio. By doing so, I wanted to show the designers around me a new way of working and show my idea's about implementing structure in and between design phases. Having used this method before in an academic environment I felt confident about this holistic design approach. Even though I still strongly believe in the power of the implemented method, I did not foresee how difficult it would be to be "sandwiched" between a company where project approaches are shaped by industry experience and a faculty, expecting an academic approach. Aiming on improving my skills as a car designer I expected to improve most on my skillset based around sketching and styling. This was a logical assumption, considering the amount of talented designers in the studio. Looking back at my time at Porsche I can safely say I made a lot progress as a designer. What I did not foresee was the reason why. Being new to the industry, the focus of the project shifted heavily towards being the manager of my own project. Conducting a project this size in a relatively new field there, was a huge variety of hurdles to take. Getting acqainted with all the exiting steps involved in getting the project to a 3d modelled design vision resulted in the fact that I felt like a manager of my own project. The focus shifted heavily to time management and handling a budget in the most tactical way possible. Futhermore, coordinating modelers and people from different area's of expertise was a truly interesting experience. If I would be able to redo the project I would probably change more than half of it's content. This might sound negative, but it is a great thing. I have learned so much and will be able to avoid a lot of mistakes in my future projects.

Acknowledgements

Many people have supported me during the completion of my graduation project. This project would not have been possible without their help. I would like to thank the following people for all their support and meaningful involvement in the project.

Elmer Thank you for your support and guidance. Not only throughout my Master Thesis but over the last couple years. I have always experienced your rational approach to problems and critical way of thinking as helpful and inspiring.

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Anke Thank for being such a kind and helpful mentor throughout my internship and Master Thesis. Sharing your experience and knowledge over the last year about Porsche and the car industry in general helped me to develop myself as a designer and gave clear insights on what is expected from an automotive designer. I always enjoyed to exchange thoughts and learn from the way you look at projects and things that happened in the studio.

Gantimur You gave me the freedom and trust to execute the project the way I saw fit at the time. Even if there might have been topics, more suitable to the UX and Hardware design department. Thank you for supporting me in this.

Doeke Despite your crazy schedule, you still managed to find the time to give valuable input, share your creative way of thinking and your enthusiasm for design with me. Over the last year I learned a lot from our interesting conversations and the way you work.

Nora Thank you for always being there for me. Last half year was not easy. You were always patient with me in stressful times and I could always rely on your support.

My Parents, Isolde & René Thank you for all the support throughout my years of studying. You gave me the opportunity, freedom and help to develop myself to the person I am today.

The Porsche Design Studio I want to thank all of you for always being willing to help. Your willingness to share information, skills and knowledge about all of your different professions helped me learn a lot last year. This will always stay a positive memory about the way I experienced working inside the studio for a year.

Executive Summary

This report contains a design proposal for a 2035 Porsche sports car vision that reacts on a future mobility paradigm shift towards fully automated transportation (Autonomous level 5). The prospect of this upcoming change in mobility as we know it today already results in a substantial amount of companies that is investing time and money in research projects. By doing so, they are focussing on revolutionizing the car industry by designing and developing these type of vehicles. Looking at this mobility paradigm shift from a generational standpoint, it is noticed that the end of a timeframe where the vast majority of sports car buyers are from a category called 'The babyboomers' is coming to an end. By setting the timeframe for this project to 2035, the targeted group of potential future buyers are nowadays referred to as millennials. In this project, the substantial differences between these two groups are used as a base to learn more about the future customer.

PROBLEM

Full automation of vehicles is not a problem for the mobility industry in general. It can actually solve a substantial amount of problems that are occurring every day (e.g: road safety or traffic jams). The majority of car owners think of owning and driving a car as a means to an end. It is the fastest and most convenient way of moving from A to B. Since the majority of today's car owners is convenience driven, these type of drivers have what is referred to as a 'rational' way of thinking about mobility and therefore see their vehicle as a tool that offers flexibility and freedom. Subsequently, full automation - leading to the ultimate convenience of being transported from door to door while remaining the freedom to focus on other things than driving - can be assumed to be a warm welcome to the average car user. There is however a target group that considers cars to be more than just functional. In their case it is just as much about the pleasure of driving as it is about a practical way of moving from A to B. In their case, the way they think about cars has a strong emotional aspect to it. Finding themselves in a niche market that focusses on luxurious and fast sports cars, Porsche mainly focusses on offering the most sportive vehicle in every segment. This is something they have always done and most likely will continue doing. Therefore the current prospect of an industry that is moving towards the realization of self-driving vehicles is not an easy issue for a brand like Porsche. It is something that runs contrary to their core values of existence and creates serious questions about how they should answer to a situation like this without neglecting their brand identity.

DESIGN

Consulted by Porsche's design studio in Weissach (Germany), the design proposal in this thesis shows a vision on how Porsche as a brand can position themselves in an automated and convenience-driven future. The concept focusses on offering future sports car drivers a unique, emotional and foremost a Porsche typical driving experience, allowing the user to focus on the road and forget about the interior as an object. Instead, the vehicle is approached from a holistic point of view. By integrating as many functions as possible into a steering module, a highly simplified and new interpretation of sportive driving has been designed while trying to maintain as much brand DNA as possible.

EVALUATION

After validating the vision by presenting the physical form via sketches, renders and a virtual reality experience, it is concluded that the design has the potential to enter a follow-up design phase in which it can be improved into a brand unique future sports car experience. Furthermore, various designers from Porsche's Design Studio confirmed that the vision is a unique and fresh take on future sports car mobility and that the way function was translated into form via a method that was until today unknown to them.

Readers Guide

PROCESS STRUCTURE

During this Thesis, structure was provided to the project, using the 'Vision in Product Design - method' (from now on referred to as: 'ViP-Method'). ViP is a method that supports innovators of any kind to 'design' the vision - the reason of being - underlying their design. This vision is rooted in a deliberately constructed future world.

The way the process is structured is illustrated on the facing page (figure 1). the process is divided into two main phases. In the first phase the focus lies on analyzing and deconstructing the brand, the product and the way people behave in and around the product. The second phase focusses on the same principles, only now the foreseen future context and the desired future behavior help the designer to frame the future product and create, like mentioned earlier, 'the reason of being'.

REPORT STRUCTURE

The report is devided into several different phases, following the basic frame of the method explained in the previous section (figure1).

Chapters are separated by sections (Darker toned pages), containing a brief introduction, an explanation of the chapter's relevance in relation to the project and the main objective.

If necessary, chapters and/or paragraphs contain a conclusion and/or are ended with design implications. The symbols being used for this purpose are shown and explained below:

A **'Conclusion'** section is indicated as:

As where **'Design Implications'** are indicated as:

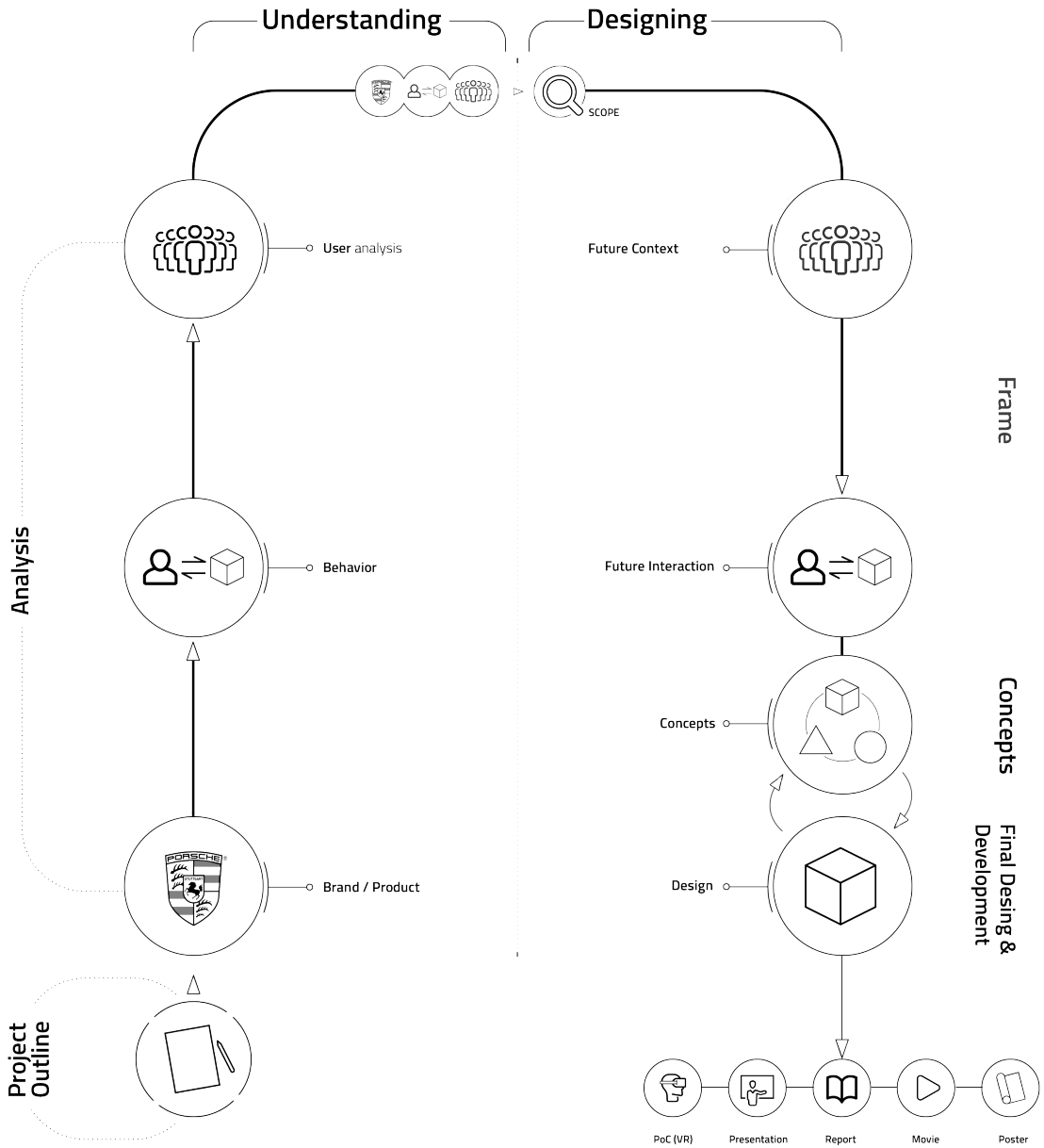

FIGURE 1 visual representation of the project structure

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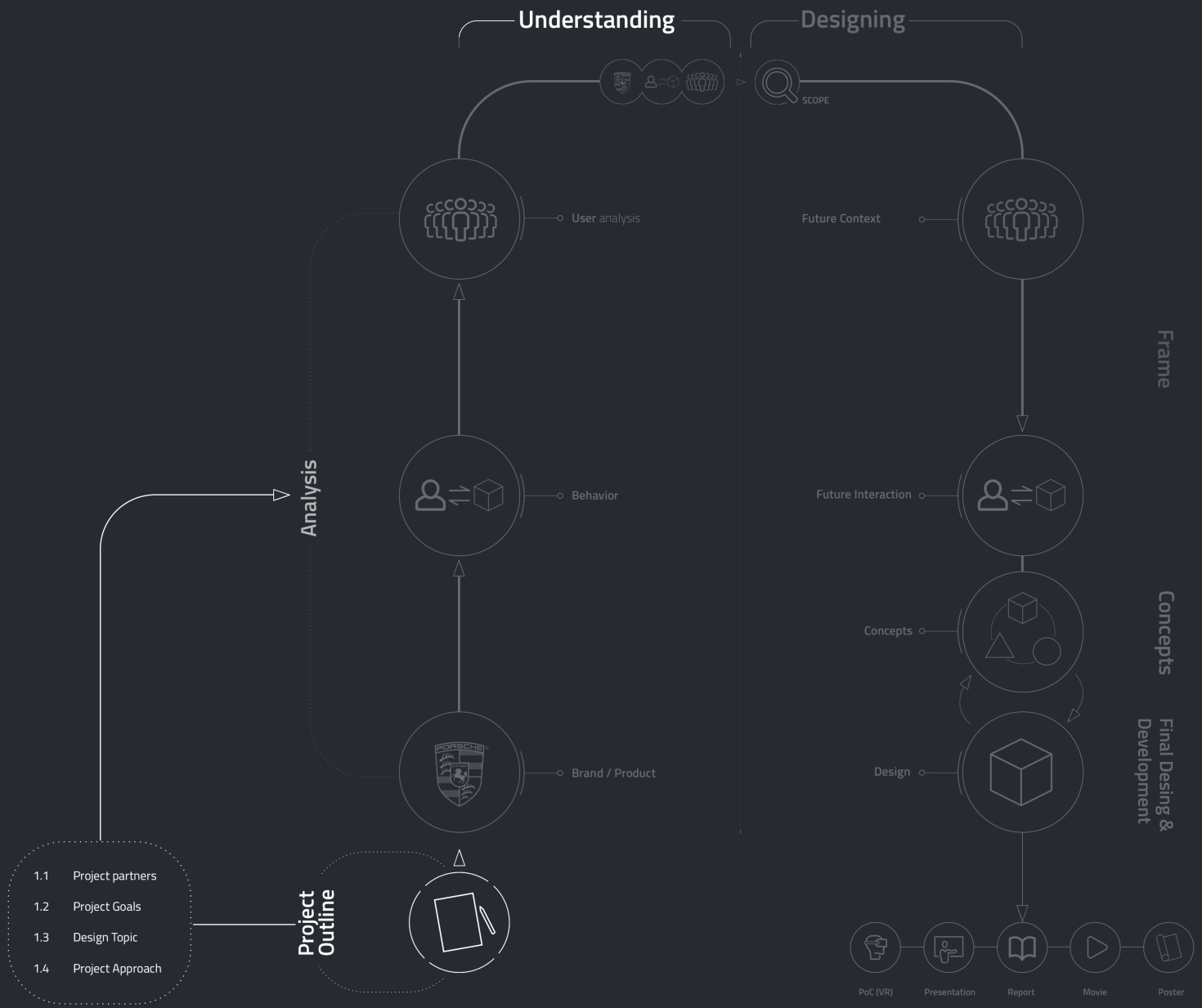
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1 Project Outline

The following section is designed to make the reader acquainted with the general structure of the project and this report. It provides information about both parties involved, the main project objective and eloborates more on the design topic. In conclusion, this chapter offers an in depth explanation about the method used.

1.1 Project Partners

This Thesis project has arisen in collaboration with two different parties involved. The following part describes the role of both the Technological University of Delft and Porsche AG within this project.

PORSCHE

Dr.-Ing. h.c. F. Porsche AG, usually shortened to Porsche AG is a German automobile manufacturer that was founded 87 years ago (1931). The company is specialized in high-performance sports cars, SUV's and sedans. Porsche AG is headquartered in Stuttgart, and is owned by Volkswagen AG, which is itself majority-owned by Porsche Automobil Holding SE.

Their Development Centre in Weissach houses roughly 7500 residents and is the place where every model is developed from the initial idea to the finished design since 1971.

ROLE

Porsche AG is the facilitator of the project. They provided the working place of the project at their design studio in Weissach. Furthermore, different departments of their design studio played a consulting role within the project. Both on a strategic and a design level. The advise given by specialists insured that the project could be realized in a professional way.

TU Delft

Delft University of technology is the educational institute for which this graduation project is executed. More specifically, the project is conducted at the faculty of Industrial Design Engineering (IDE) within the context of the master track Integrated Product Design (IPD).

ROLE

The Technical University of Delft is the academic Authority in this project. Their role is to offer guidance when needed and offer constructive criticism in order to guarentee the project is properly carried out. In the end, their role is to assess the final result from an academic point of view.


TUDelft
PORSCHE

1.2 Project Goals

The goal of the project is to inspire both Porsche's design studio and the Technical University of Delft (from now on reffered to as: 'TU Delft') by presenting a personal vision on a topic that is relevant to Porsche as a company. Discussed on forehand is the fact that Porsche requested a feasible product that is consistent with the predetermined timeframe (2035). This prevented the project to be either to abstract, or unclear. It is therefore expected from both parties involved that the correct reasoning is applied throughout the project. The strength of the project should lie in how a vision for the future - created, based upon proper research and method - is demonstrated in a styling proposal that is presented via sketches, renders and a virtual reality experience.

1.3 Design Topic

The car industry is heading towards the realization of self-driving cars. Subsequently, many companies are already investing serious time and money in research projects, focussing on revolutionizing the car industry by developing automated vehicles. Porsche has allowed me to choose my topic freely, but expressed the preference to stay away from autonomous vehicle design. Instead they challenged me to find something that lies within the core values of the company and brand. I decided to design a vehicle that has a very high demand for a driver, in a timeframe where mobility is heading towards a paradigm shift (automation). The design topic houses four components: the product, the time, the focus and the target group.

1.3.1 THE PRODUCT

A future sports car, focussing on a brand authentic driving experience.

Porsche states that every Porsche is a sports car, no matter the segment or the type of engine (Porsche AG, 2018). Nevertheless, their higher segment cars have a higher implementation of lifestyle elements, focussing on making traveling from A to B more comfortable, enjoyable and suitable for a bigger target group. Although this is a logical step in an industry like today, this 2035 Porsche vision project stays out of this grey area of mixing rational mobility with sports car mobility and focusses on segments with a stronger connection to earlier models: cars that are track born and offer an irrational and fun way of mobility.

1.3.2 THE TIME

2035

The year this project focusses on is 2035. The choice for 2035 is mainly based on two different factors:

1. The pace in which technology that focusses on automation of vehicles is developing.
2. The target group (Clarified more in the next section: 'Target Group')

Since this project is meant to be a reaction on a mobility paradigm shift towards autonomous driving, the vehicle can only be situated in a context where level 5 autonomous vehicles are existing and reached a stage of commerical production. Research learns that there are five different stages of autonomous driving (Fortuna, 2018):

Level 0 - No automation: Fully human level.

Level 1 - Driver Assistance: Possibility to call upon driving assisting technology (E.g.: Cruise control)

Level 2 - Partial Automation: One assistance system is automated (Control of steering and speed simultaneously, Lane assist)

Level 3 - Conditional Automation: Ability of transferring safety-critical functions to the vehicle.

Level 4 - High Automation: Vehicle is capable of performing all driving functions under certain conditions.

Level 5 - Full Automation: Vehicle is capable of performing all driving functions under all conditions.

It is predicted that fully autonomous cars (Level 5) will enter the market in the year 2020. By the year 2030 it is expected that self driving cars have found widespread adoption (Jaffe 2014).

1.3.3 TARGET GROUP

2035 Millennials (Generation Y)

At the moment, Porsche has a relatively old customer base. Over the last years a significant increase in age showed. Looking closer at this rise in age, it shows that the average age has grown just as much as the amount of years. From a generation point of view it became clear that the majority of porsche owners are baby-boomers. Although this is a logical phenomenon, concerning the price of the vehicles, it is logical that not everybody can afford a Porsche. In order to address a younger future customer I decided to set the age to 45 in 2035. Meaning right now, these people are addressed to as millennials.

1.3.4 THE FOCUS

Driving oriented Interior

The project was conducted in the User Experience and Hardware department. As a part of the overall interior department within the studio, the focus laid on creating an interior vision. Key in this vision is that it should have a strong focus on driving yourself. Like mentioned in the section about the project's timeframe, the decision was made to design an inspiring interior that forms a contrast to what is happening in the autonomous industry. Within the interior, the aim is to implement technology that is feasible in the future to solve problems in a new way. By doing so, the focus of the product should lie in how the driver experiences speed and driving.

1.4 Method / Project Approach

This section offers a point by point explanation of the addressed phases in the project. Figure 1.1 shows a visual representation of the method. further clarified in the section below.

ANALYSIS

Since the project started with a relatively undefined topic, the analysis aims to further specify the eventual design direction (the project scope). When faced with a design assignment - whether it is your own or brought to the designer by a client - it is inevitable that existing designs pop into your mind (Hekkert & van Dijk, 2011). These designs were solutions to the problem as it was once stated. Before immediately starting the design process by (re)defining the scope it is helpful to initiate the project with an analysis of these familiar, existing solutions.The analysis focusses on three different phases.

1. **Brand** - Defining important brand and company values & Design DNA.
2. **Interaction** - Analyzing the interaction/relationship between the product and the user.
3. **User** - Learn about current user and define future user.

1.4.1 BRAND

Via an internal brand analysis and various field researches a deeper understanding about the brand/company's most important values is established. The internal analysis describes the most important factors in Porsche's brand model which explains Porsche's main design principles. As a follow-up, the exterior and interior design DNA are investigated. Since the focus of the project is especially on designing an interior vision, an extensive field research which focusses on finding and describing the most important interior design DNA components of the brand has been conducted. The main target of this phase is to eventually use the knowledge gained in the design vision and to ensure brand integrity is preserved by using the right Porsche DNA-elements.

1.4.2 INTERACTION

In the brand analysis, the main focus is on analyzing and finding the product's static qualities (product characteristics). However, a substantial part of a product's meaning is determined by how people interact with a product (Hekkert & van Dijk, 2011). Only when someone uses a product, true meaning is generated. By conducting several field researches, this section concentrates on how Porsche owners interact with their vehicle and on what this tells us about the true meaning of a Porsche sports car.

1.4.3 USER

It is likely that the former context, the context underlying the existing product, contains a number of assumptions that are obsolete. They may have been quite current and valid at the time the product was designed; now they are outdated because the world (and with that the user) has changed or because the designer looks at the world differently. By understanding the former and current user's background, values and principles and comparing these with those of the targeted future user (the millennial), it is possible to recognize the differences between both groups. The user phase focusses on understanding these differences and establishing valuable design implications for the project's design phase.

DESIGN

1.4.4 FUTURE CONTEXT

After completing the analysis phase it is possible to create the scope based on the learned knowledge. This scope contributes to a more precise search for valuable trends and developments for the future context. At the same time it can not be too specific so that it possibly stands in the way of new findings. By connecting the right factors in a logical way, context clusters are being developed. By finding the correlation between this clusters the final future context on which the design is going to be focussing on is being created. This section is concluded with a mission statement. This statement determines in what way the design or the user is going to react on this future.

1.4.5 FUTURE BEHAVIOR / INTERACTION

Building on the established future context and mission statement, this phase in the project focusses on defining

the future product - user relationship. To elicit this interaction, the product has to have certain qualitative characteristics (as stated the section 'interaction' above), better referred to as 'Product qualities' . If the vehicle has these specific qualities, the user of the car will experience the product as you have defined and envisioned him or her to do so. Therefore, defining product qualities is the last link in the chain between the three main phases of the method (context, interaction and product stages.) and is the last element of the future vision. This vision consist of the mission statement, the interaction/relationship and product qualities.

1.4.6 CONCEPT & DEVELOPMENT

Using the vision as a starting point of the concept phase, the focus in this stage of the project now is on creating and exploring different solutions and reactions on the earlier established future context. By working with a variety of flexible tools, these concepts are translated into their initial shape. Consulted by experienced designers, this phase is concluded by choosing a concept with the highest potential.

1.4.7 FINAL DESIGN

In the last phase of the project, the chosen concept is being translated into its final shape. Keeping a close eye on the preservence of Porsche's brand DNA and brand integrity, together with various experienced modelers the concept is being converted into a high quality surface model. After adding the last details and final touches to the model and the final vision, this face is concluded with the creation of photo realistic renderings and the final data that allow for a virtual reality presentation and experience.

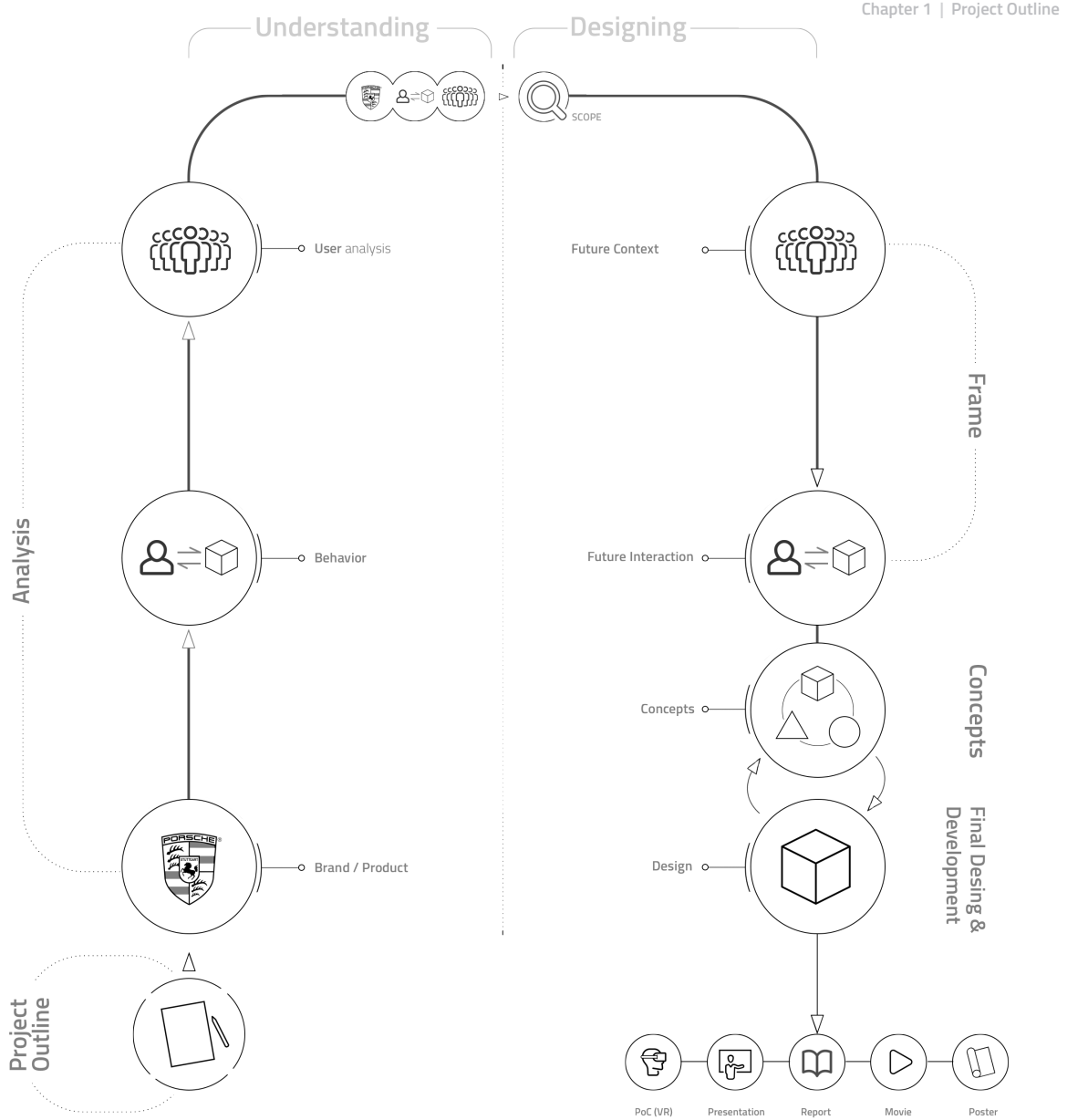
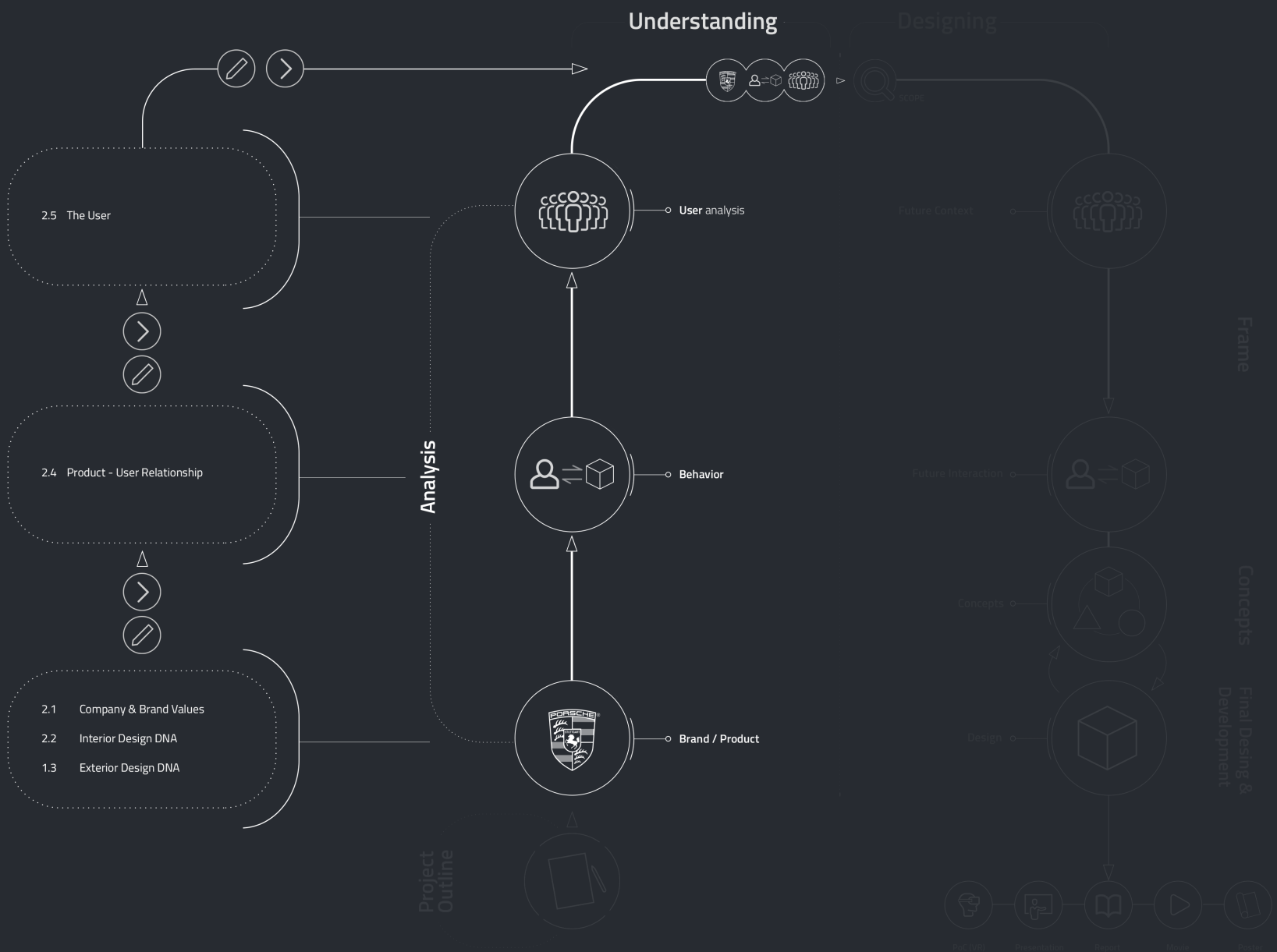


FIGURE 1.1 Full visual representation of the method used


Understanding
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Project Outline

2 Analysis

The following section is designed to make the reader acquainted with the phases out of which the analysis is composed. Although it is more common to deconstruct a product in the method used, this section puts the emphasis on Porsche as a brand. Subsequently, different field and literature studies were conducted in order to find what kind of product DNA and type of interaction properly describe the the core values of the brand. The section concludes with information about the current user.

2.1 Company & Brand Values

COMPANY & BRAND VALUES

"In the beginning I looked around and could not find the car I dreamed of. So I decided to build it myself."

Ferry Porsche

Ferry Porsche's dream of the perfect sports car has always been the drive and mission for the company throughout their history. Along the way, the company tries to follow a plan, an ideal that unites them. This plan or ideal is referred to as 'The Porsche Principle'. The underlying principle is to always get the most out of everything. The company claims that from day one, they have strived to translate performance into speed in the most intelligent way possible (Porsche AG, 2018). "It is no longer all about horsepower, but about more ideas per horsepower" (Porsche AG, 2018). This principle originates on the race track and is embodied in every single Porsche. It is referred to as "Intelligent Performance". (Porsche AG, 2018).

2.1.1 BRAND PERSONALITY

fascination for sports cars
The first layer in Porsche's brand (figure 2.1) model is based on the way the company was founded and reflects how Ferry Porsche's fascination for sports cars stimulated the idea to build the perfect sports car himself. This fascination is something that Porsche as a company

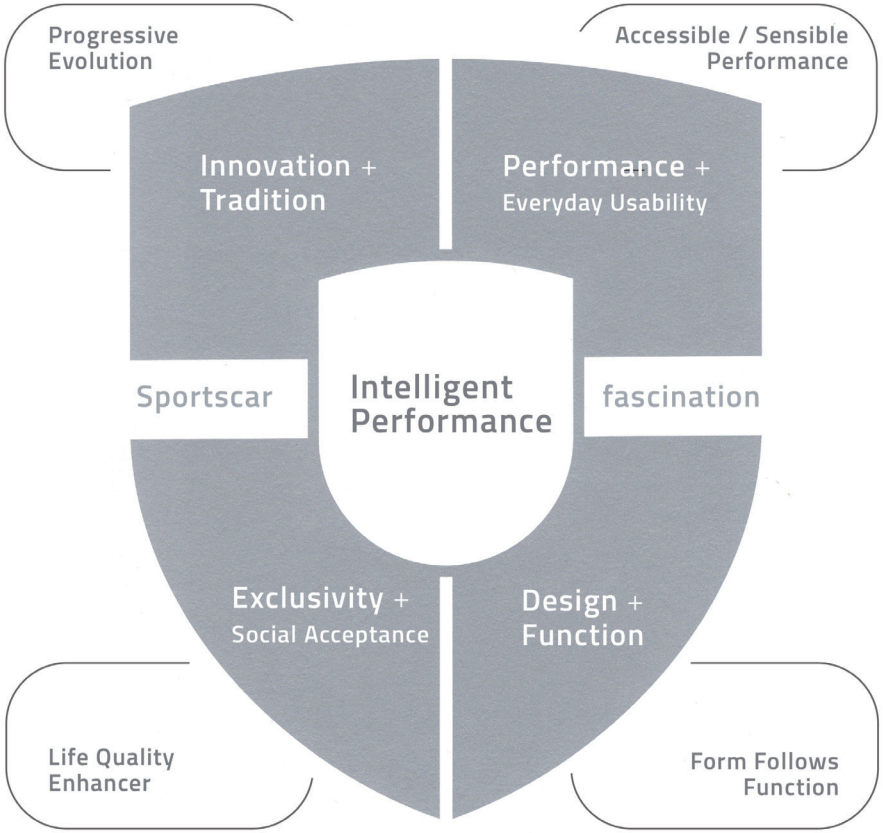


FIGURE 2.1 Porsche Brand Model

still tries to preserve every day. By doing so, they are trying to realize the production and development of the perfect sports car every day.

2.1.2 PORSCHE'S CORE VALUE

intelligent performance
With intelligent performance the brand's perception of the perfect sports car and the way their engineers and designers should think is reflected. Without intelligence, performance is meaningless and vice versa. Their principle "Intelligent Performance" explains the approach on building efficient motors that perform good as a race engine as well as an every day engine. "Only like this, dynamic performance and sportive design gets proper value, but always with functionality in mind (Porsche AG, 2018).

2.1.3 THE UNDERLYING PRINCIPLES

Porsche finds pride in the fact that they aim and succeed to integrate brand principles in their vehicles that - at first glance - seem to be each others opposites. This particular fact is what lies within their unique brand DNA and what makes a Porsche sports car unique. Porsche states that "only by playing with these opposites, the excitement and energy that give their cars an extra edge and their unique character can be created" (Porsche, 2018).

Innovation + Tradition
(Evolution / Progressive / Reacter)

Innovation
A sports car not only classifies itself as a sports car by reaching an as high as possible amount of horsepower.

Tradition
When looking at different Porsche models, the DNA of each car is very strong. Porsche focusses on preservering their well known ideas about sports cars and their iconic shape while still trying to integrate new technologies.

Performance + Everyday Usability (Accessible / Sensible performance)

Performance
With over 30.000 wins in various races and race events, Porsche truly is a track born and racing focussed brand. This focus on motorsport is something that is truly noticeable when walking around at the development centre in Weissach and is in many ways a leading factor in the way their vehicles are designed. All the drive related mechanics are tested on the race track.

Everyday Usability
Unlike other sports car brands, a Porsche is a sports car that is relatively often spotted on the streets. This is for a reason. One of the things Porsche is truly proud of is their everyday usability. They claim they want to create cars that can offer the driver victories on the race track after which they go grocery shopping with the same porsche on the way home. This unique factors creates an accessible and sensible way of experiencing and getting the most out of a sports car like the brand envisions it.

Exclusivity + Social acceptance (Life quality enhancer)

Exclusivity
Porsche's approach on the quality and exclusivity of their cars is that they see their cars as a properly tailored suit or a piece of art.

Social acceptance
Even though Porsche produces some very serious sport models and hyper cars (918 Spyder, 911 GT2, 911 GT3), Porsche strives to create cars that are socially accepted and are firmly anchored in todays society. They aim to create high end sports cars that are not only affordable for the richest people on the planet. They want to be rooted in the middle of todays society and aim to create sports cars that fall within reach of making childhood dreams come true.

Design + Function (Form follows function)

Design
As a key element of the earlier mention factor 'tradition' Porsche is a brand that creates cars which are easily recognized from a distance. This is because of various design elements that are deeply rooted within their for language. Elements like their iconic fly line (Roofline), strong shoulders and a steeply dropping bonnet because of the placement of the engine in the rear are to be found in all their cars.

Function
Maybe one of the key elements that makes Porsche such a bespoke and well known German engineered sports car brand is the fact that they strive to let their form follow function. The rational way on how they approach design and integrated solution truly reflects the way they approach building their so called perfect sports car. It is this factor that makes Porsche sports cars a rather rational product.

2.2 Exterior Design DNA

Porsche's iconic design is based on a design process where you don't discard major key design elements, but instead develop them further and let them evolve - carefully but consistently. Since 'form follows function' is an essential design principle for the brand, the aim is to let design and technology be very closely integrated. This way the company aims to create timeless design. Chief of design, Michael Mauer, states that it becomes harder and harder to be "timeless" in todays car industry. Since time has been speeding up the brand Porsche tries to use this as an opportunity to evoke desire, precisely with those elements that don't go running after everly little trend (Mauer, 2017). This is because they radiate stability to the brand. Although it was not the first Porsche ever built, Porsche's Design DNA mostly leads back to the form language of the iconic 911 (figure 2.2).

1

2.2.1 **Strongly pronounced front fenders**

A result of the flat bonnet is that the front fenders, covering the wheels, are strongly pronounced. The integrated head lights create Porsche's recognizable face.

2

2.2.2 **Flat bonnet.**

Porsche 911's have the engines placed in the rear of the car. This allows the iconic design to have a flat hood, offering good visibility on the road and strong aerodynamics.

3

2.2.3 **Flyline**

A recognisable design element is the "Porsche flyline", which runs back all the way to the first Porsche 911 ever made. The flyline is a result of drawing the most optimal and minimal solution to cover the driver with a roof. The peak of the flyline is placed directly above the driver's head.

4

2.2.4 **Front bumper Air Inlet**

A Porsche always has an integrated air inlet in the bumper and not a cooler grill. This feature is a strong "form follows function" element since the engine of the Porsche 911 was place in the rear. This is something they also kept for the cars that have a front engine (e.g.: current SUV models).

5

2.2.5 **Strong continues line from A pillar extending to back**

The character of the flyline is translated into a continues line that runs from the A pillar all the way to the rear of the car.

6

2.2.6 **Strong taper of hood lines**

Characteristic for the front of a Porsche the strong taper of the bonnet. This is a result of the wheel arches. The lines indicates a forward motion and runs all the way down to the softly curved front bumper

7

2.2.7 **Sculptural and Muscular rear shoulders**

The relatively narrow greenhouse of the 911 results in strongly emphasized, muscular and sculptural rear shoulders. This feature is recognisable from the back as wel as from a side view.

FIGURE 2.2 Porsche Exterior Design DNA (The Porsche Design DNA, 2014)

2.3 Interior Design DNA

Mention car design and often the idea of someone drawing an exterior comes to mind. However, the interior must be styled and created as well. This requires the same level of attention to detail, practicality and comfort as anything exterior related. Designing a car interior has a lot of overlap with product design. From an objective standpoint, a car interior is an assembly of stand alone products, designed in such a way that it creates a harmonic architecture. Attention hereby goes into: Ergonomics, Functionality, Materials, Safety and Interface related matters.

FIELD RESEARCH

Since the main objective of the project is to design an interior vision with the main focuss on creating a Porsche typical and driver-oriented experience, a research in Porsche's official museum in Stuttgart was conducted after closing hours. This created the opportunity to actually engage with the vehicles and take a closer look at the interiors (rather then just admiring the cars form a distance).

Since the project started with a relatively undefined scope, being able to take a close look at a carefully selected and rare collection of Porsches offered a substantial amount of valuable insights. By photographing a variety of older and more recent models, a solid framework that helped to specify the scope was established.

2.3.1 GOALS

Since the goal of the project was not fully specified on forehand, it was hard to directly establish very concrete goals. The main approach of the research was to look at the cars with an open mind and see how the brand model (section 2.1) is reflected in the displayed vehicles and establish more clarity about Porsche interior development over the years.

2.3.2 FOCUS

Although interesting exterior design elements were not neglected, the main focus was on the interior. By looking at:

- Elements that are porsche typical and contribute to understand Brand DNA and "The Porsche Principle" (section 2.1, Company & Brand Values).
- Functionality and archetectural elements that create a porsche typical driving experience (Dashboard, Steeringwheel, Instrument clusters).

The research is concluded with an assembly of insights that help guide further research after a direction for a the 2035

DNA & FUNCTIONALITY

2.3.3 'Le Mans' Ignition (Figure 2.3)

One of Porsche's most iconic features is the ignition switch, placed on the left side of the steering wheel. This key element owes its heritage to the ' 24 hours of Le Mans race' and is a unique feature in every Porsche vehicle ever since. At the sound of the starting signal, it is tradition that drivers run to their vehicle and enter and start their cars as fast as possible. The driver, succeeding in accomplishing these steps fastest, takes the advantage of a leading (or more up front) position in the race. Integrating the ignition on the left side of the steering wheel is one of Porsche's interior design DNA elements that most strongly reflects the amount of thought that goes in their cars.

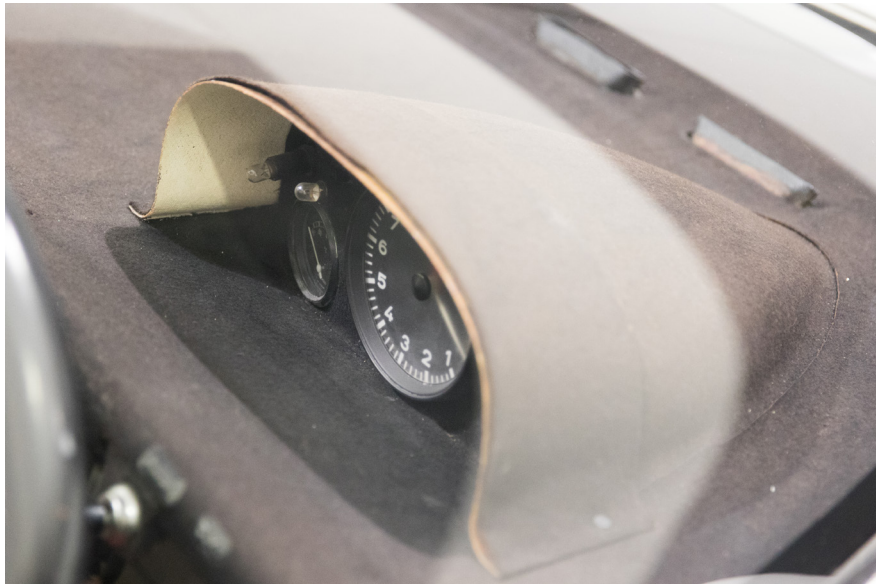
FIGURE 2.3 Porsche Design DNA - 'Le Mans'-style ignition

2.3.4 Middle console (Figure 2.4)

A returning theme in almost every Porsche is their middle console. Laying horizontally between both seats, it makes a vertical movement before merging with the horizontally emphasized dashboard. The design is a good example of the 'form follows function-principle' (section 2.1 - Brand model). This type of architecture results in a placement of the gear lever closer to the steering wheel. Furthermore, it allows for quickly operating driving related functions (buttons etc).

FIGURE 2.4 Porsche Design DNA - Middle Console

Porsche Design DNA - 'Breitebetonung' **FIGURE 2.5**



Porsche Design DNA - Instrument Cluster **FIGURE 2.6**

2.3.5 **Horizontal emphasis on dashboard (figure 2.5)**

Porsches have a strong horizontally emphasized dashboard Porsche refers to this design element as: 'Breitebetonung'. Together with the air vents, placed in all models on the far left and right, the dashboard is in balance with the exterior's DNA where the narrow greenhouse puts the emphasis on the wide sculptural shoulders of the iconic Porsche 911. (section 2.2-Exterior Design DNA.)

2.3.6 **Instrument cluster highest point in the car (figure 2.6)**

In all models, the instrument cluster and/or the heads up display (or the older instrument clusters) are always the highest points in the interior. Looking at a porsche from the outside, the exterior is complemented by the emhpasized and most important features: the steering wheel and driving related instruments, housed in the instrument cluster. From the drivers point of view, placing the instruments like this, creates a driving experience without distraction.

2.3.7 **Round instruments (figure 2.7)**

All Porsche instrument clusters are equipped with round instruments. The most iconic example is that of the 911 which always has 5 different instruments next to each other. From these five, the speedometer is always placed in the centre, surrounded by additional information windows.

2.3.7 **"Strategy" (Figure 2.8)**

As a result of the rapidly evolving technological sector, throughout the years, the museum research showed clearly that over the years more and more functions and elements are expected and thus, being integrated. At a certain point, implementing all these new types of functionalities results in an interior that is too clustered and therefore creates too much distraction.

New technologies which have proved themselves over the years allow

the brand and industry to clean the interior up every now and then by merging multiple functions into a more compact solution. Figure 2.9 is a visual resemblance of how this sinus-like movement in todays technology shows that Porsche is currently aiming to clean up there interiors. (figure 2.8). This strategy creates the effect that the emphasis will be more on the exclusivity of the materials and on the most essential functions, needed for driving.

FIGURE 2.7 Porsche Design DNA - Speedometer

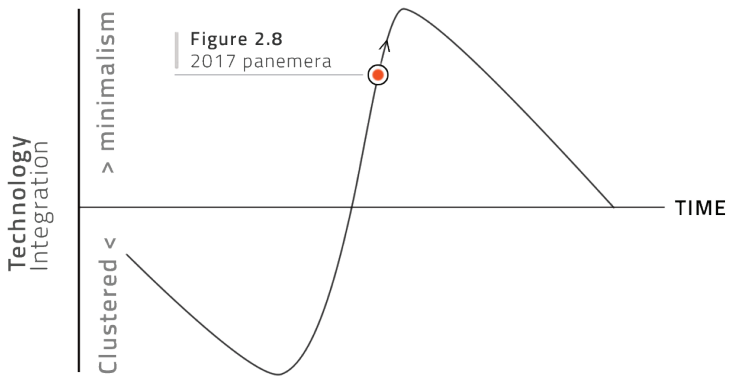


FIGURE 2.9 Technology integration over time

FIGURE 2.8 Porsche Design DNA - Clean interface strategy

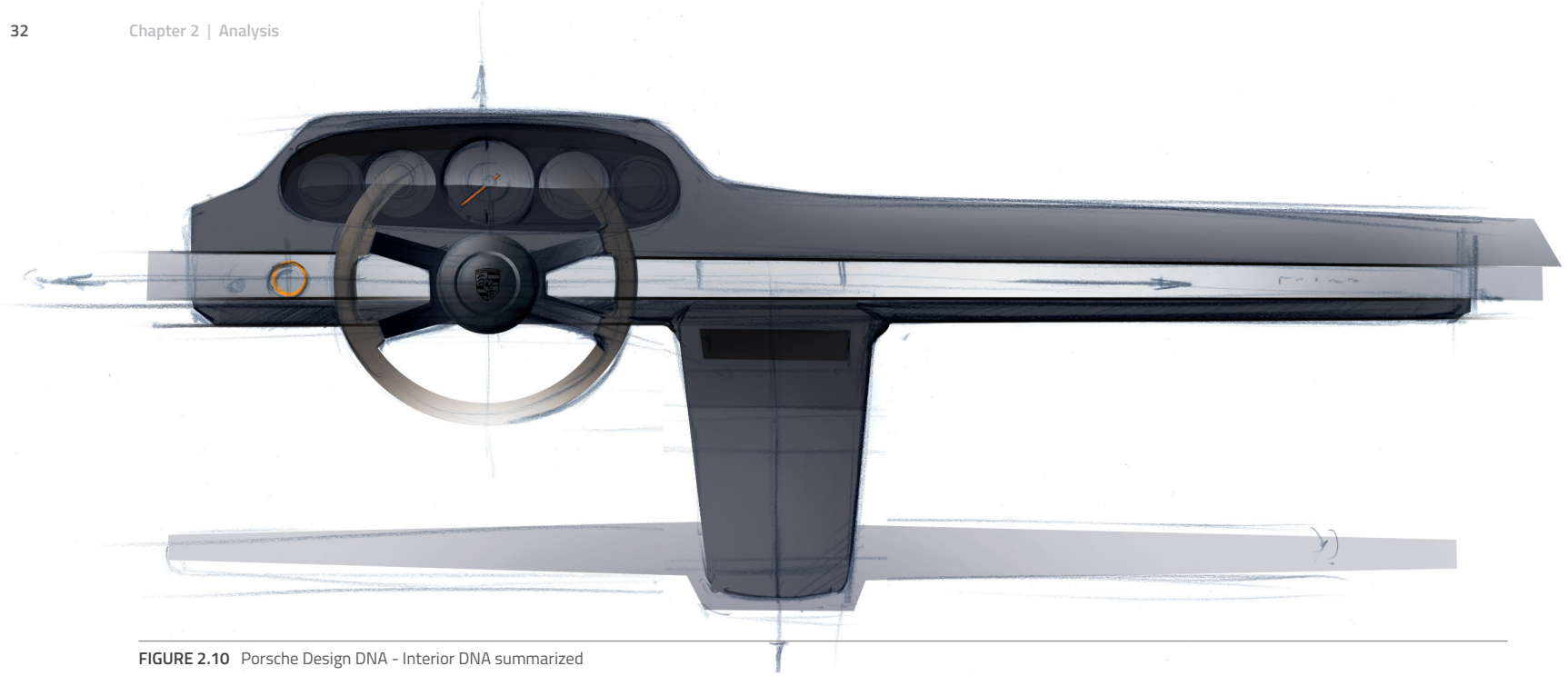


FIGURE 2.10 Porsche Design DNA - Interior DNA summarized

2.3.8 CONCLUSION

Porsche interior DNA was found during a research.
Figure 2.10 gives shows the key elements that were found.

1. Instrument Cluster is always the highest point of the dashboard
2. Ignition is always placed on the left side of the steering wheel
3. Dashboard is horizontally emphasized
4. Porsche always has the round speedometer placed in the middle of the insturment cluster
5. Middle console attached to dashboard. Moving in a horizontal to vertical way.

2.3.9 DESIGN IMPLICATIONS

Reserach showed that Porsche tries to merge technological components with each other. By doing so, it is possible to create a cleaner appearance where the attention is more in the exclusivity of the materials and the driving experience.

COMBINING

By Reïnterpreting interior parts based on technological developments or predictions, without losing Porsche's iconic DNA elements, a new design can maintain a recognizable Porsche character.

2.4 Interacting with Porsche

One of Porsche's main design principles is 'Innovation & Tradition' resulting in a progressive Evolution in their designs (Section 2.1.3). A frequently used term in their design studio therefore is: "To design the future, you have to study the past". To understand and find the true meaning of Porsches, a research was conducted. This research focussed on how drivers interact with their car. This has been done by analysing the static interaction (Museum) and the dynamic interaction (On the road with Porsche drivers).

STATIC INTERACTION

From a designers point of view it is important to create an opinion based on your own experience and findings. By analyzing the way I experienced interacting with various vehicles in the museum, a standpoint on how I perceived their cars was created. Since it is not allowed to actually drive the cars, the focus in this research was more on the details in and on the car that play a part in the actual experience of driving (figure 2.11).

HIGH THOUGHT DENSITY

Both the exterior as the interior of a Porsche strongly reflects the amount of thought that went into these vehicles. This density of thought that went into each vehicle strongly shows in:

- The quality with which the cars are finished
- The attention that is spent on hiding all unnecessary driving-unrelated components.
- The alignment and and logic in how everything fits together.

TACTILE SATISFACTION

With the 3 factors, mentioned in the section above in mind, Porsche's way of solving problems with a 'form follows function'-approach results in a Bauhaus-like, honest layout with a high level of function readability. This particular style of designing a car interior is more rational compared to various other sports car brands. It does however offer an emotional experience. This is found in how the well-balanced, often symmetric and organized the design is. One of the things that stands out most is the exceptional tactile experience the car offers (figure 2.12). Even the buttons and leavers in the oldest cars still have a highly satisfying, mechanically perfect, 'clicky' and 'snappy' feel that is often not even found in modern day cars.

FIGURE 2.11 Museum research - Interaction

DYNAMIC INTERACTION

Owning a car or just experiencing an object you don't own is something completely different. To better understand the relationship between a driver and his Porsche, The opportunity arised to go on a drive with special and old vehicles (figure 2.12 & 2.13). Observations about the behavior of both contestans combined with conducted interviews while driving through the hills of Weissach, Germany, helped to define the meaning of the cars for the owners.

HONEST ENJOYMENT

By looking at the way both participants behave in and around the vehicle without steering their behavior too much with questions and out of the ordinary tasks, the goal was to frame the way both drivers interact with their car.After participating in as co-driver, it became clear why these cars mean so much for their user. After talking about the perfect day to drive for about three weeks, the almost child like anticipation was over. While driving around, a child-like, honest happiness and enjoyment was detected. Simply driving around without a destination, while enjoying the unique experience compared to what we know from other normal vehicles almost takes you back to the 60's. For both drivers, the honest joy of handling a car that is demanding in its handling and offer an experience that modern cars simply dont have anymore because of the high amount of automation.

INTERVIEWS

1956 356A Speedster (Figure 2.12)

"Owning a 356A Speedster is as much about the anticipation of a nice drive as it is about the drive itself. It is a hobby and a nice way to empty my mind. My Speedster is a highly mechanical object that demands a lot of energy since it is not as easy to drive, like modern day cars. The fact that I have to be so aware of everything I do offers a zen-like experience. The focus, this car demands from me does not allow my mind to drift away to unwanted daily troubles. Today, a lot of responsibility is taken away in modern vehicles since more and more is automated. Although this is not per se a bad thing, a certain emotional and almost romantic part of driving will be lost. This is something that a lot of today's younger kids might not understand".

356 Coupe (Figure 2.13)

"My car is like my baby. On a daily bases I drive other cars as well. These vehicles are also nice, but this old one is special to me. It is a very rewarding experience to drive around in my 356 coupe. You really have to focus and put in the work. The pedal work is not as easy as modern cars. Although the car robust and well taken care for, you have to

FIGURE 2.11 Museum research - Tactility and Alignment

treat them a little more delicate. I like to go on a drive with friends or my wife sometimes. It is a perfect teambuilding or social event. A big part of the fun of owning a vehicle like that is taking friends on a drive. To see the smile on their face by just simply driving around in the hills is a rewarding thing."

CONCLUSION

Porsche's are vehicles with a ***high-thought-density*** feel. This is visible in way the cars are finished, lined out and put together. The pleasing tactility of buttons, leavers and other components create have a satisfying result on the senses and enhance the driving experience extensively. The child like anticipation on finding the perfect day to simply drive around and enjoy the mechanical perfection of what once was perceived as the perfect sports car (and still is to its current owners) tells a lot about what these cars mean to the drivers. The drive is the experience and the way ***they have to be focussed*** while handling the car and truly have to ***put in the effort*** during the drive is the most ***rewarding*** aspect of the drive itself.

FIGURE 2.12 1956 Porsche 356A Speedster - Interaction research

FIGURE 2.13 Porsche 356 Coupé - Interaction research

2.5 USER

Over the last ten to twenty years, the average age of the sports car buyer has been increasing noticeably. This also showed in Porsche's customer demographic. Initial thoughts are that the increasing prices of Porsches over time have resulted in the fact that it takes people longer in life to reach a point where they can actually afford their so called 'childhoods dream'. The current economic status and the increasing prices of sports cars will definitely play its part in the changing demographic. The aging customer however, might also point in other directions. Approaching this fact from a generation point of view, it became evident that they belong to a demographic group referred to as "The Babyboomer" (born approximately between 1946 and 1964). Further study after the baby boomers' background and beliefs created a better understanding about a big part of Porsche's customer group.

THE BABYBOOMER

The baby boomer generation came in a mass population bubble after World War Two until around 1964 and were the children of parents of the so called 'silent generation'. Fathers of the baby boomers were generally too young to have served in World War II and both parents would have gone through the great depression. This had a profound effect upon the values baby boomers were brought up upon. Their parents would have had a grave, conventional, and conservative outlook on life and were also perhaps confused morally, indifferent, unadventurous and disappointed with what life had brought them. (Nordic page, 2018). The baby boomer generation was extremely large because of the relative political stability after the Second World War. They were much more optimistic than their parents due to the economic boom from post war reconstruction and the following years of steady industrial development. Baby boomers tended to reject the traditional values of their parents, religion and became much more individualistic and liberal. They were witnesses to fast development of technology and came to appreciate and accept this. (they saw the space race, the arms race, the invention of the transistor, television, the green revolution in agriculture, and great improvements in medicine, Baby boomers probably got the idea that mankind could control and harness nature during this time).

CORPORATE BOOMERS

In their mature working years the baby boomer accepted the system, not only becoming part of it, but being the ones responsible for building it to what it is today. The 70's and 80's were the time of rapid corporate growth where the baby boomers were workaholics. They competed with their peers with a 'live to work' kind of mentality and became a relatively financially well off group. They respected success and achievement as an important institutional foundation. Having the latest gadgets, like a color television or a nice car, became the baby boomer's status symbol defining class and confirming success to some extent.

PORSCHE BOOMERS

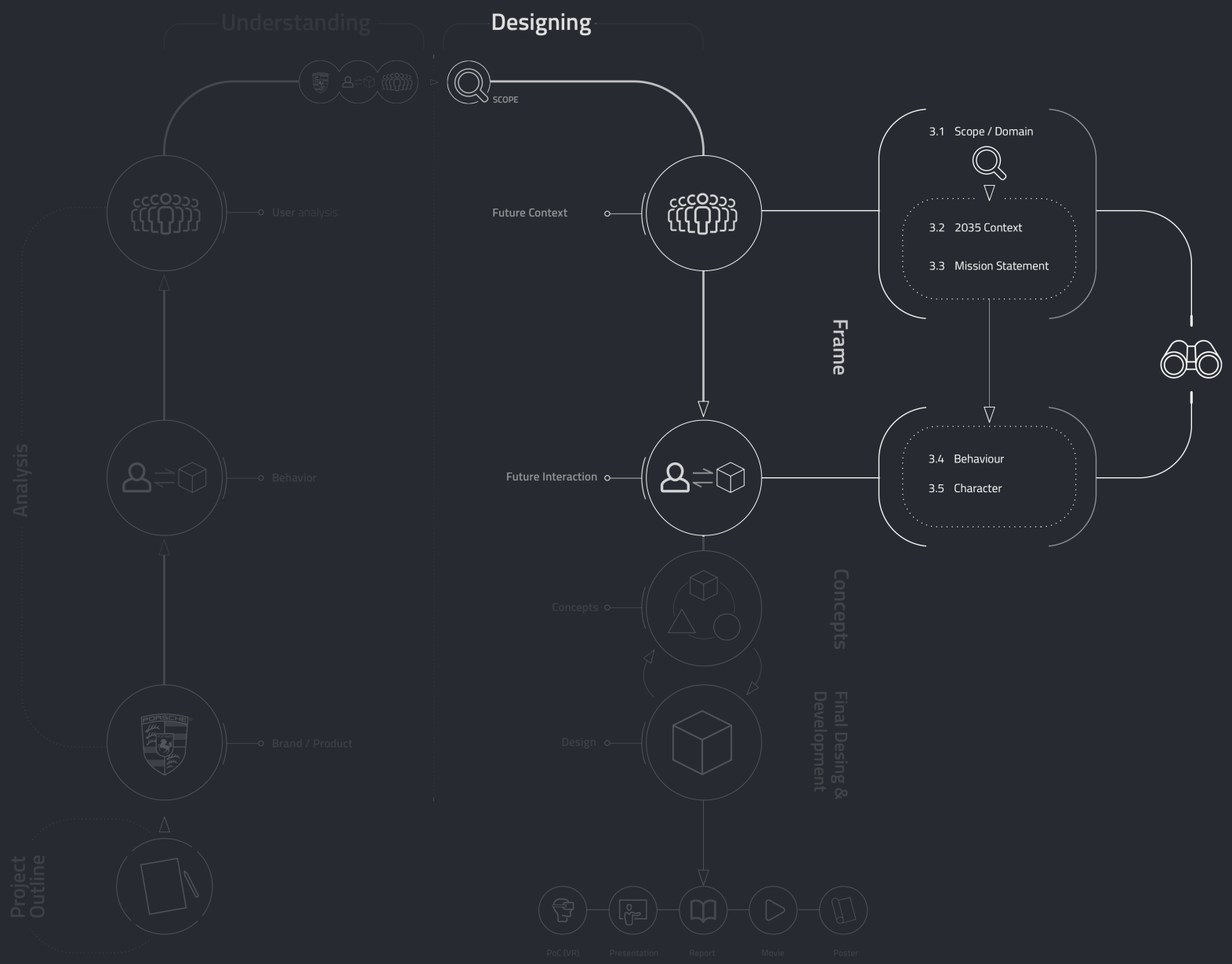
Baby boomers are starting to outgrow their midlife crisis years, and that's bad news for a brand like Porsche who want to sell sports cars. Although there are still plenty of buyers who would still love the passing lane, automakers face a confronting reality. Men born between 1946 and 1964, who currently still buy most sports cars, are cruising past their top spending years. And as age 70 is approaching, folding your knees up to get into the front seat of a low sports car is hardly the prescription for an aching back (Ross,D. 2014). Some are even turning to high-powered versions of luxury sports utility vehicles (SUV). Although Porsche will probably not experience noticeable trouble in the purchases of their vehicles in the near future, A demographic change in their customer base is inevitable. Where the babyboomers still give a strong economic boost to todays market, the main buying power and wealth is slowly and inevitably shifting towards the two generations that come after the babyboomers. Generation x and the millennial (generation y) (Welch,D. 2016).

"Boomers are starting to age out of sports cars," said Eric Noble, president of the CarLab, a consulting firm in Orange, California. "When you get into your 60s, comfort becomes more important. Sports cars are not going away, but the market will get smaller." (Nordic page, 2018)

	BABY **BOOMERS** BORN 1946 - 1964 AGE 54 - 72	GENERATION **X** BORN 1965 - 1980 AGE 38 - 53	**MILLENNIALS** BORN 1981 - 2000 AGE 18 - 27
CORE VALUES	Anti war Anti government Anything is possible Loyalty to children Personal Gratification Personal Growth Spend now, worry later Trust no one over 30 Youth Work	Diversity Balance Fun Highly educated High job expectations Independant Self reliance Suspicious of Baby boomer values	Freedom of choice Avid consumers Confidence Extreme fun High morals Like personal attention Self confident Members of global community Most educated generation. Now!
ATTRIBUTES	Ambitious Competitive Consumerism Live to work Strong work ethic	Adaptable Big gap with boomers Flexible Independent Pampered by their parents Work to live Work / life balance	Attached to their gadgets & Parents Best educated Eager to spend money Focus on change using technology Globalism Loyal to peers Digital generation
VALUE	Success	Time	Individuality and Authenticity
TECHNOLOGY	Acquired	Assimilated	Integral

During the user research, the key finding was that Baby boomers, who are/were able to afford an expensive sports car, were mostly surrounded and grew up in a society with company cultures where success and class was expressed and confirmed by **materialistic buying behavior**. An interesting approach assumption therefore is that this is today still the main drive in their buying behavior and thus explains the rise in age over the last years.

Looking at the values that are important in todays millennial (the future customer) circle creates a better understanding on how the future concept can be adapted on what they like and look for in a possible future context. The figure above shows some core values that generation Baby boom, x and y have.


Understanding
Designing
SCOPE
User analysis
Behavior
Brand / Product
Analysis
Project Outline
Future Context
Future Interaction
3.1 Scope / Domain
3.2 2035 Context
3.3 Mission Statement
Frame
3.4 Behaviour
3.5 Character
Concepts
Design
Concepts
Final Dasing & Development
PoC (VR)
Presentation
Report
Movie
Poster

3 Frame

This sections is the first stage of the design phase and illustrates how the future context and the user's behavior within it has been developed.

The scope that was created in the analysis, prior to this section, helps to establish a framework that provides a basis for searching meaningful context factors (trends, principles and ongoing / future developments). By generating meaningful links between these factors, it is possible to make assumptions about a possible future context.

In conclusion, this section establishes the desired interaction the future user will have with the vehicle. By doing so, it is possible to generate a character for the vehicle that fit this interaction. All the elements, invoked above, play a role in putting together the final vision. This vision will be the starting point of the concept phase (section 4) and is the decisive factor when it comes to creating the actual concepts and the final design.

3.1 Context building (2035)

DOMAIN / SCOPE

In order to assess obversations and considerations that should be taken into account when designing a future vehicle for Porsche, the domain (or scope) had to be established. The domain serves as a description of the field where this project aimes to make a contribution.

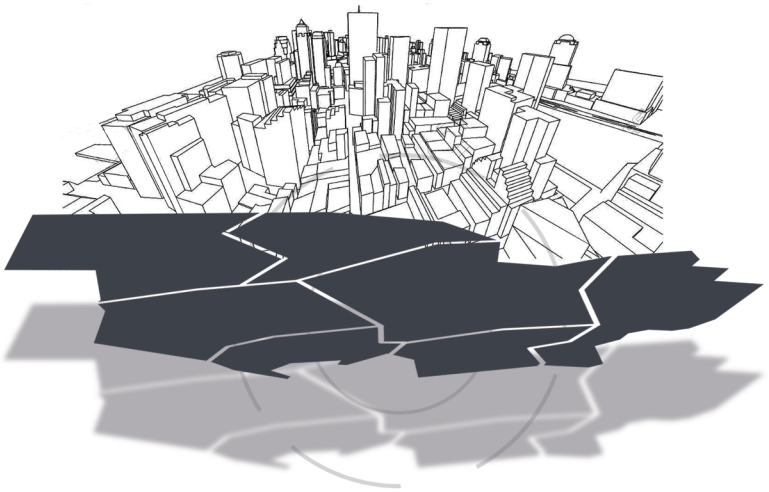
By careful consideration of the conclusions and design implications, identified in the analys and the strategic goals of Porsche, the filter through which will be looked at the world (the domain) is as follows:

Honest, High-thought-density, Millennial Sports car Mobility in 2035.

CONTEXT FACTORS

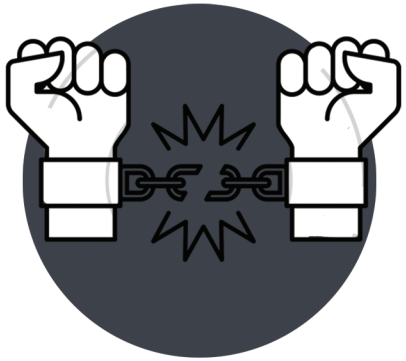
In order to 'build' a Porsche relevant future context for the year 2035, so called "building blocks" (context factors) had to be collected or generated. These factors are observations, thoughts, theories, considerations, beliefs or opinions (Hekkert & van Dijk, 2011). In theory, factors can be found anywhere from the internet to a valuable observation, made inside Porsche's design studio. As long as they offered information and/or scientific insights that are relevant to the earlier mentioned domain. Factors can be true in general or true for the designer. They can be facts or highly debatable. By trying to stay away from moral judgements that includes how I think the world should be, the goal was to define value-free descriptions of world phenomena as they appeared to me as a designer.

To create value in the search for context factors, a variety of directions can be looked for. A desirable outcome is to find the right balance between trends, principles, states and developments that are relevant to the domain. To create insights about a wide range of topics, factors can focus on a variety of fields: cultural, psychological, demographic, sociological, economic, biological, evolutionary, etc.



CLUSTER I

ZONES



CLUSTER II

FREEDOM & FUN

CLUSTER III

ALONE/ TOGETHER

3.2 Behavior & Qualities

As a reaction on the formed mission statement the goal now is to take a position in how the future customer should interact with the vehicle. As described in section 2.4 (interaction) during the analysis, the meaning of a product was derived from analyzing the way Porsche owners interact with their vehicle.

The car is in the end a means to accomplish what Porsche wants to bring to people in the future. By establishing the desired character of the future relationship between the driver and the vehicle it is possible to let people understand how the yet to be desired product will be experienced.

Framing this experience in the correct way will help to meet the goal and helps to understand what the final product must bring in to reach it.

There are various ways to define a desired future interaction. In case of this project, the use of an analogous situation in a different domain was used. Working with an analogy helps to see the appropriate interaction from a different/fresh perspective.

As a result, the analogy will serve as a 'springboard' to clarify the qualities of the intereaction desired in the established 2035 context.

ANOLOGY

Mountain climbing is a highly irrational thing to do. It is in no way the easiest way to reach the top of a mountain and It pushes the climber to strongly engage with what he/she is doing and to focus fully on the task and his environment.

While doing so, there is no room for errors. You have to be completely in the moment. It is just you and the mountain. In a way, demanding character of the climb has an almost therapeutic character.

Just like a mountaineer, climbing a mountain, I want my user to really engage with the car. Just like “the climb” I want my vehicle to ask for the drivers full focus and attention so that there is no room for other thoughts in his or her head.

In order to reach this state of being, the product need to have certain qualities. Just like the climb of the mountain, the qualities my product should have are:

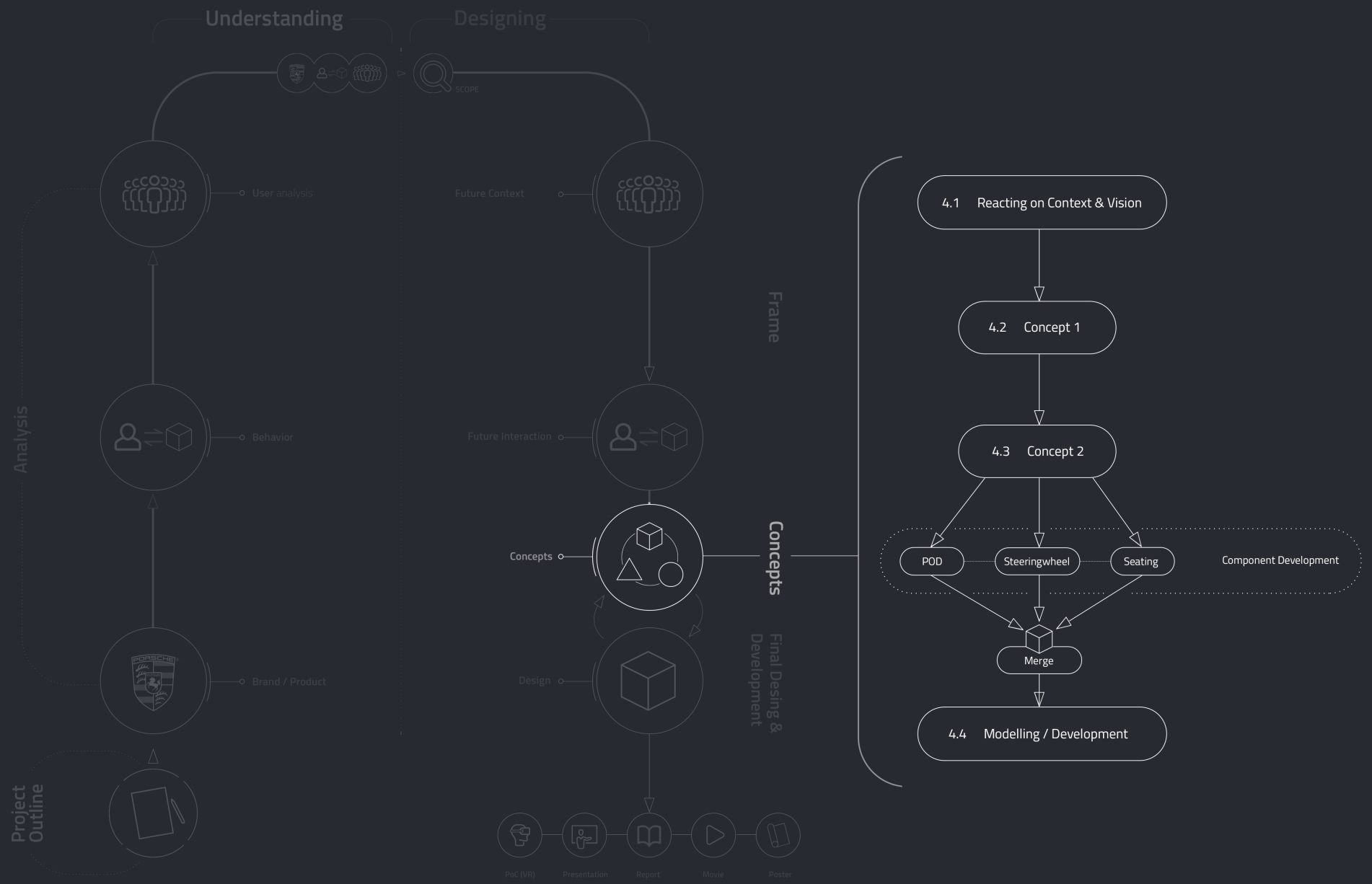
Demanding & Therapeutic.

3.3 Vision

In the domain of honest, high-thought-density, millennial mobility in 2035
I want people to rebel against rationalism, alone, together.

Just like the the climb demands from a mountaineer the vehicle should ask for full focus and a high, therapeutic way of being in the moment.

The vehicle should therefore be demanding and at the same time, offer a certain amount of serenity to the driver.


Understanding
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Brand / Product
Analysis
Project Outline
Frame
Concepts
Final Desing & Development
PoC (VR)
Presentation
Report
Movie
Poster
4.1 Reacting on Context & Vision
4.2 Concept 1
4.3 Concept 2
POD
Steeringwheel
Seating
Component Development
Merge
4.4 Modelling / Development

4 Concept & Development

After concluding the previous section with the definition of the future vision, the main goal of the following part is to get the reader acquainted with the steps, taken to create a meaningful concept that serves as a possible answers to this vision.

By conducting an elaborate sketching and conceptual 3d modelling phase, Section 4 is concluded with the final design direction.

4.1 Concept phase 1

In order to help establish the right product qualities, section 3 shows the method used. Via the use of an analogy, the design direction gets more clear. Before reaching the point of the final analogy which led to the final design (Chapter 5), a different part of the analogy was used to base concept 1 on. Thinking of the vehicle as the tool to conquer the road, design direction 1 was based on the product character of the climber's ice axe (figure 4.1).

Being a technical and highly optimized tool, the analogy seemed to make sense in the initial phase. Concept one (From now on referred to as "the Axe"), focusses on offering a technical looking, yet minimalistic interior design to the driver while maintaining a high amount of functions.

Inspired by the possiblities of mixing Augmented reality (mixing real life objects with computer generated content) with a minimalistic, monocoque-like interior, an exploration was conducted to establish a first design direction.

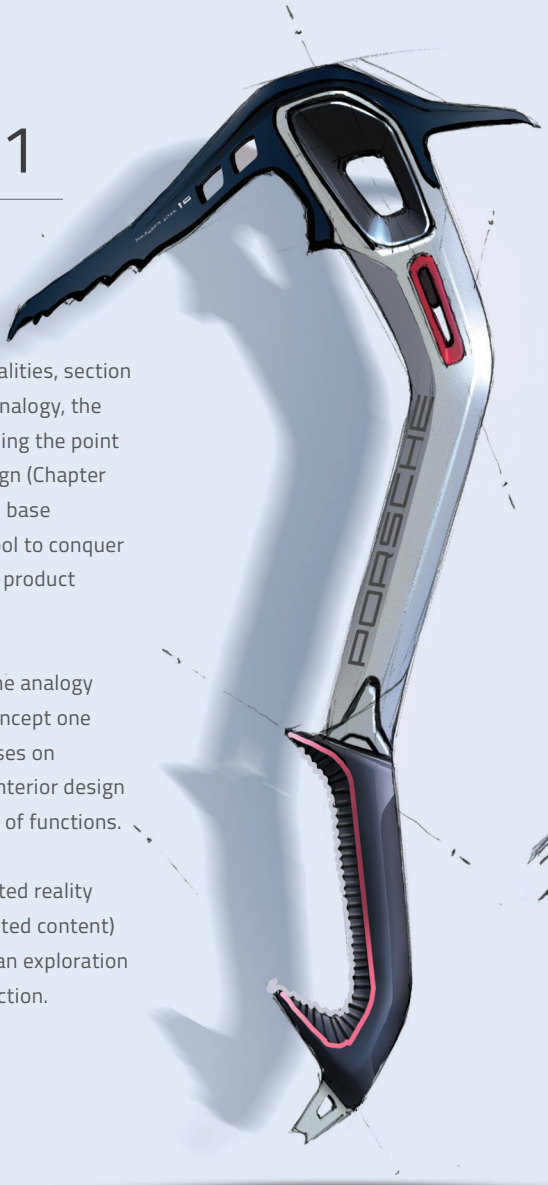


FIGURE 4.1 Ice axe - Technical & Optimized

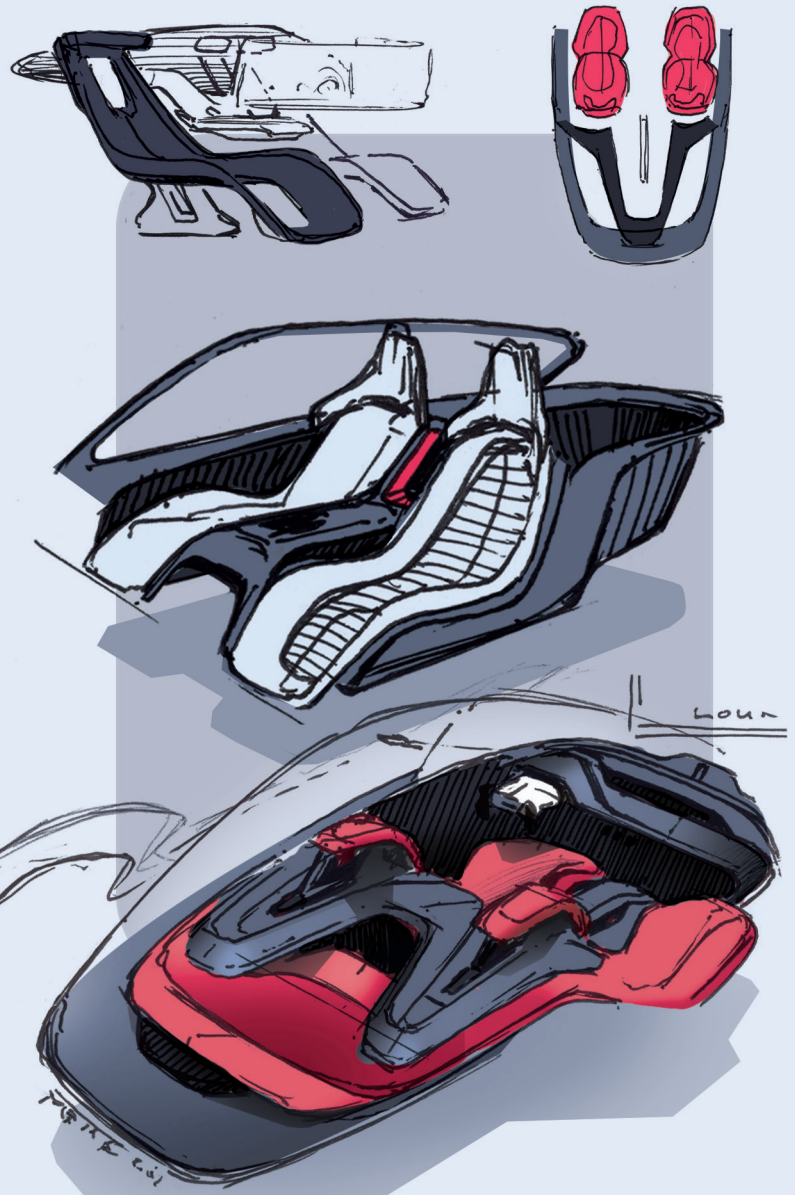


FIGURE 4.2 Interior layout exploration - Seating

FIGURE 4.3 Exploration dashboard and movable headrest

FIGURE 4.4 Concept direction sketch - "the axe"

CONCEPT 1 - The Axe (Figure 4.4)

The final interior sketch (figure 4.4) shows how the architecture of the concept is designed in a way that allows the driver to use the surface behind the dashboard (Highlighted) as a platform to display different type of information on it, using Augmented reality technology (background sketch of user). Figure 4.3 displays a variety of explorative sketches for the dashboard's design and a movable headrest. The stage of the concept in this phase was used as an underlay in Maya (3d polygon modeling program) to further explore the concept's potential in 3d (Figure 4.5).

CONCLUSION PHASE 1

After 3 weeks of work on the first design phase, the decision was made that design direction 1 was not heading in the the desired direction. In this stage, retaking the steps of creating an analogy helped to conclude that the initial direction based on the climber's ice axe was not the correct one.

Conducting further research after the usage of Augmented reality glasses (figure 4.7) made it clear that wearing a device like the glasses, tested in the studio, is not optimal in mobility environments. Even when the devices become much smaller, it was concluded that it is not like for people to wear similar devices like this in a future mobility context.

Consulted by various designers at Porsche's design studio, the outcome was that the layout of the car was too conventional. Therefore, the concepts that were created by making sketches over the maya model all headed into a direction, much similar to what we already see on todays market (figure 4.6).

FIGURE 4.6 Sketch over maya - headrest detailing

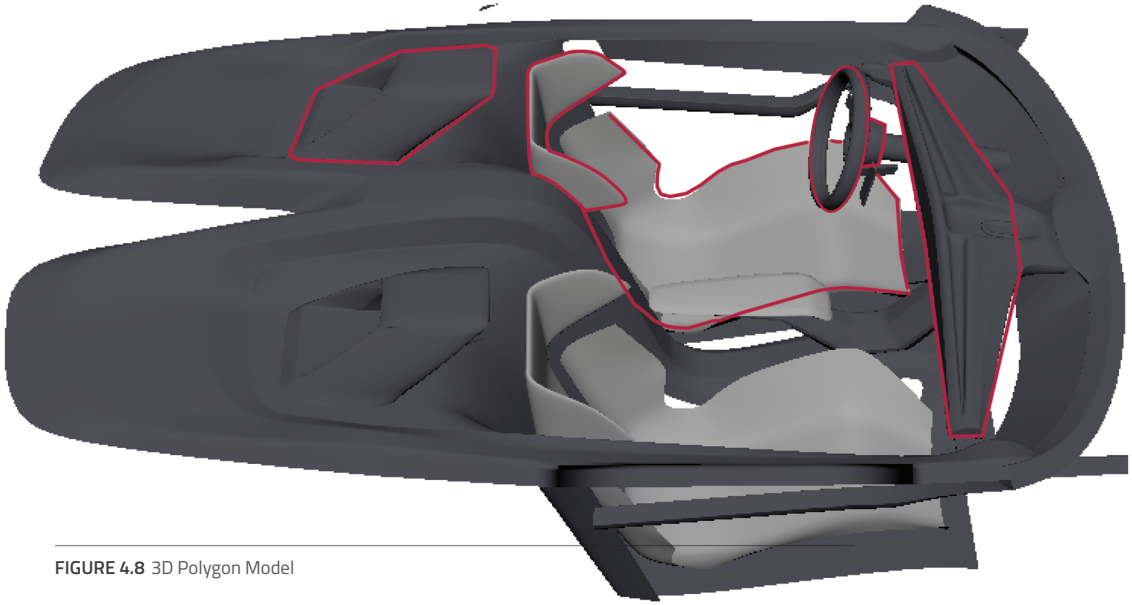


FIGURE 4.8 3D Polygon Model

FIGURE 4.7 Augmented Reality glasses testing

DESIGN IMPLICATIONS

After concluding that the concept was not heading in the right direction, more time was spent on finding and improving the analogy. Section 3.3 elaborates more on the final analogy that was used to determine the final design qualities. Even though the analogy and therefore the qualities of the concept changed, the concept that was explored in phase I had a variety components that proved useful in concept direction 2.

The following design implications are based on the knowledge gained during concept phase 1 and are highlighted in the 3d model (figure 4.8)

STEERING WHEEL & DASHBOARD

Both the steering wheel and the dashboard can be further minimized. By trying to integrated all functionality into 1 object, a singular driving 'tool' can be developed. This approach be in the same line of thought as the character of the ice axe: A technical and minimal object, housing all necessary functions.

SEATS

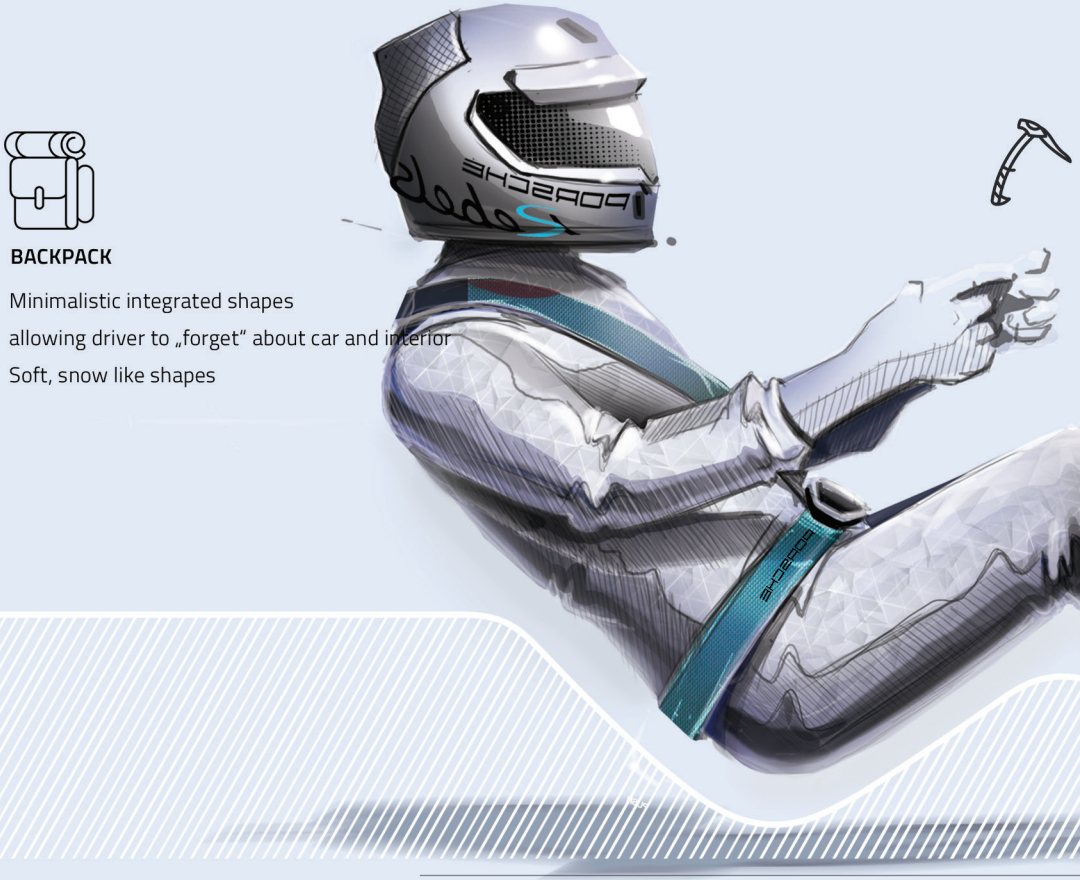
Although the seats in concept 1 where placed in a layout that was heading in a direction that was too conventional, the design has potential to use in a more advanced concept direction. The separate shoulder and back rests could prove useful in further development stages.

FLOW

The "flow through" motion of the monocoque between the seats has potential to create a feel where both seats are embedded in the structure of the car.

4.2 Concept phase 2 “The Climb”

Concept two starts with the analogy, explained in section 3. Climbing a mountain is a highly irrational experience. It is a very challenging activity that demands a high level of focus. Concept 2 is designed based on this analogy. The goal is to design a vehicle that is demanding to drive and offers the driver a mind-emptying experience. The way the concept is perceived and developed can be found in the upcoming sections.



BACKPACK

Minimalistic integrated shapes
allowing driver to „forget“ about car and interior
Soft, snow like shapes

ACTIVE TOOLKIT

„The backpack
All essential tools, integrated in one object.

FIGURE 4.9 “embedded” - driver figure

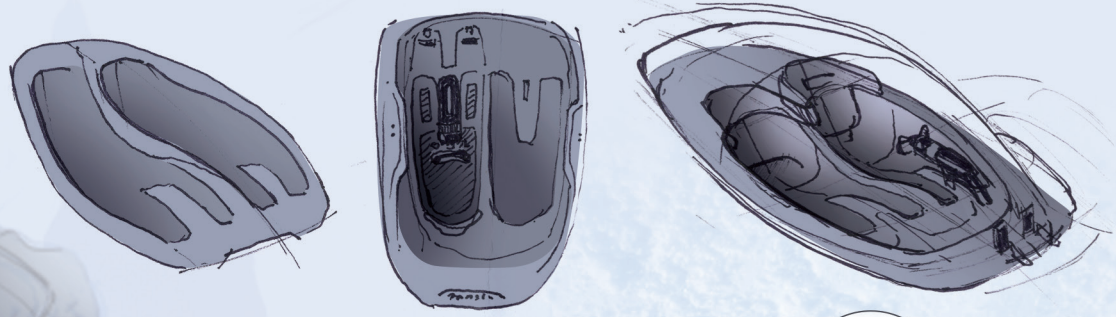


FIGURE 4.10 "Embedded" Keysketches

"EMBEDDED"

Figure 4.10 shows the initial sketches, leading to the concept showed in figure 4.12. The concept is inspired on the model shown on the left page (figure 4.9) and plays with the idea of being embedded in the snow. While sitting in the snow, all you have is the essential toolkit you brought on your mission (which in this case is experiencing a nice drive). The rest of the interior and possible interior is derived from a serene snowy landscape. This allows the driver to fully focus on the elements that matter (the toolkit) and have as much focus and attention for the road ahead of him/her.

FIGURE 4.11 Full visual representation of the method used

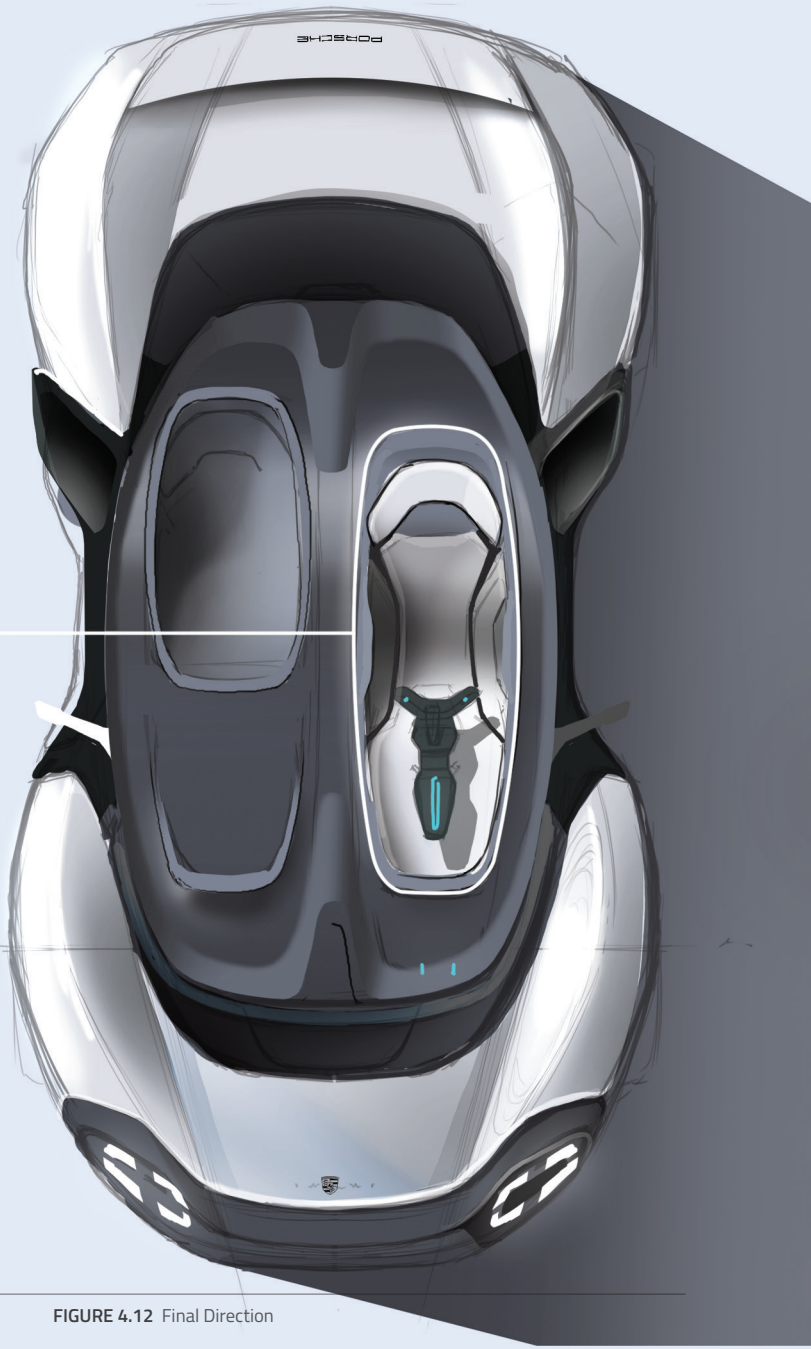


FIGURE 4.12 Final Direction

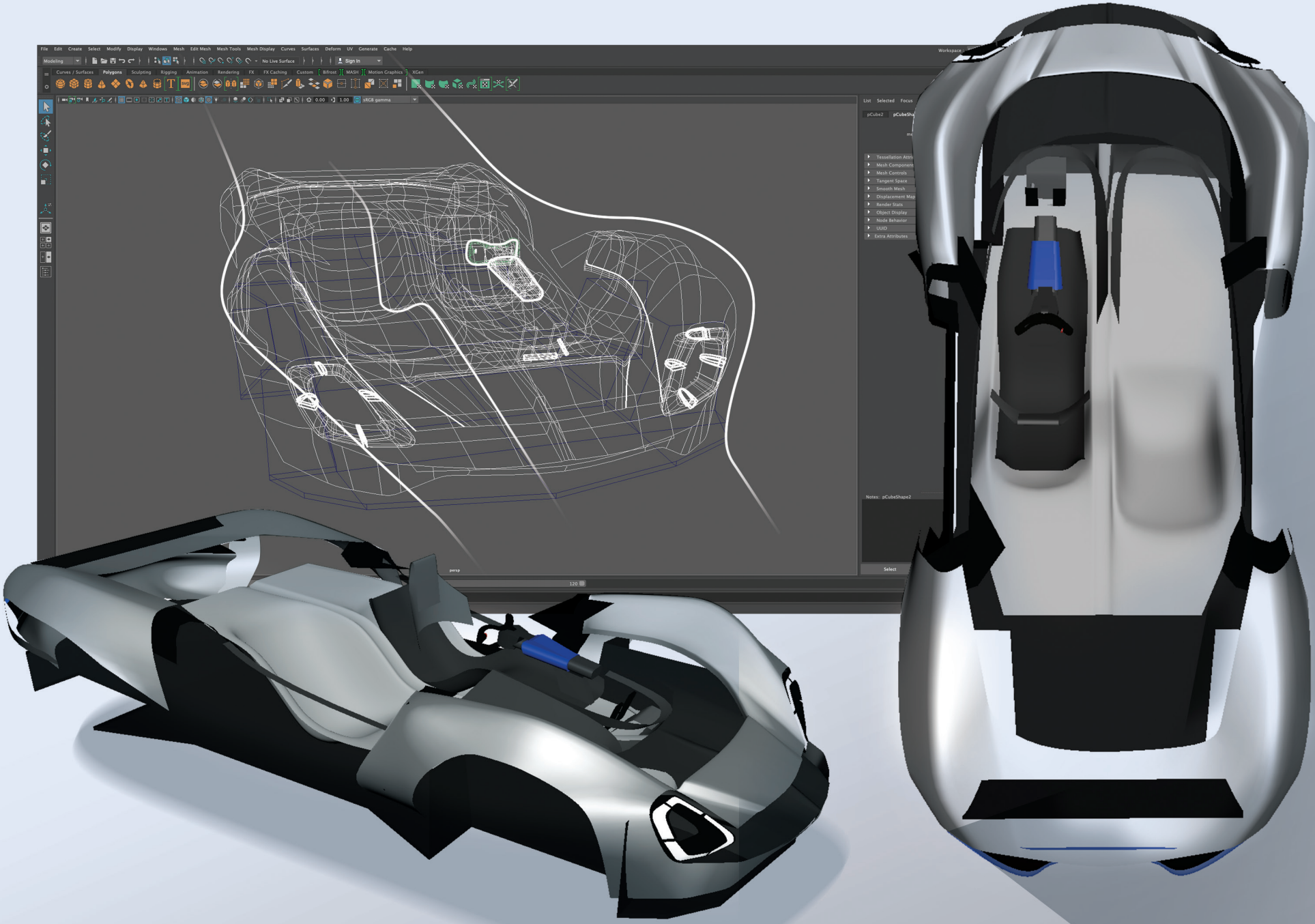


FIGURE 4.13 3d proportion modeling phase

4.3 3d exploration

After establishing the concept's main direction (figure 4.12) to a point where a clear picture is created on what it should look like in 3d, the choice was made to build a 3d proportion model (figure 4.13). Although sketches can be of great value when exploring a design, certain problems are only noticeable and solvable when further elaborated upon in 3d. Building the model in Maya was a fast and effective way to solve the first main problems and created better view on how the most important elements of the design should be further developed. Figure 4.13 gives an impression of the "lego-like" model in this stage. The analysis of the maya proportion model created the following insights for the following components:

DRIVING POD

ADJUSTABLITY
Create a design that allows the steering wheel be automatically set to the right driver settings.

ATTACHMENT
Offer the driver the drive pod with minimal attachment to the car.

PORSCHE DNA
Play on Porsche's DNA factor where the instrument cluster is always the highest point of the interior.

LINE OF SIGHT
Allow the user to always have full visibility on the road.

STEERING WHEEL

FUNCTIONS
Create a layout that allows an ergonomic way of handling the steering wheel.

DNA
Use research to find key Porsche DNA elements to enhance the steering wheel's design.

SEATS

EMBEDDED
Integrate bottom part of the seat with the flowing motion of the interior to create less distraction and a cleaner and undistractive interior.

ERGONOMICS
Allow the seats to be as flexible as possible when it comes to creating the right user settings.

INTERIOR
Try to make it appear as if the exterior is flowing through the interior, creating optically less boundaries between interior and exterior.

EXTERIOR
Strong emphasis on front fenders.
Calm and neutral sculptural feel, no distraction from the driver point of view.

4.4 Driving POD

Normal dashboards partially look the way they do today because they hide the mechanism of the steering column. Exploring the possibilities of steer-by-wire technology allowed the design more freedom in the design of the package. Hence, the steering pod. Furthermore, steer-by-wire has potential to grow into a car handling technology that is superior to the more conventional hydraulic system. It contains benefits like:

- Adoptable steering characteristics
- More possibilities for active safety (e.g.: side wind control,
- road disturbance filtering etc)
- Less energy consumption
- Weight reduction (no hydraulic system)

The development op the steering pod started with an explorative free sketch phase, playing with these new types of freedom. Figure 4.15 shows some key sketches, leading to the first design (figure 4.14)

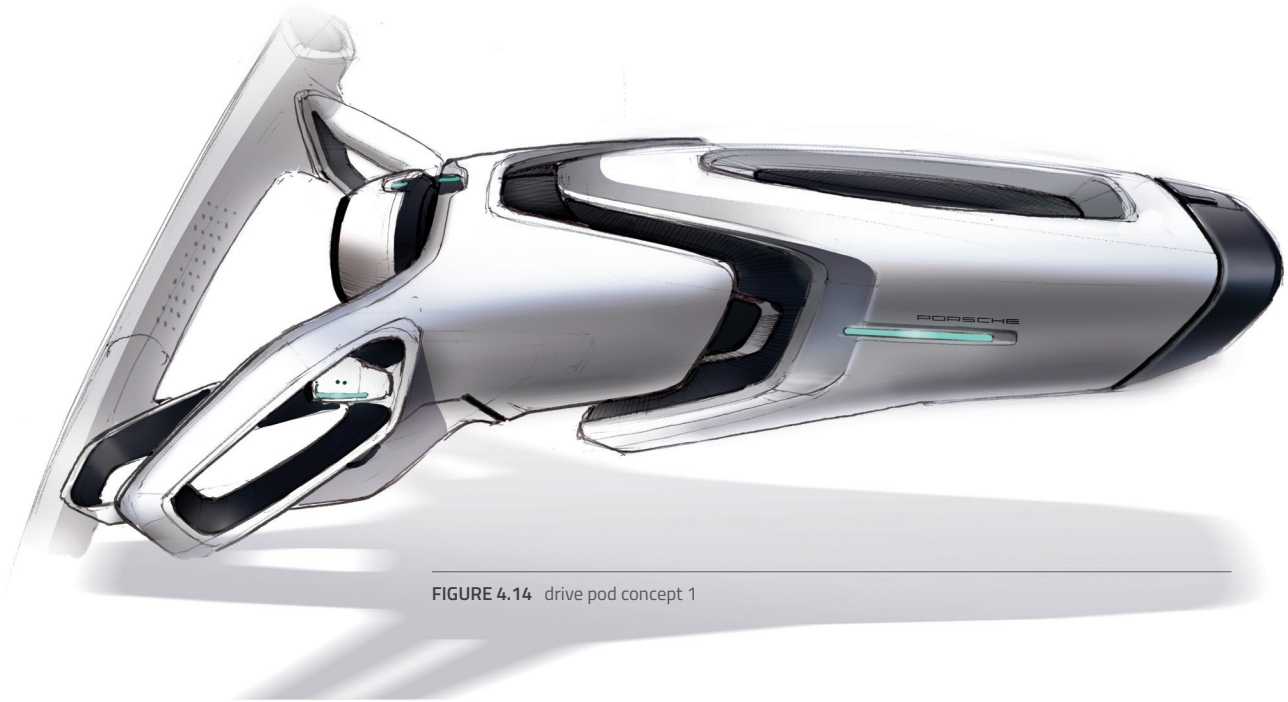


FIGURE 4.14 drive pod concept 1

EXPLORATION

Figure 4.16 shows the three concept directions that were explored to find the way, the steering pod is connected to the car. Although concept 2 and 3 proved to be elegant, placing the steering module on a stand of on an arm proved difficult the integrate in the model's architecture. Furthermore, the stand had to be placed between the legs of the driver which did not prove to be optimal. In the end, concept 1 (the frame) was chosen. Section 5.3 elaborates more on the chosen concept direction and why it's final design DNA was derived from.

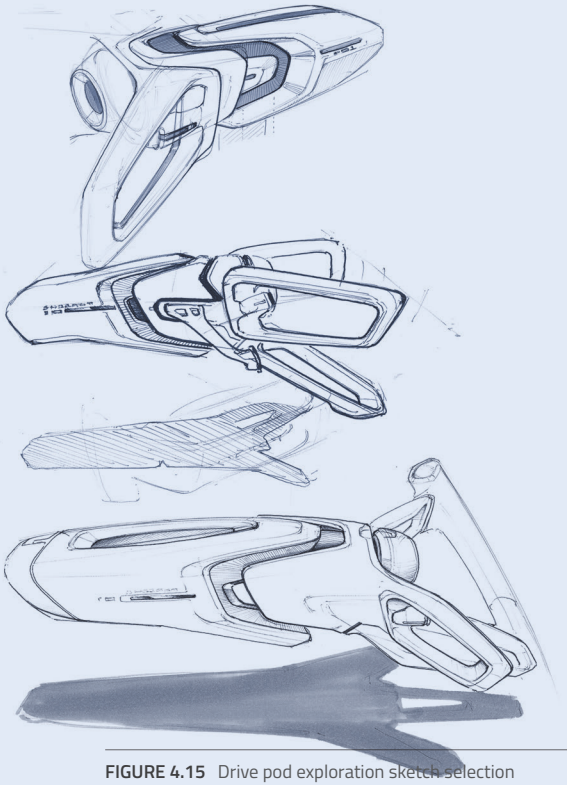
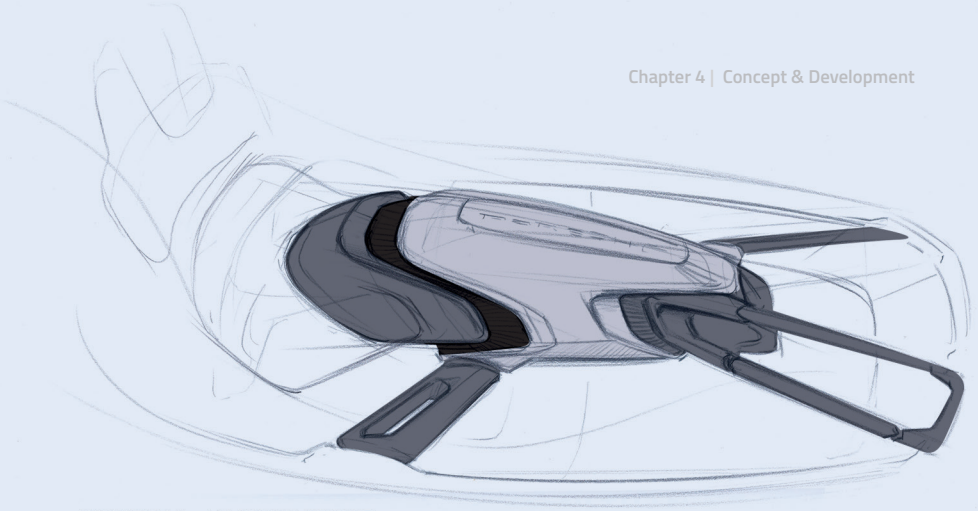
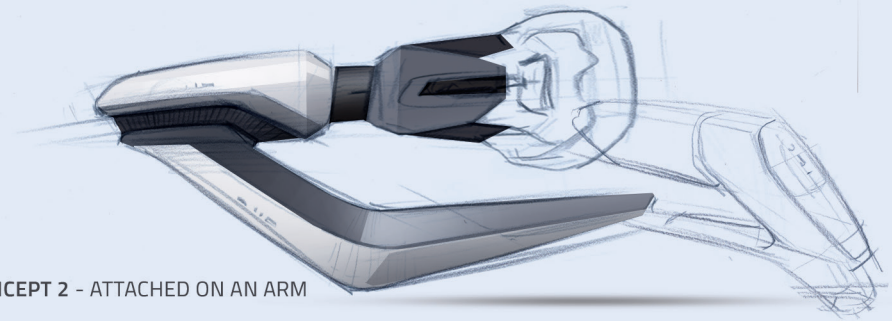


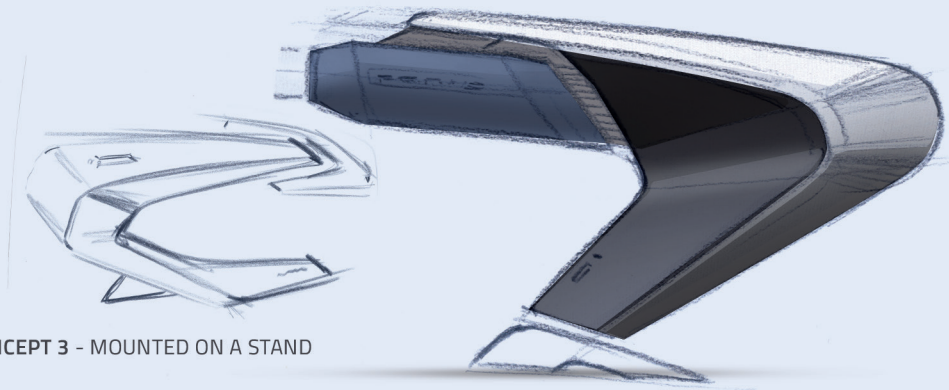
FIGURE 4.15 Drive pod exploration sketch selection



CONCEPT 1 - HANGING FRAME



CONCEPT 2 - ATTACHED ON AN ARM



CONCEPT 3 - MOUNTED ON A STAND

FIGURE 4.16 Connecting to the car

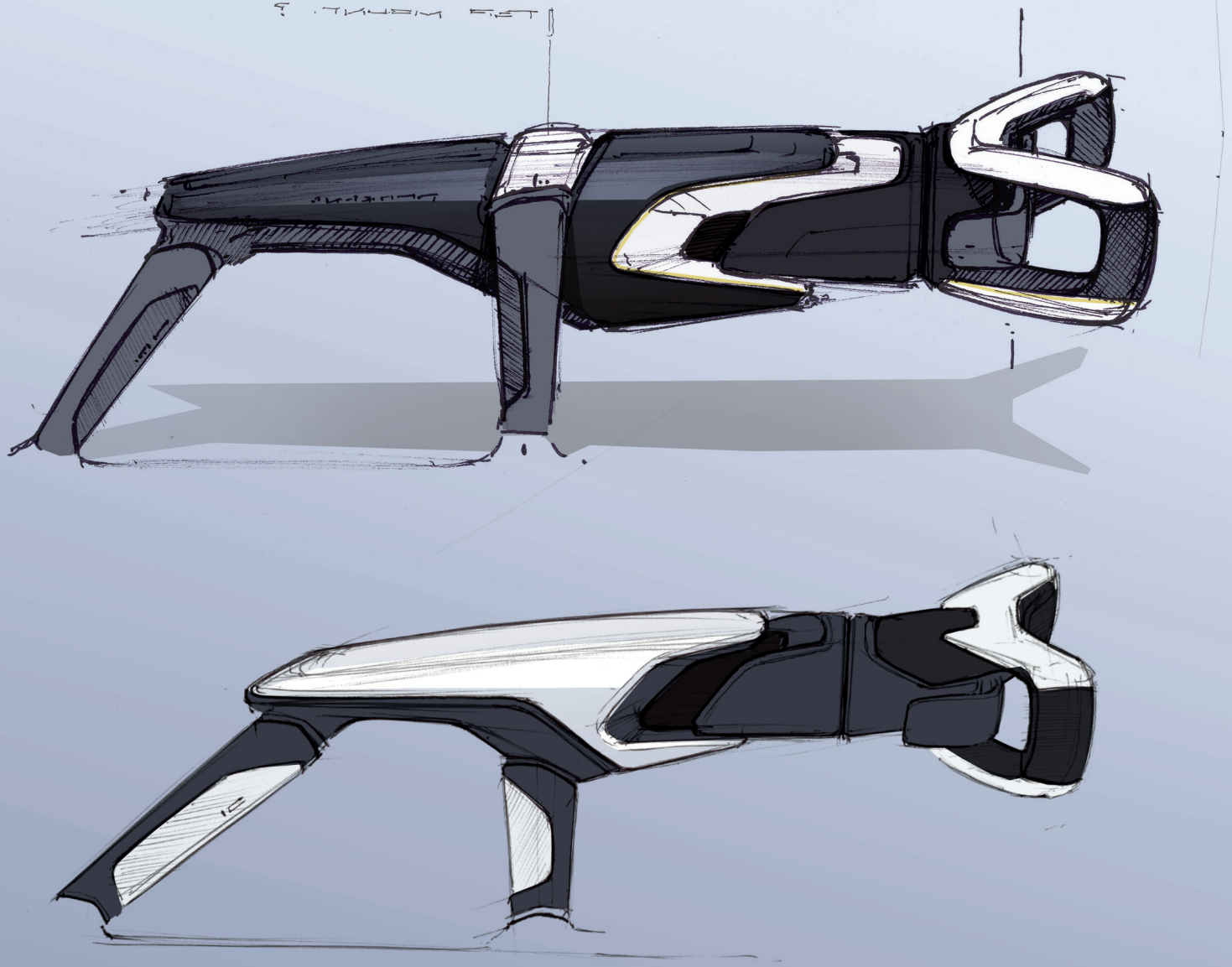


FIGURE 4.17 Final concept sketches driving POD

EXPLORATION

Figure 4.17 shows the last two concepts of the driving pod. In this design sketches, the options on how the pod is mounted to the car has been reduced to two different possibilities. In this stage, the different connections have influence on the height of the placement of the driving module. In the end, the decision was made to maintain the concept of the frame, only now with 3 legs. This proved to be a more optimal solution for the asymmetric shape of the belt line in combination with the middle spine.

Figure 4.18.1 shows a stage in the alias development process where the final design of the frame which houses the driving pod is nearly done. The design sketch of the frame is visible in figure 4.18 (top image).

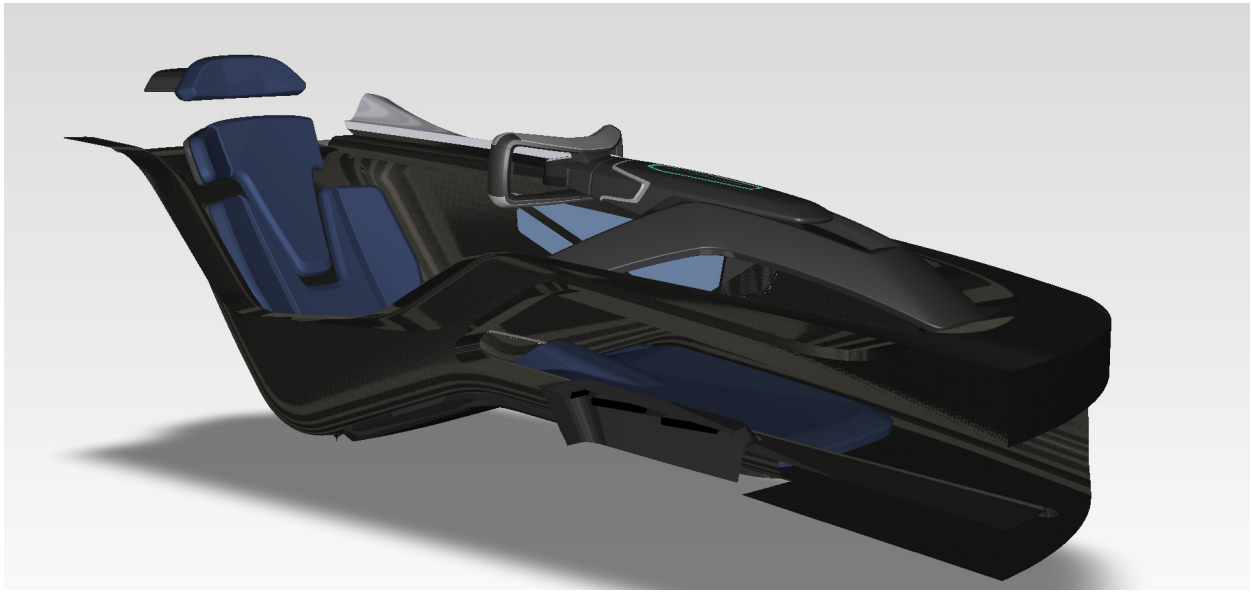


FIGURE 4.18 Sketch over alias model - Exploring attachment

FIGURE 4.18.1 Alias model final driving POD frame

4.5 Steering wheel

EXPLORATION

Figure 4.19 shows the first design sketches out of the intitial concept stage of the steering wheel. The focus was on finding different solutions to find high functionality integration in the handles/grips of the steering wheel. Although these concepts did not make it in into the final product, they were an essential first step in trying to integrate more functionality into the steering wheel.

Elaborating further on this principle, figure 4.20 shows a variety of explorative sketches out of the follow up phase. Different types of volumes and solutions to integrate as many touchpoints in the steering wheel to control the vehicle in a controlled way were played with. In this stage the sketches already contain key elements which will later be found in the final concept and design.

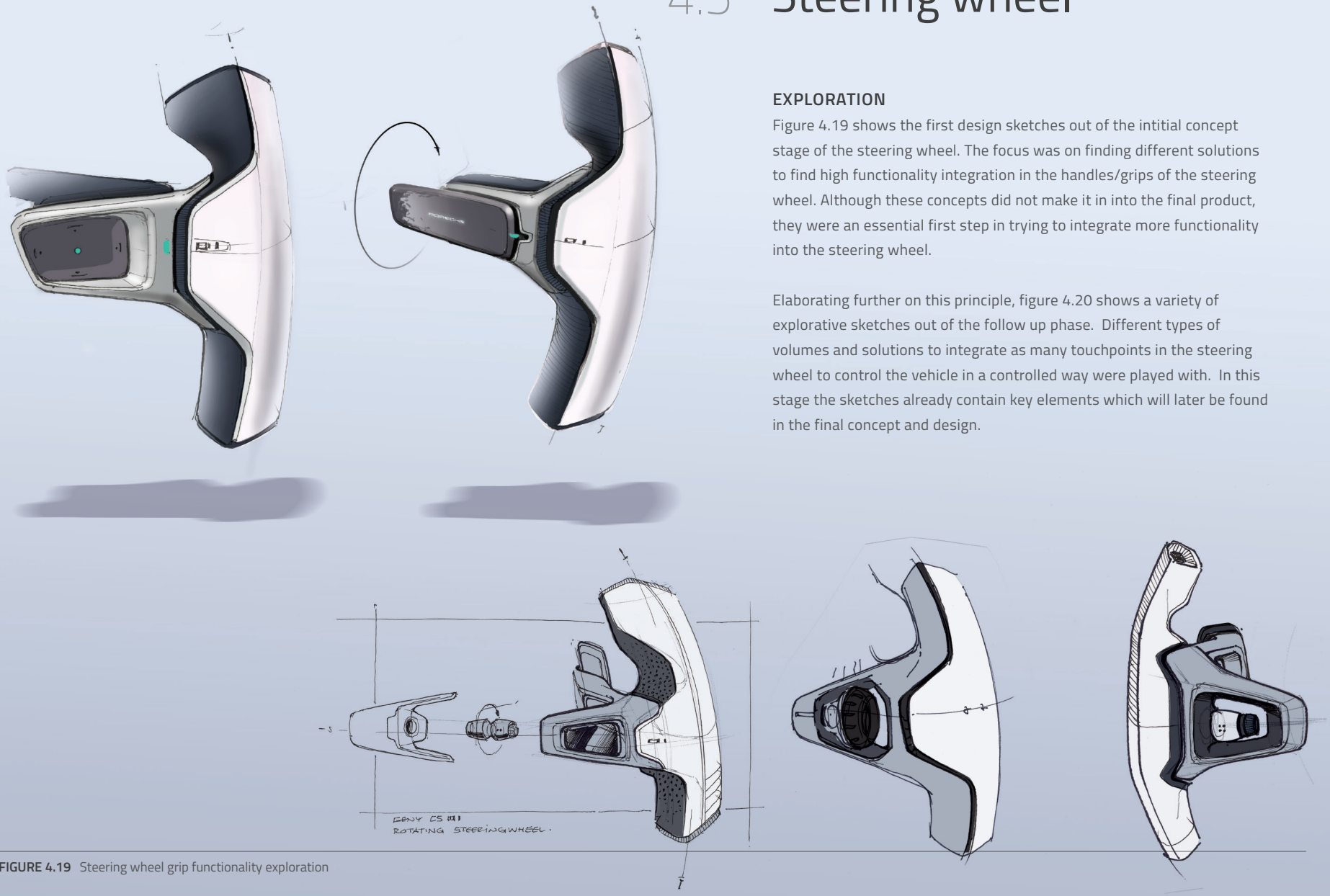


FIGURE 4.19 Steering wheel grip functionality exploration

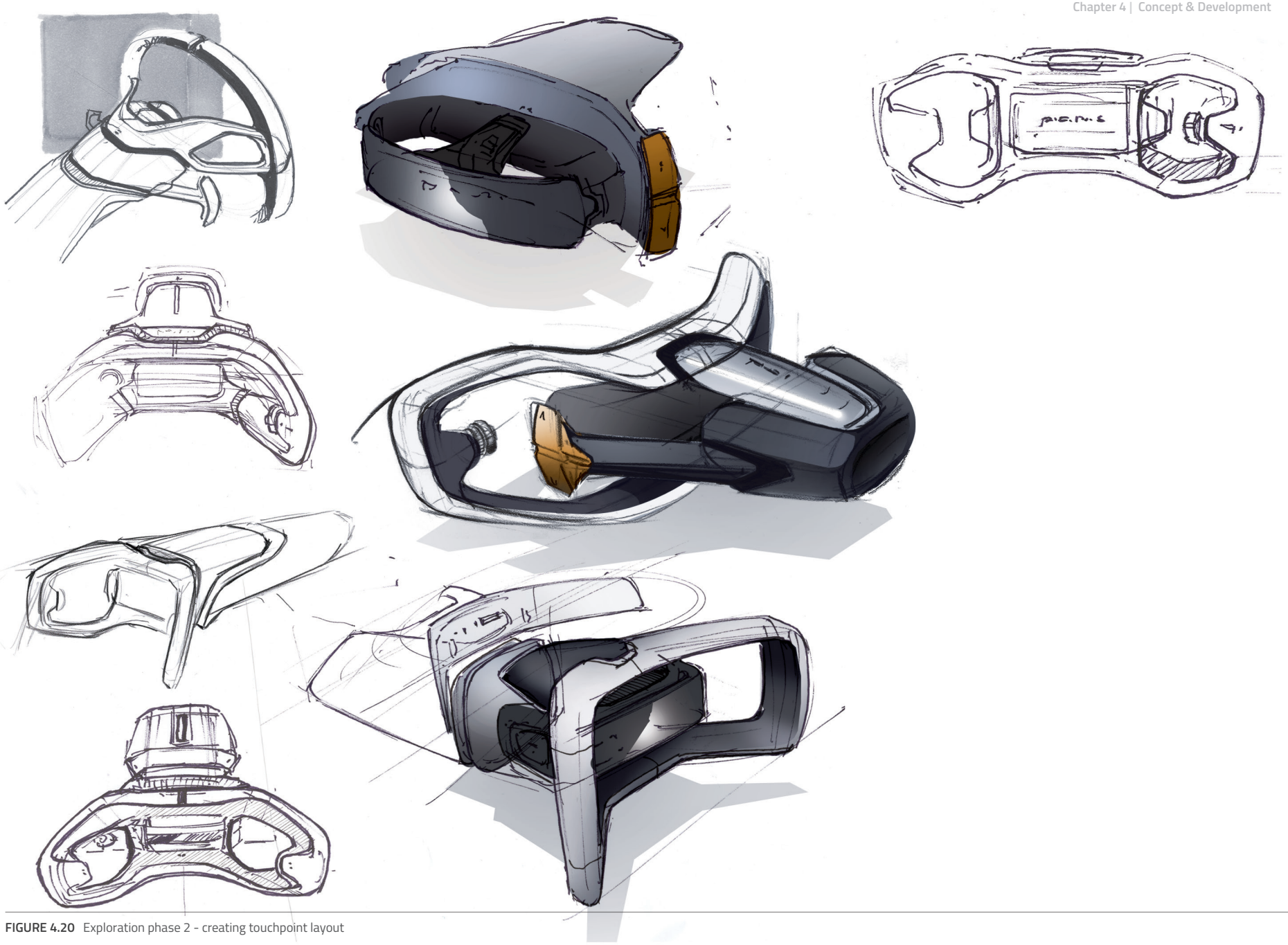


FIGURE 4.20 Exploration phase 2 - creating touchpoint layout

FINAL CONCEPT

Figure 4.21 shows a selection of the final concept sketches in the exploration phase of the steering wheel. In this stage, the final placement of the touchpoint, the driver has with the steering wheel were found. Based on the sketches in figure 4.20, the decision was made to integrate functions in the steering wheel (for the thumbs), to house a screen in the center of the steering wheel and to place the control buttons, related to the screen's functions at the back side. This way, the index and middle finger can easily reach the controls while maintaining both hands on the steering wheel. Figure 4.22 shows the final concept sketch, made over a polygon model. This sketch was the starting point for the final design model. At this point, the final design of the screen and the way the screen is attached to the steering columb was determined. Figure 4.23 shows a front view of the alias model with a quick button and screen layout exploration.

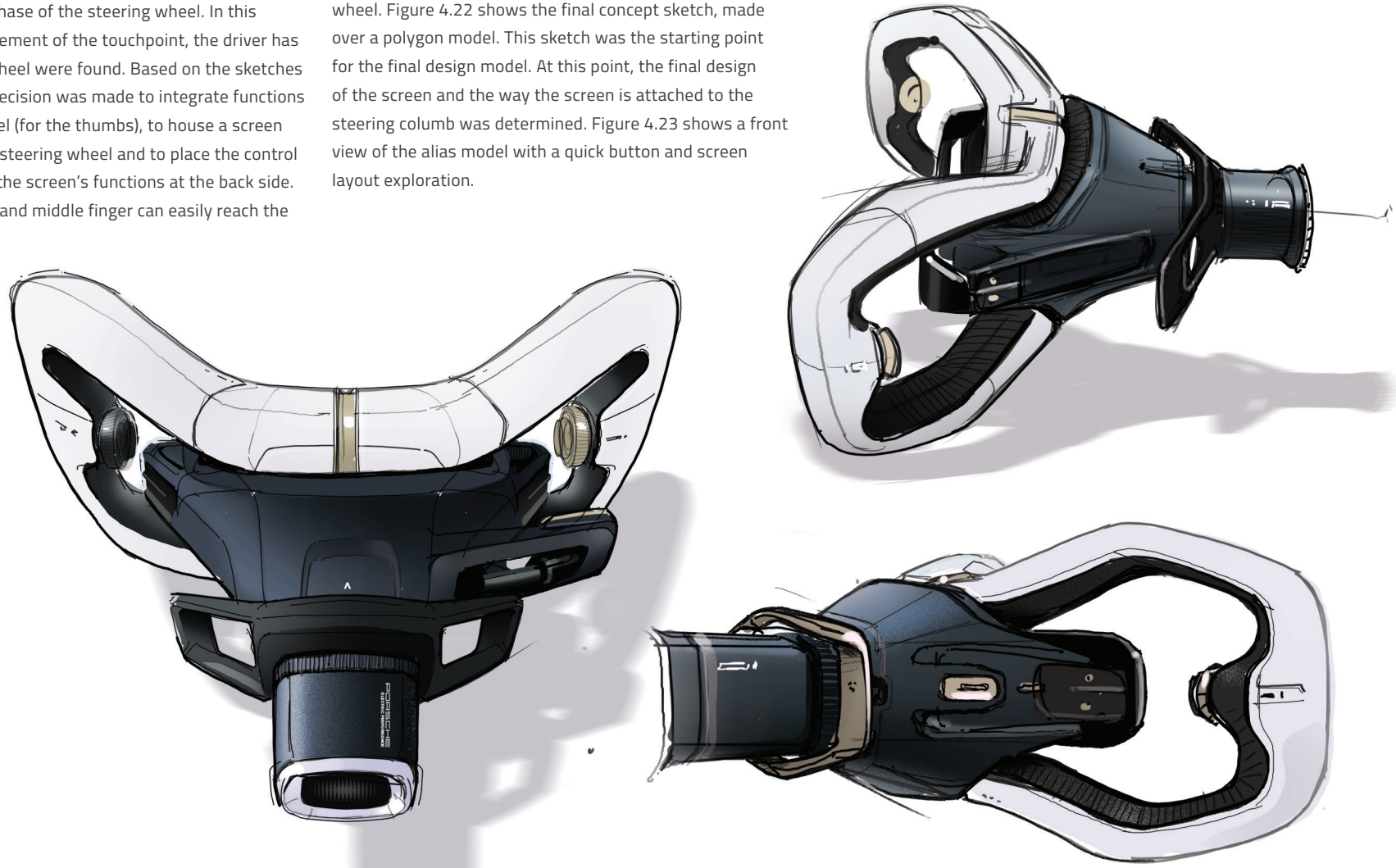


FIGURE 4.21 Final concept direction sketches

FIGURE 4.22 Maya model - before going into alias

FIGURE 4.23 quick sketch over alias - reaching final design state

4.1 Seats

At a certain point in the conceptual phase, building the final model needed to be initiated. At this stage, a substantial amount of time was already spent on the development of the steering wheel and the driving pod. In the first concept phase (section 4.1), an exploration on seat design was already conducted (Figure 24). Since the concept of phase 2 (embedded) was to create the feeling that the driver is embedded in the car's interior, the decision was made to further develop the seat's design in the final modeling phase. Figure 25 shows how during the modeling phase, the seat was sketched over the alias model in order to convert the earlier found design into a suitable shape for the car. The main focus was on trying to prevent that the flowing theme of the interio r got disrupted while still offering the same functionality as a normal car seat. The bottom part of the concept is fixed to the shape of the car while the back, shoulder and head rest are each separately moveable. Sketching over the Alias 3d Model was a fast way to communicate the design with the modelers and helped to establish the right proportions as quick as possible.

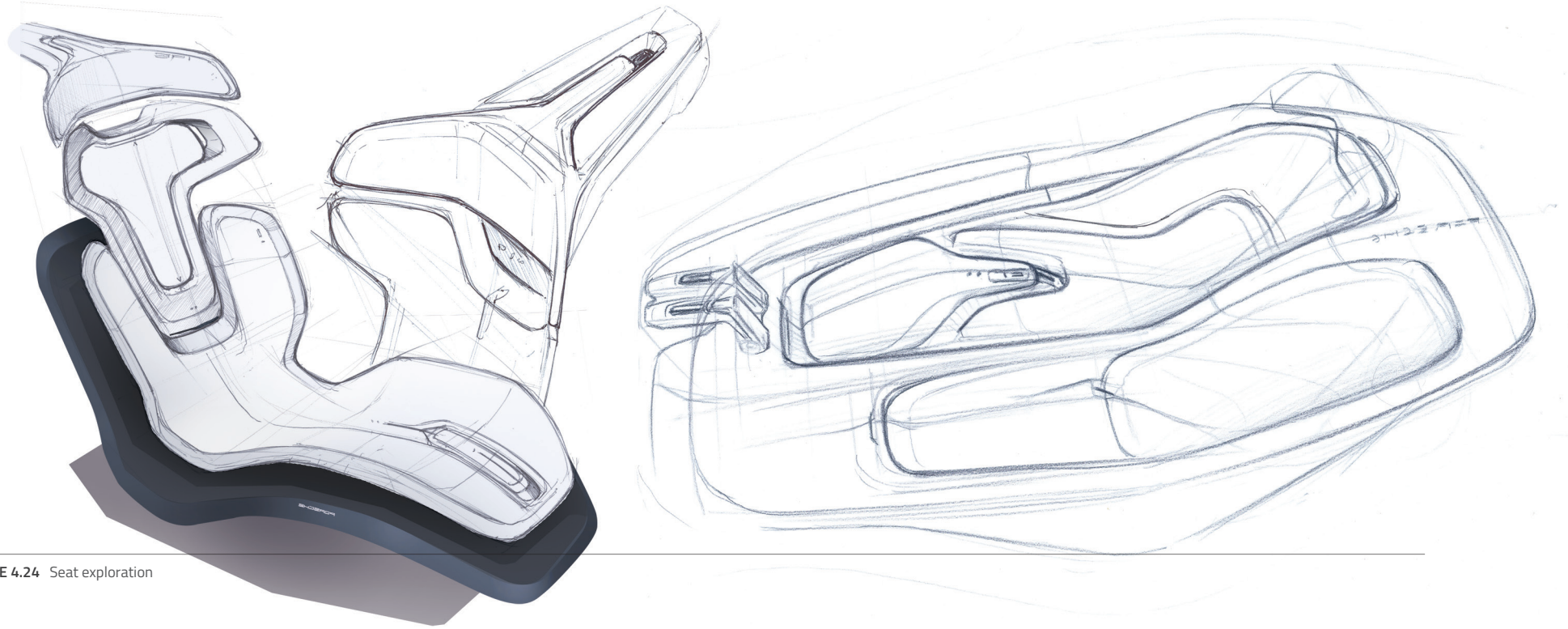
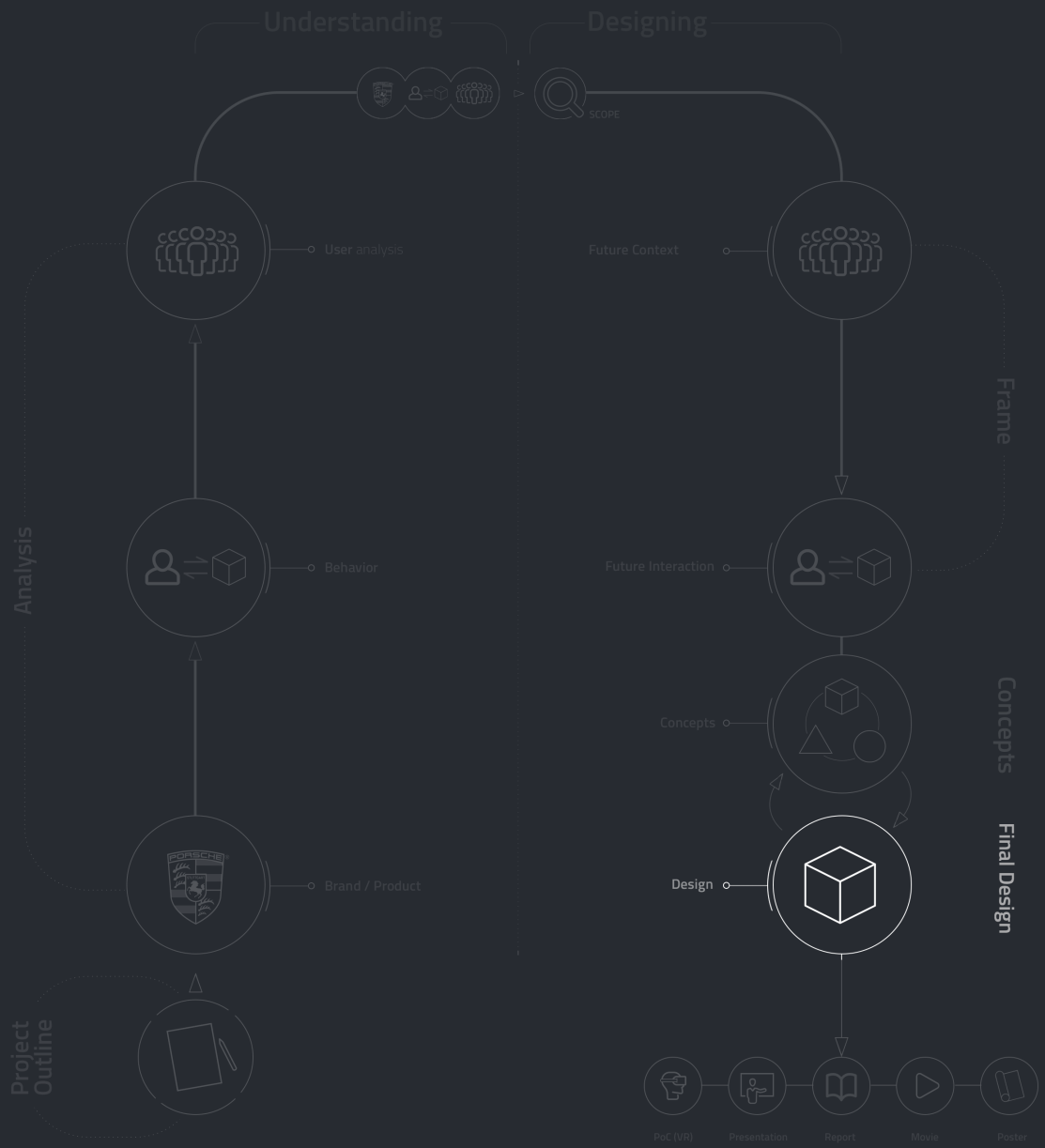


FIGURE 4.24 Seat exploration

FIGURE 4.25 Sketch over alias - Final concept stage

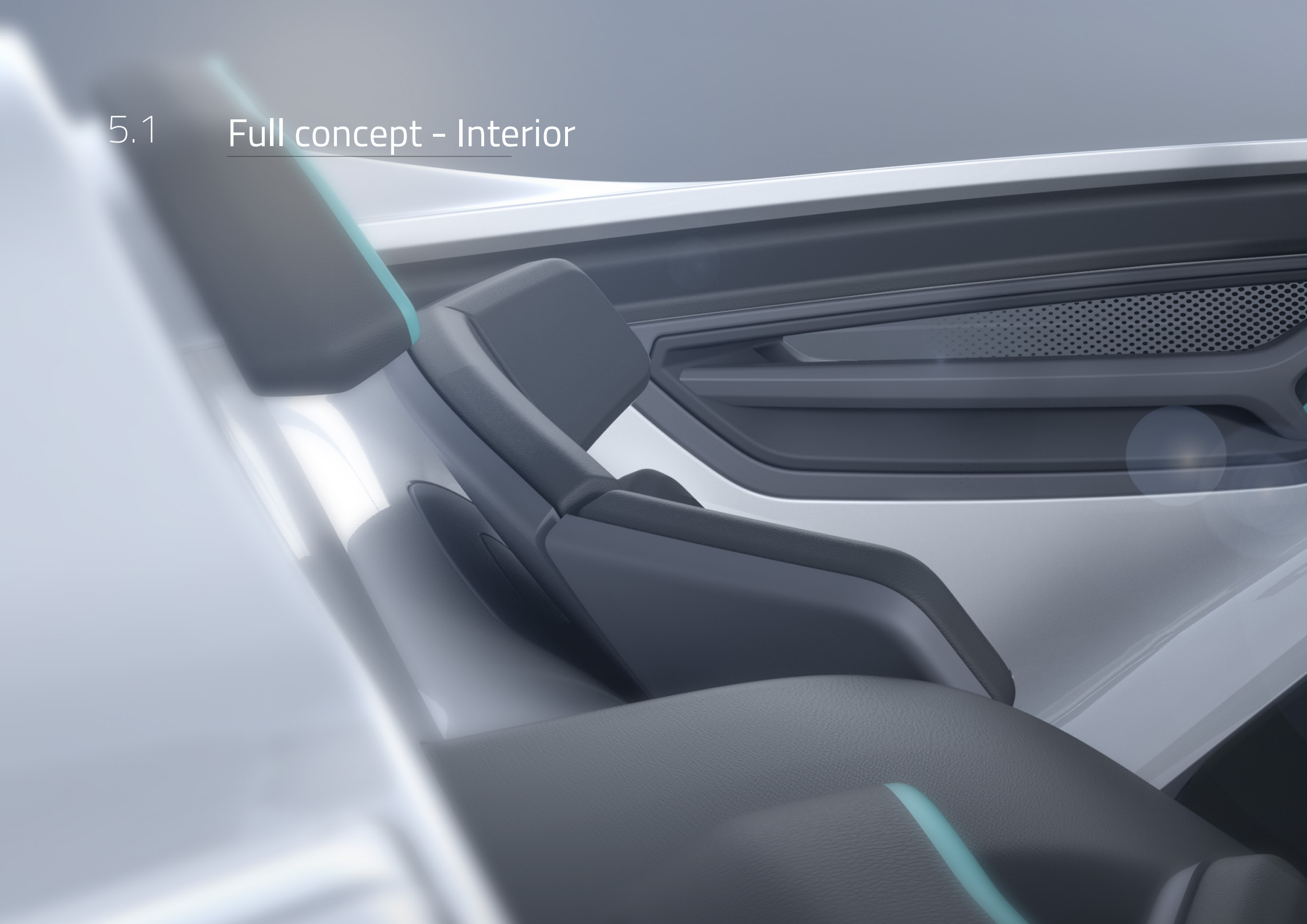


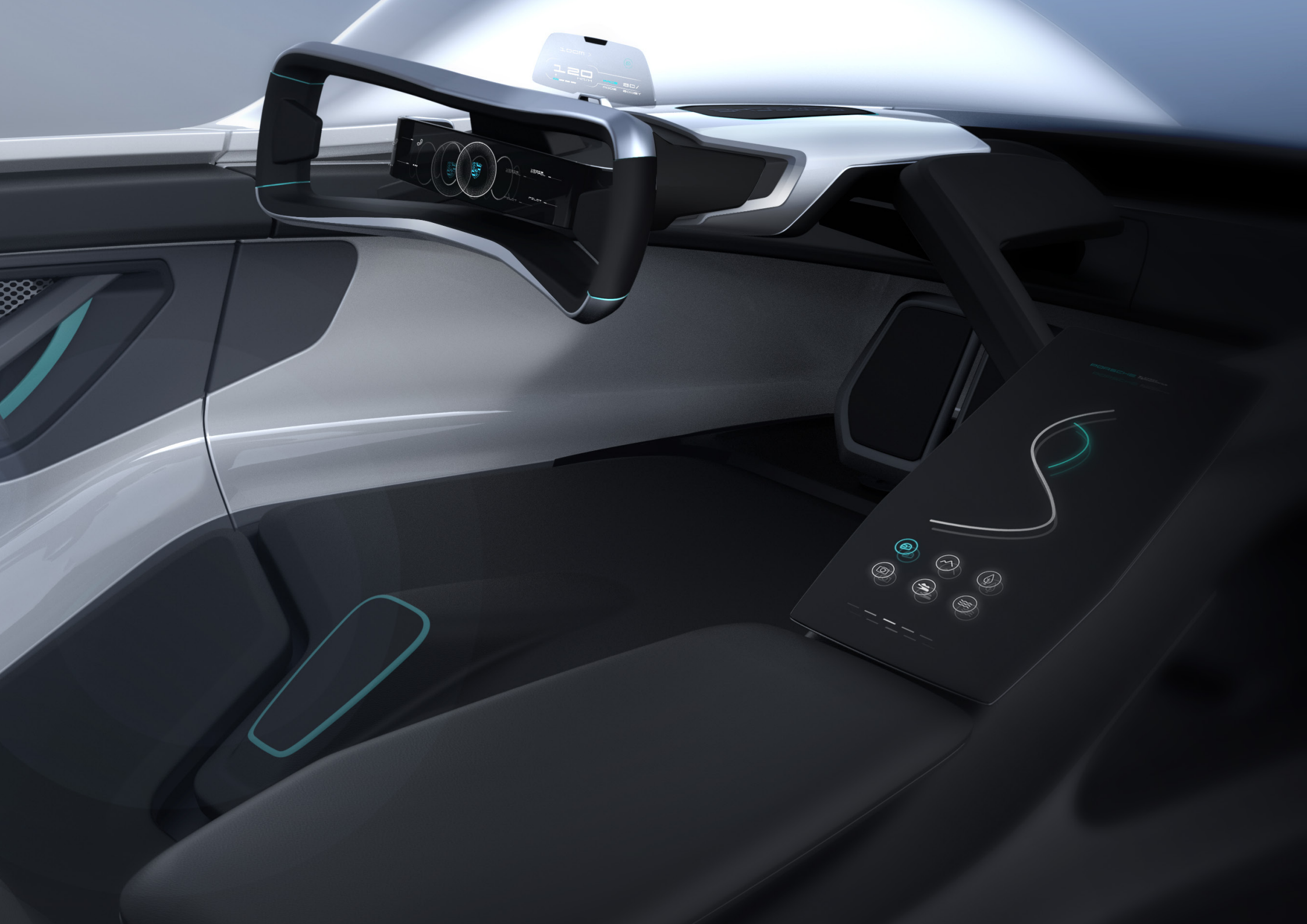
5.1 Interior Vision Complete
5.2 Steering wheel
5.3 Steering POD / Module
5.4 Exterior

5 Final Design

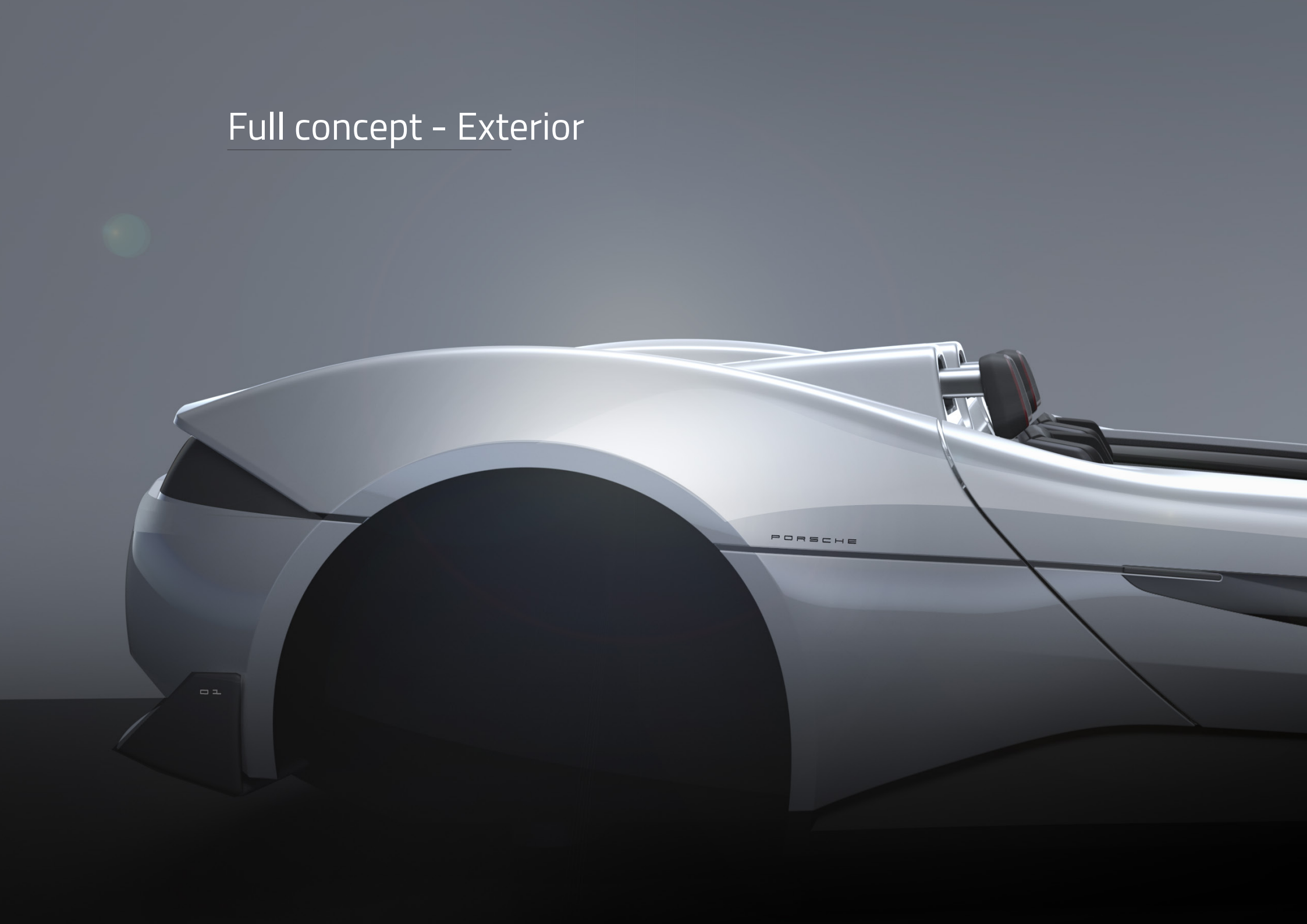
After finalizing the conceptual phase of the project, a clear direction on what the final design should look like was created (Section 4, Concept & Development). In the following section, the reader can learn about how the 2d concepts are converted into the final 3d model. The section explaines the DNA and functionality of the main components of the concept and concludes the design process of the report.

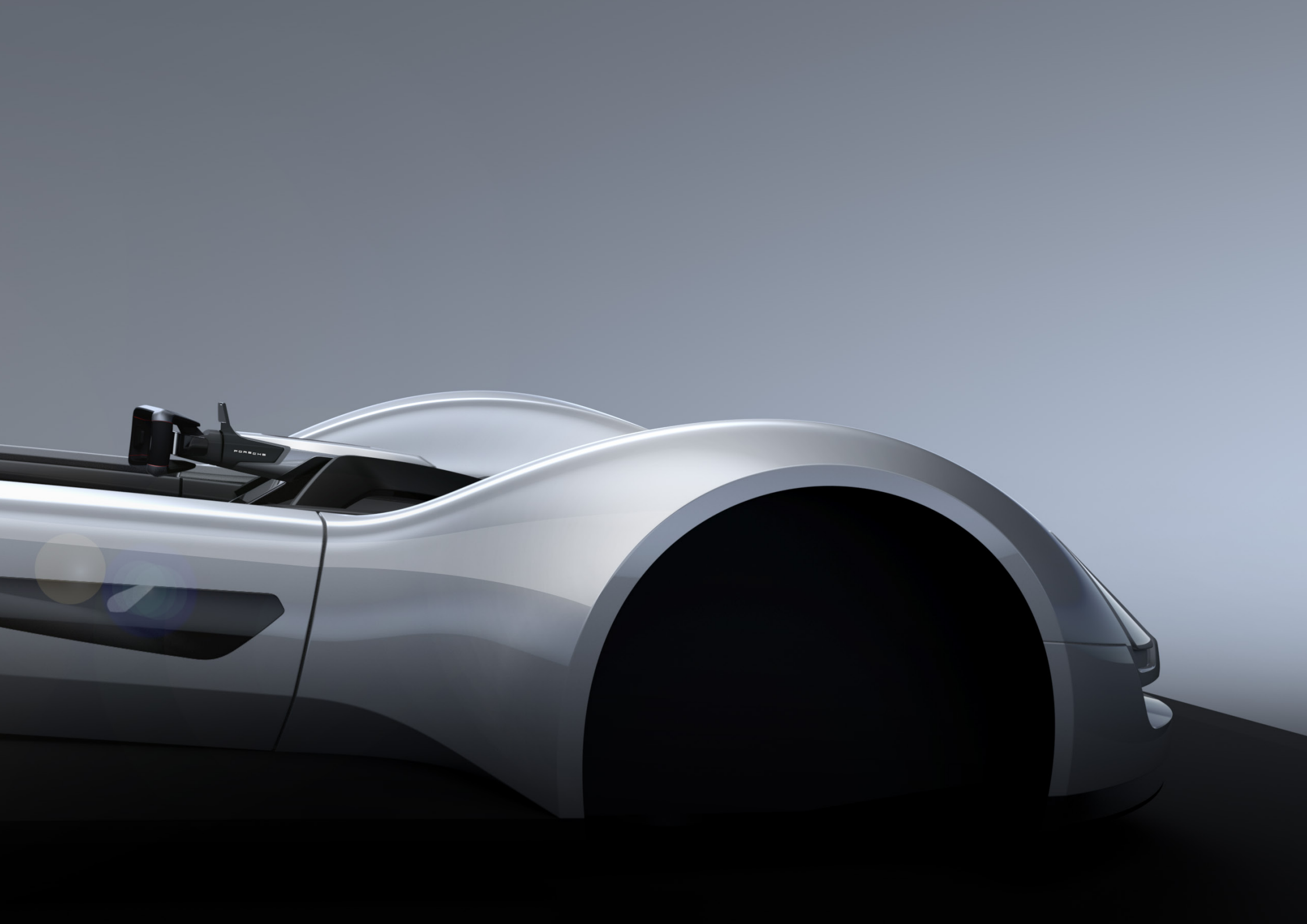
5.1 Full concept - Interior





Full concept - Exterior




PORSCHE

5.2 Steering wheel

DESIGN & DNA

DESIGN

As the most important part of the final design, the steeringwheel combines various components from the concept phase into a layout that demands and allows the driver to have his/her hands on the steering wheel as much as possible.

A densely clustered combination of touchpoints allows the driver to control the vehicle with either haptic feedback buttons on the sides of the screen, or physcial buttons on the steering wheel (figure 5.4) in order to have full access to all main driving related functions of the vehicle.

DNA

The form language of the steering wheel is a reïnterpretation of that of the old Porsche 912 Targa (1967) and a variety of older 911 models (figure 5.2)

Considering the year these steering wheels were designed, an elegant, lightweight and highly functional solution to offer the driver access to the horn without taking the hands of steering wheel was created.

Perceiving the horn-part as the main functional element, the 2035 vision uses the same layered structure only now bent through the main frame of the steering wheel. (figure 5.2)

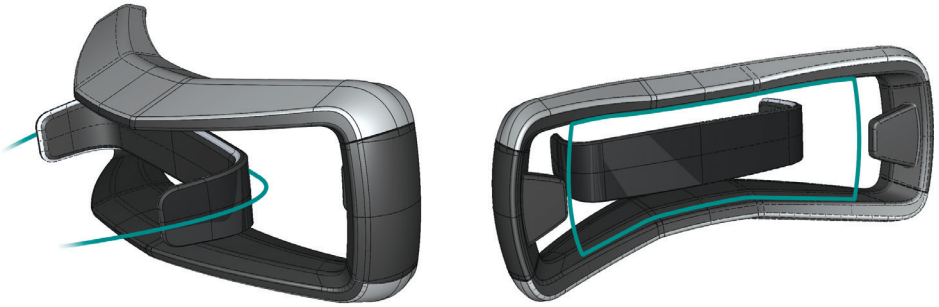


FIGURE 5.2 DNA Explained

FIGURE 5.3 1965 Porsche 911 2.0 coupe (top) 1967 Porsche 912 Targa (bottom)

FIGURE 5.4 Steering wheel final design 3/4 side view

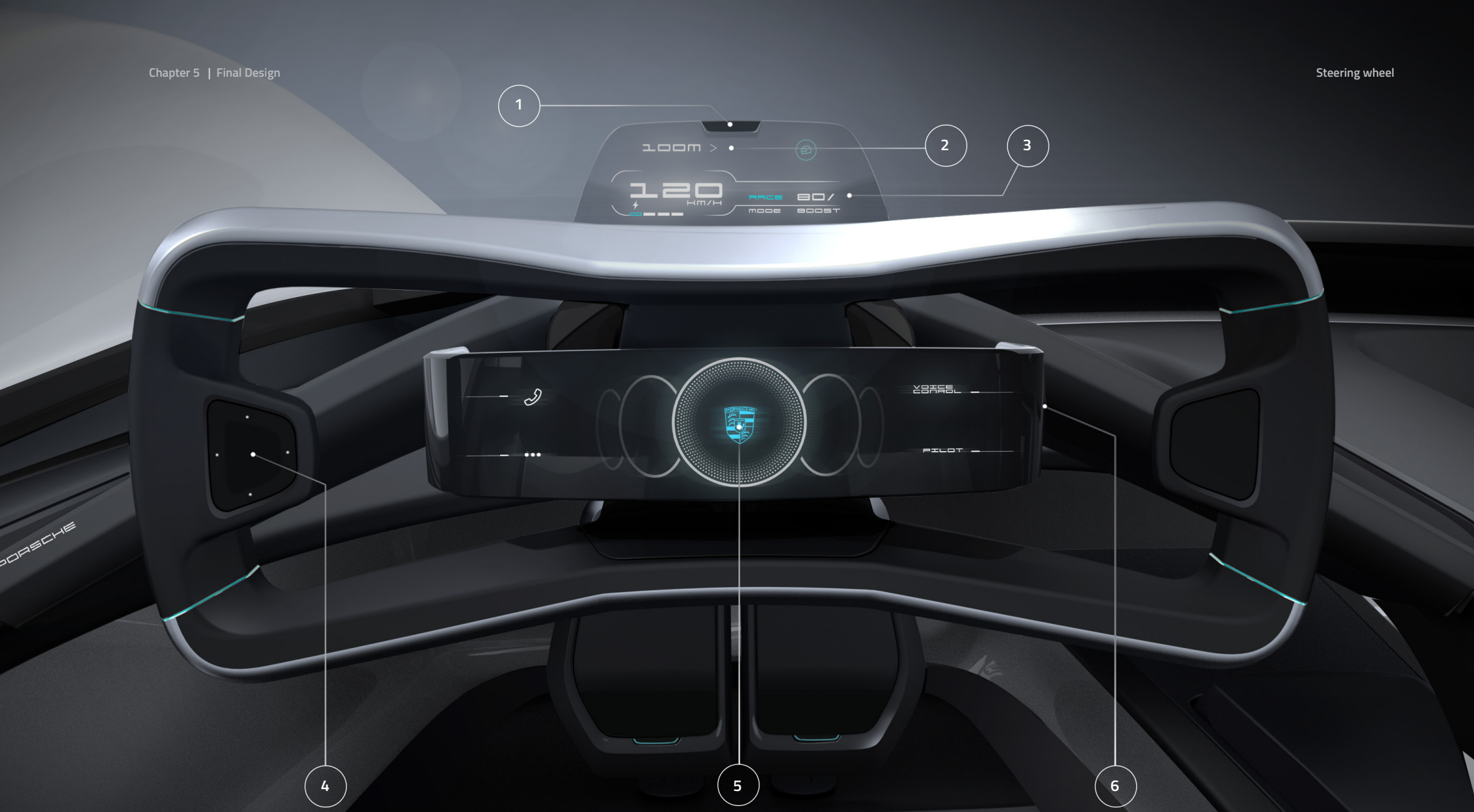


FIGURE 5.5 Driver POV

INTERFACE & CONTROL

2 LAYERS

The design of the interfaced is split into two layers. The top layer (main instrument cluster) is a transparent screen, offering the driver the essential information on the road. In combination with the flat steering wheel, the transparent screen allows full visibility on the road. The bottom layer (integrated screen) is embedded in the steering wheel and allows the user to access other functions of the vehicle.

1. Integrated biometric face scanner for 'no-key-start' and automated optimization of the cockpit based on own profile.
2. Experience indicator
3. Main vehicle and drive information
4. Steering wheel integrated buttons to quickly navigate in screen menu's
5. Static main instrument that always stays in a horizontally lined out position (figure 5.6).
6. On-screen haptic buttons (Figure 5.4)

CONTROL

Steering wheel buttons

Integrated buttons on the steering wheel allow for quick navigation through menus with your thumbs. Without having to take hands of the steering wheel.

2 Screen buttons

two buttons on each side of the screen each offer changing functions. The functions available are connected to the type of cluster that is shown in the middle of the screen and are thus, offering a flexible and personalizable way of controling a substantially bigger amount of functions than a regular steering wheel while using limited space.

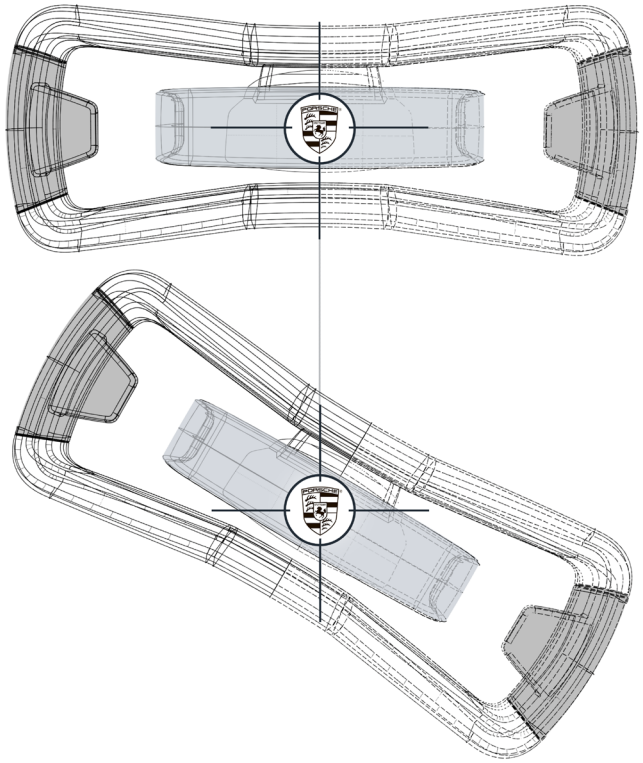


FIGURE 5.6 Rotating steeringwheel vs Static main instrument

5.3 Drive POD

DNA & DESIGN

DNA

The DNA of the 2035 electric vision's steering module / POD be found in the older Porsche Formula 2 cars (figure 5.7). A frame like structure holds up the steering module with the most essential elements while at the same time offering structure and stiffness to the car, preventing it from twisting and bending during the race. Maintaining the same design principle, a more elegantly styled solution to the same kind of problem was found. The driving pod with the steering wheel attatched houses all functions which would normally be integrated in a dashboard.

CONTRAST

The pod is deliberately given the same white tone as the exterior. By doing so, the contrast this creates with the dark frame and interior elements results in a strong emphasis on the main driving element of the design.

OPEN STRUCTURE

Together with the open cockpit, having only a frame with a steering module rather than a full dashboard create an open cockpit feel. The idea behind this is to feel less encaptuled while driving so that there is less physical boundary between the exterior and the interior.

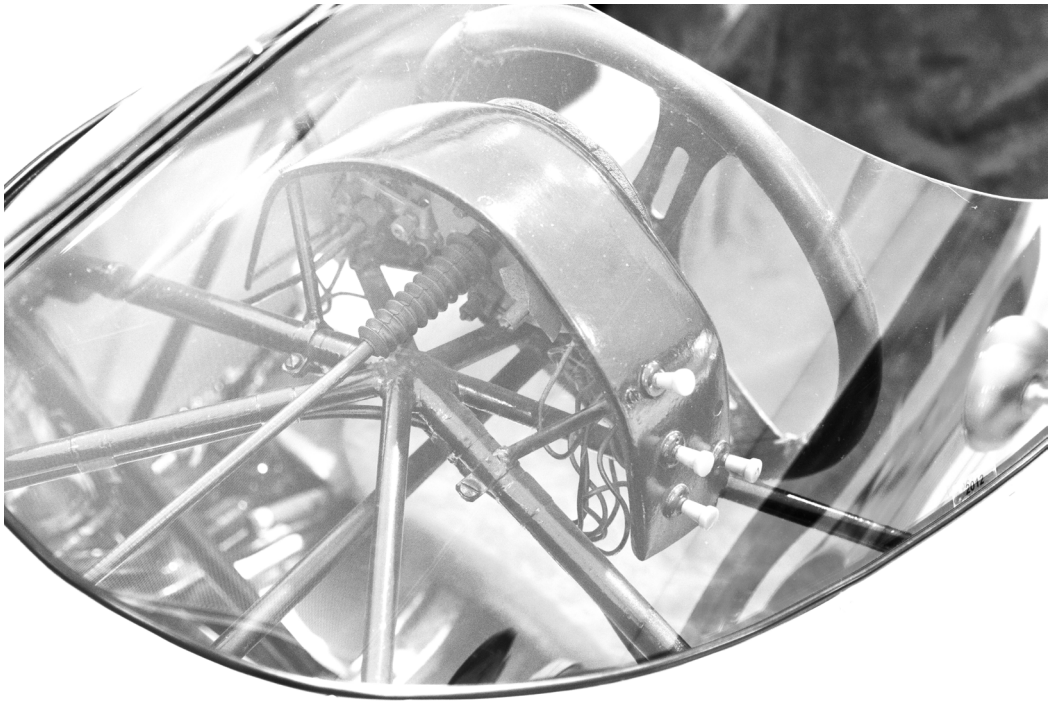


FIGURE 5.7 Porsche race car steering wheel structure

FIGURE 5.8 Driving POD top view

FIGURE 5.9 Driving pod from door opening

FIGURE 5.10 Driving pod in frame - front of car

FIGURE 5.11 Full visual representation of the method used

HIGHEST POINT OF INTERIOR

Section 2.3.6 explaines and shows how an important DNA element for Porsche is that their instrument clusters always are the highest point of the dashboard.

Maintaining the integrity of this brand DNA factor, figure 5.10 shows how the driving pod, supported by the race-car-inspired frame, maintains the highest point of the interior. Together with the pronounced fenders and muscular shoulders a Porsche typical yet fresh take on sports car architecture was found.

OPEN VS CLOSE

The steering module is seperated into two different elements. The body colored part is fixed on the frame. The darker part “ejects” towards the driver. The camera, built into the heads up display recognizes and the module opens up to the right settings. Both parts are seperated by a technical looking splitline. If the object is closed, a monolithic and more discrete look is created. When the steering POD is activated and ejects, a darker inner housing is visible. Laying in a different layer, it creates more deph and a more technical appearance if opened.

4.5 Exterior

THE CONCEPT

EMPHESIS ON WHAT MATTERS

A characteristic point of a Porsche interior is that the instrument cluster always remains the highest point of the dashboard (Section 2.3, Interior Design DNA). Reïnterpreting this brand DNA factor by placing all driving related functions into a steering POD that rises above the low belt line offers a new perception on experience sports car mobility.

As the elemental design principle, this reïnterpretation became the leading element in how the exterior came to life. By working this way, the most important function of the vehicle is emphasised and readable from all sides of the car.

The low seating position, combined with the flat bonnet allowed the design to play strongly on emphasizing the front fenders and rear shoulders (section 2.2.7). The driving experience therefore has similarities with how the fenders in the old Porsche 356 speedster during the user test where experienced. The idea of this design principle is to have an optimal viewing angle on the road in front of you while the only remaining visible parts are the strongly emphasized muscular front fenders.

FLOW

STYLING

Inspired by the curved and serene shapes and curves of a snow landscape, the final design is kept soft and curvy. Key was to create as little distraction for the driver as possible while maintaining the sportive and Porsche typical sculptural feeling.

AIRFLOW

To integrate function into the final design of the exterior, the soft and organic design is equiped with aerodynamic functions . As figure 5.14 shows, the front of the car houses an air inlet. This inlet lets air flow under the bonnet, after which it ramps up, over the cockpit. By doing so, downforce is created. Another air flow element of the exterior is the integrated rear spoiler. Not only can the rear spoiler function as an actual spoiler, it can also open up in a way that lets air flow underneath, creating a vortex behind the car. This will enhance breaking performance.

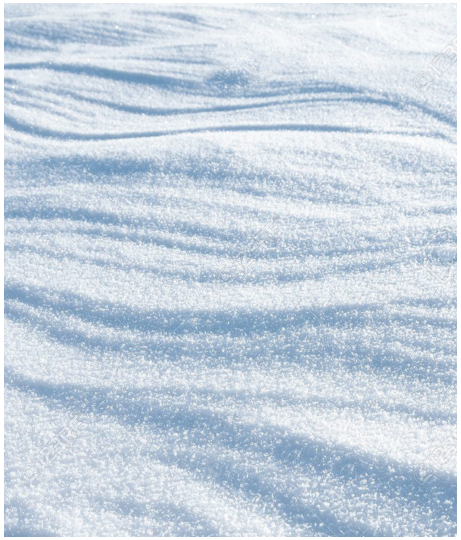


FIGURE 5.12 Snow

FIGURE 5.13 Alone and Embedded

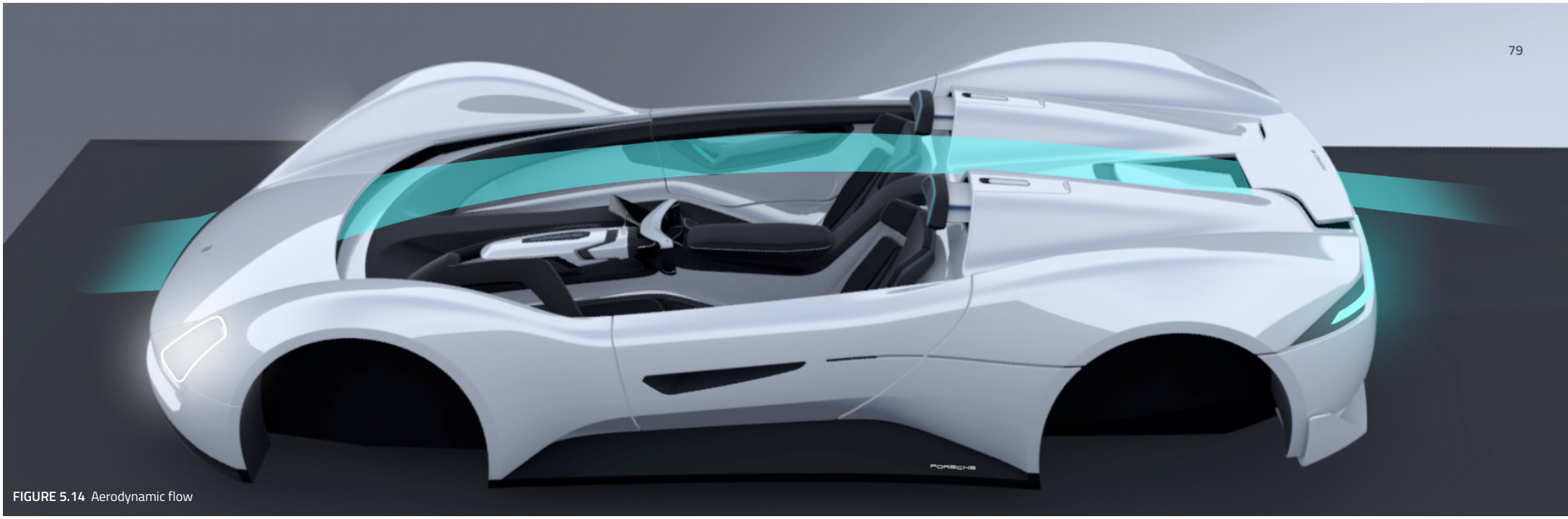


FIGURE 5.14 Aerodynamic flow

FIGURE 5.15 Exterior flowing into Interior

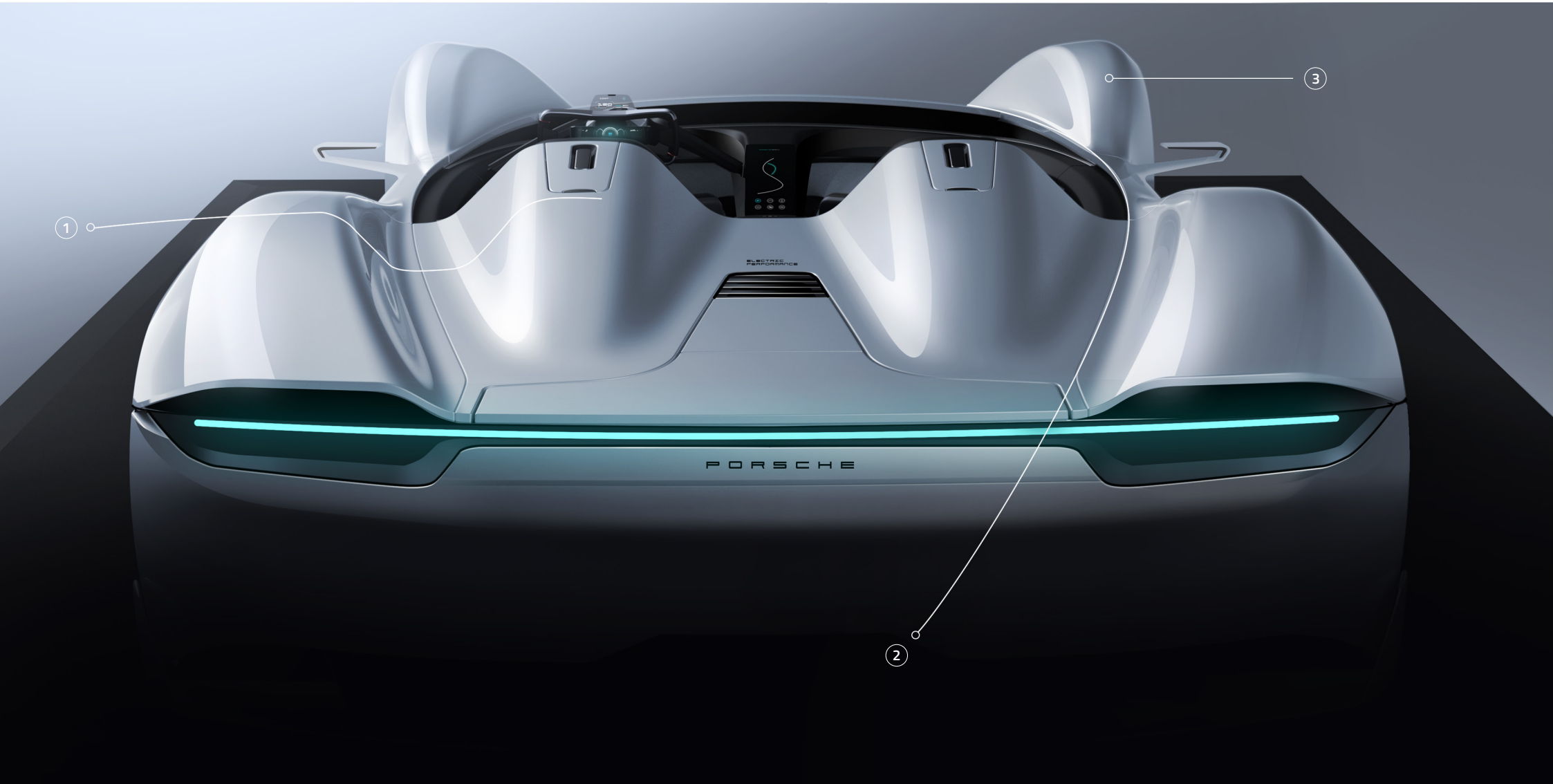
PORSCHE DNA IMPLEMENTATION

1 **MUSCULAR / SCULPTURAL SHOULDERS**

The two volumes behind the driver create the same effect as the greenhouse van the Porsche 911 (section 2.2.7). Being relatively narrow, they put extra emphasis on the sculptural and muscular shoulders.

2 **CONTINUES LINE**

A continues line, running from the front of the hood, all the way to the back results in a highly readable shape and a harmonious design (Section 2.2.5) .



3 **EMPHASIS ON FRONT FENDERS**

A result from the steeply ducking down bonnet, the front fenders are emphasized. Together with the integrated headlights this results in a Porsche typical face (Section 2.2.1).

4 **TAPERED BONNET**

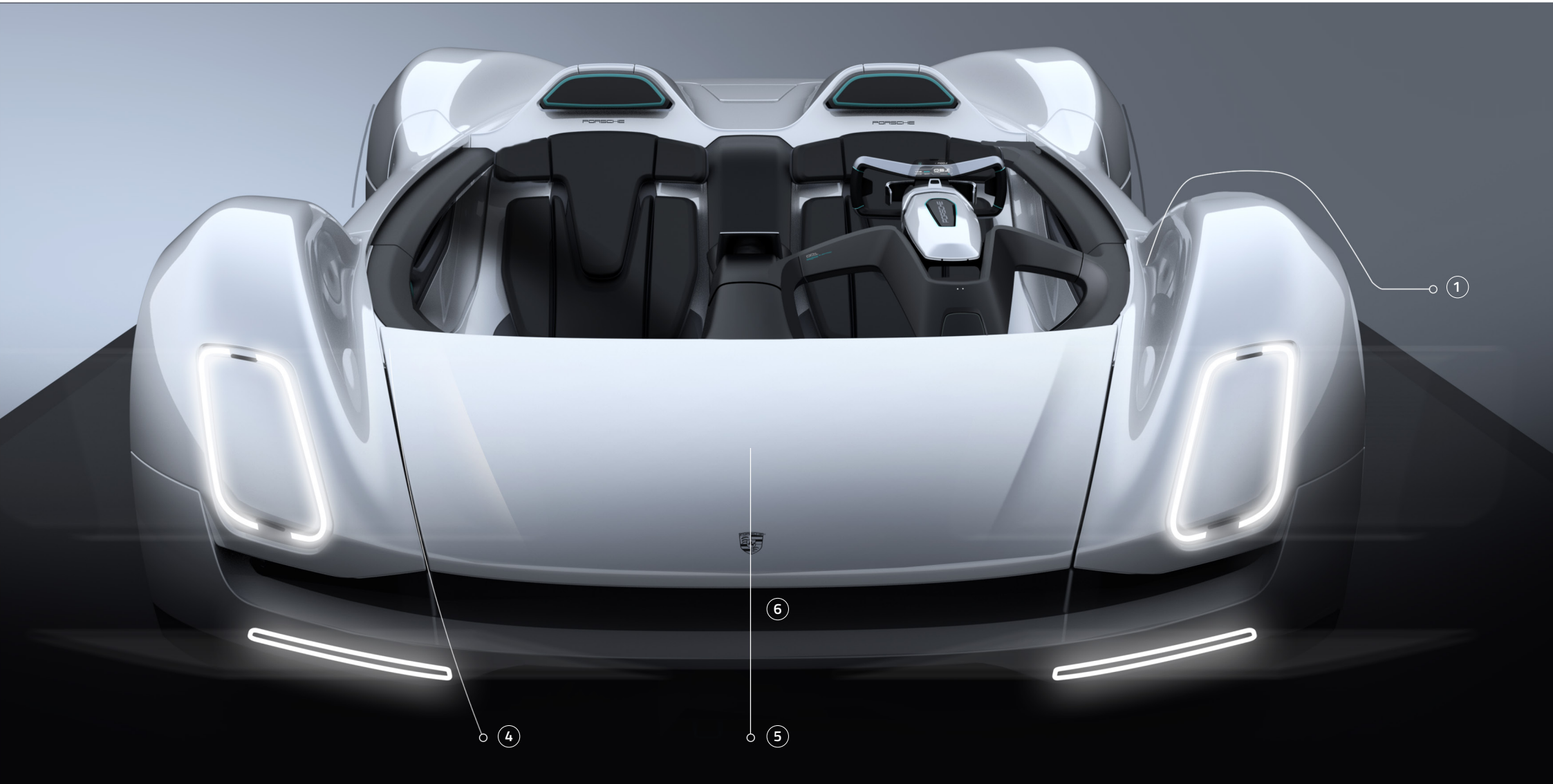
The shape of the front fenders result in a strongly tapered bonnet (Section 2.2.6)

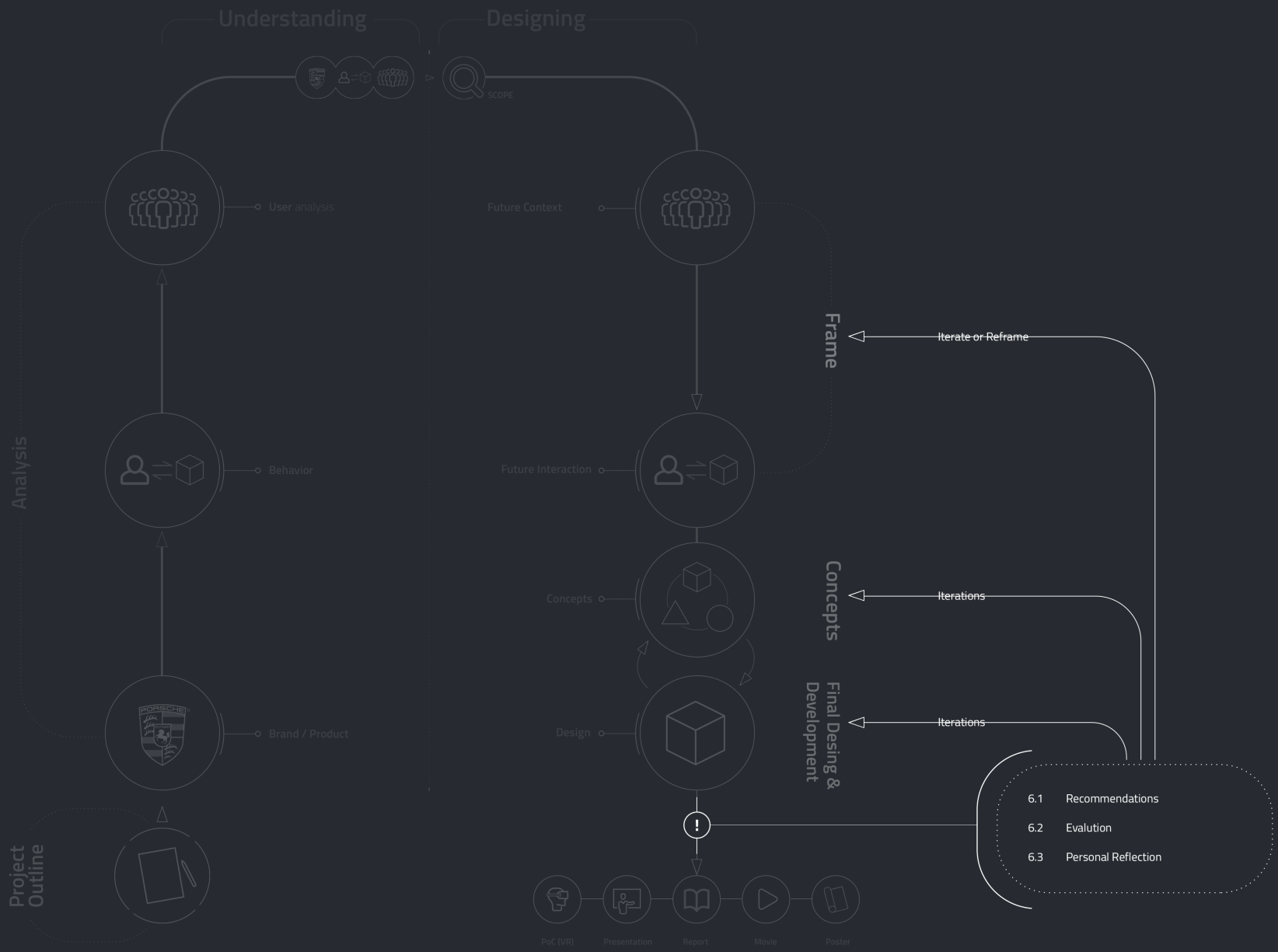
5 **STEEP BONNET**

The electric drive train results in the possibility to create an ever steeper bonnet than in the current Porsche models (Section 2.2.2).

6 **FRONT AIR INLET**

The low nose of the 2035 Porsche vision houses an air inlet, guiding incoming air under the hood after which flows over the cockpit (figure 5.14)




Understanding
Designing
SCOPE
User analysis
Future Context
Behavior
Future Interaction
Concepts
Design
Brand / Product
Analysis
Project Outline
Frame
Concepts
Final Dsesing & Development
Iterate or Reframe
Iterations
Iterations
6.1 Recommendations
6.2 Evalution
6.3 Personal Reflection
PoC (VR)
Presentation
Report
Movie
Poster

6 Discussion

After completing the final design, this section offers the reader a look back in the project. Via various recommendations and a critical review on the project, the reader will get a clear picture on how the project went and on how it can be continued and enhanced in the future. In conclusion, an extensive critical personal reflection will explain what the designer of the project could have done better. The goal is to reflect what I have learned and to give the reader valuable insights in the mistakes I made so that he or she might be able to avoid these mistakes in a possible similar future project.

6.1 Recommendations

STYLING

Stiffness

During an elaborate modeling phase, a model of substantial size has been created. Since the analysis and framing of the concept and final design took a lot of time, a limited timeframe to translate all the relevant content into a final 3d shape. In the end, the model is a strong representation of the concept vision. However, in a second phase of the design process, I recommend to further refine certain components in order to reduce the 'stiffness' of the design. A good example is that of the chairs (figure 6.1)

Crown

Just like reducing the 'stiffness' of various design elements I recommend for a second design phase to put more crown on certain surfaces. If a surface is too flat, it almost feels like a negative surface. (Figure x)

Steering pod frame

The modeling phase knew many stages, all building on each other. At the time that the decision was made to lay the steering Module in a separate frame, there was not enough time to After modeling the biggest themes of the interior, the frame which holds the steering module in place was designed. Although the design stage as it is now supports the basic concept, looking for a more elegant solution in a possible future design phase is something i can recommend.

PRACTICAL

Improve distance steering wheel in comparison to driver

While working in Alias with a dummy, the dimensions seemed to be correct. After testing and evaluation the model with the virtual reality model, it became clear that even with the steering wheel in activated mode (ejected), the driving position is still not optimal.

Headrest

Because of the order in which certain components were placed in the model, the headrest is not properly lined out with the back of the seat.

Door shut line

Since the main focus of the model was to translate a story into a physical product, certain practical elements were integrated at a too late stage. Subsequently, adding/ determining the cutline of the door after the main volume was modelled resulted in a weird looking cutline. Also, the opening of the door does not offer enough clearance when entering the car.

FIGURE 6.1 Stiffnes

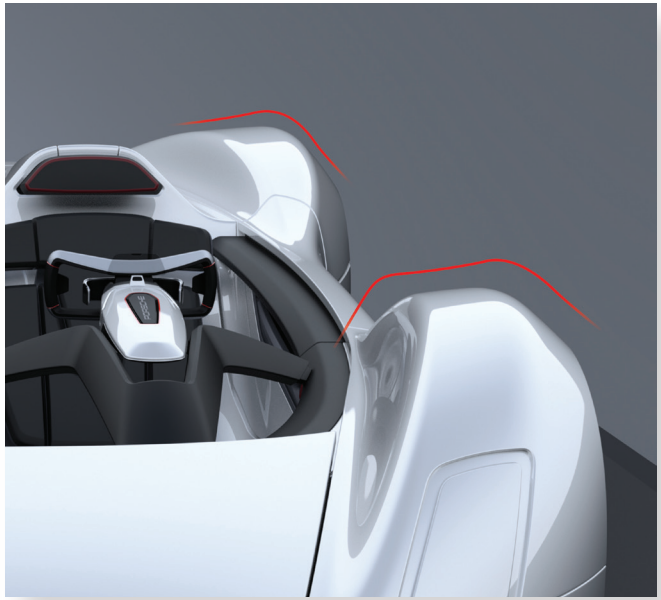


FIGURE 6.2 Crown

FIGURE 6.3 Steering POD frame

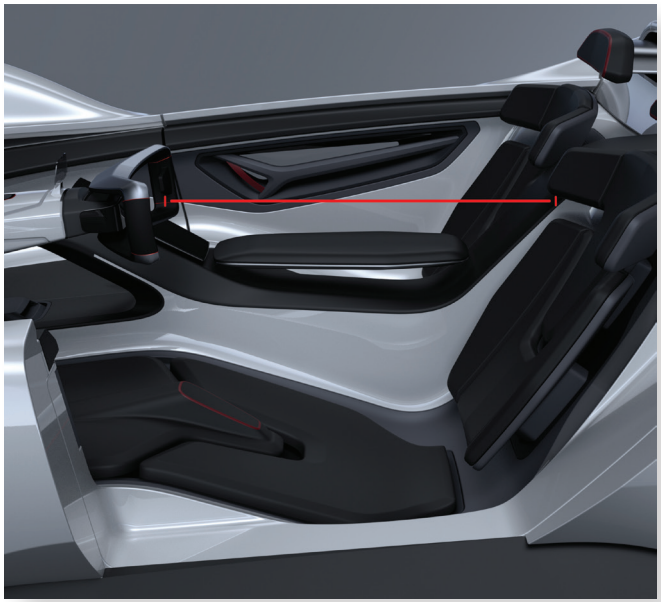


FIGURE 6.2 Steering wheel distance

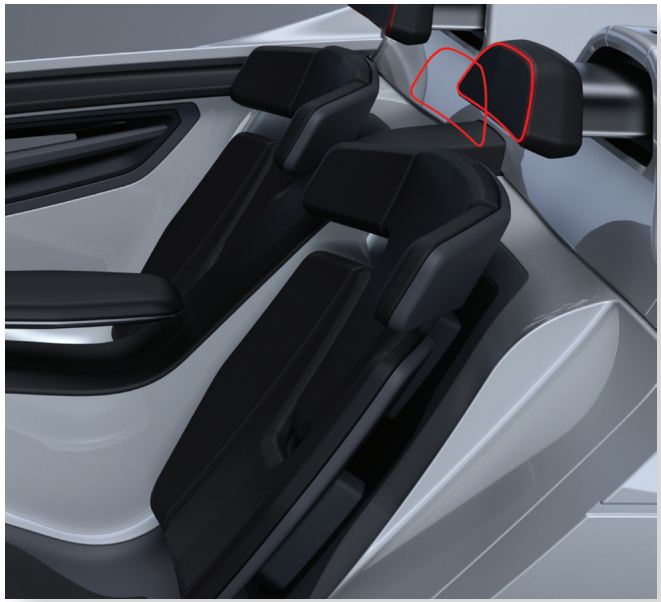


FIGURE 6.5 Misplaced headrest

FIGURE 6.6 Doorline

6.2 Evaluation

PROCESS EVALUATION

PRIORITIZING & DESIGN FREEZES

Speaking in terms of speed and efficiency, most designers desire their process to be as lineair as possible. By conducting a proper and well-targeted analysis you move on to the conceptual fase, after which you find a perfect final design without ever diverging from your predetermined schedule and process. However, reaching a proper final result in a design project requires multiple iterative steps. Often, this is the only way to find a sophisticated and suitable answer to the future vision. Although it is completely normal to not directly find the correct solution to a problem, it is important to recognize on forehand (and during the project if needed) at what moments a so called 'design freeze' is necessary to maintain the correct pace within the project.As the left side of figure 6.7 shows, this project's concept phase was iterative, just as described above. By searching for the correct concepts via making sketches and using flexible and fast 3d-modeling programs, a suitable design for the 2035 vision was established. Important to mention is that these the tools in this phase should be able to properly react on each other in terms of speed and flexibility.In the follow up phase (Final design & Styling), the focus should mainly be on converting the concept into a high quality 3d model. Here, attention is spent to applying the right brand DNA, details and solving small problems that where not noticed in the concept phase's sketches and basic 3d

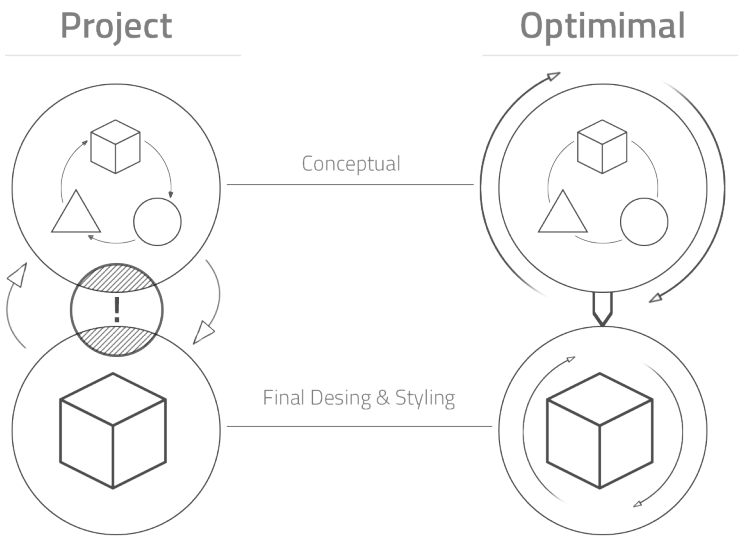


FIGURE 6.7 Original versus Optimized design phase

models before.Since in this project, the concept phase and final design phase had too much overlap, a situation occurred where too many essential architectural elements of the concept where still being changed in the final modeling stage. Since the used program (Alias surface modeling) is not able to apply big architectural changes as fast as the concept phase allowed this, this overlap created a difficult and unintended final project phase.The right side of the models is a visual depiction of how the process should look in an optimized process. As the figure shows, both phases are still iterative, only now a predetermined design freeze protects the way of working and thus the successful completion of the project.

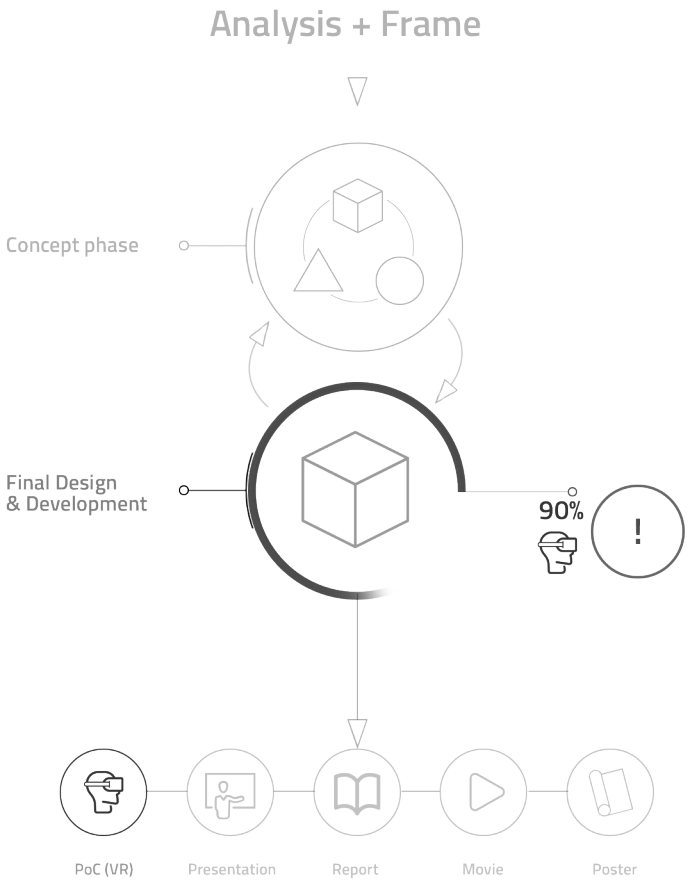


FIGURE 6.8 Virtual Reality implementation - Final Design phase

VIRTUAL REALITY

Virtual Reality (VR) is a realistic three-dimensional image or artificial environment that is created with a mixture of interactive hardware and software, and presented to the user in such a way that the any doubts are suspended and it is accepted as a real environment in which it is interacted with in a seemingly real or physical way (Reality Technologies, 2014). This section evaluates on how virtual reality played a role in this project and how it can be better integrated in future projects.

The first time virtual reality was utilized in the project was when the model was nearly finished (Figure 6.8). In this stage, VR technology offered valuable insights in how the project and the vision model should be concluded. The three factors below evaluate on how integrating VR in the last phase of the project was helpful and how future projects can benefit from implementing such a tool in the project structure.

DESIGNER vs. MODELER

In essence, 3D modelers are hired to translate a designers idea and sketch into a well proportioned 3d model. Within this process it is possible that the modeler does not understand the designers' approaches certain problems, volumes and/or surfaces. In a situation like this it can be of value for both the designer as the modeler to further elaborate on the models' current state via a virtual reality experience. Being fully immersed in the 3d model and its related environment can improve the outcome of a discussion and offers more clarity for both parties involved.

MATERIAL & DETAILS

A design can appear different in a 3d-modeling application (like Autodesk Alias Surfacing) then it looks when converted to an immersive 3d-experience. Since a creating a full scale clay model is a time consuming and expensive process, evaluating on the experience that different materials and details create via virtual reality is an interesting and highly flexible alternative.

PRESENTING

In various stages of the last two design phases (Concepts and Final Design & Detailing), the consulting designers of the Porsche design studio received project updates. Finalizing the project with a virtual reality presentation helped to create a good impression of the final result and was a useful tool to receive adequate feedback one last time. Looking back on the way VR was used in this stage, it became evident that this technology can be of great value in various other project stages.

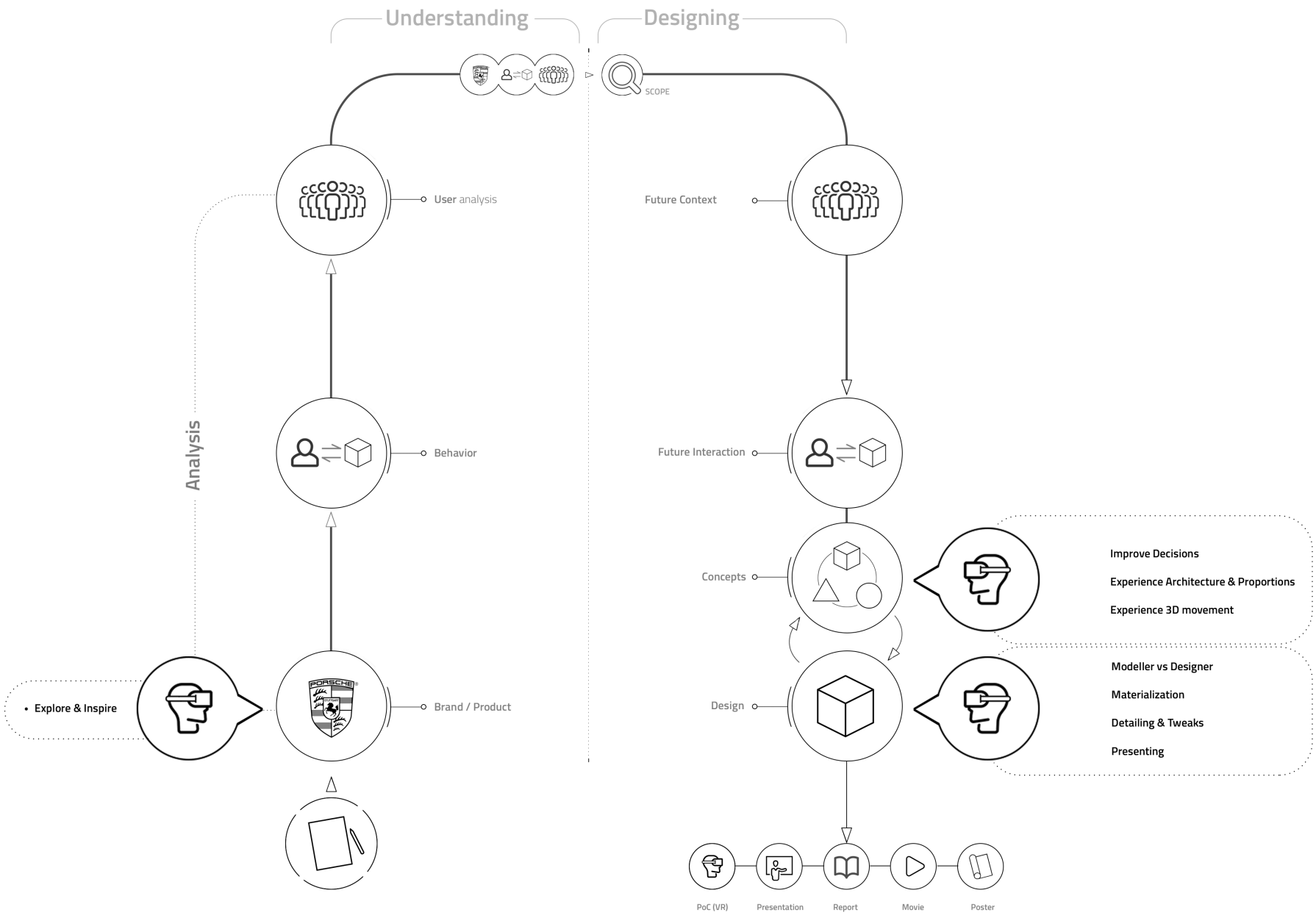


FIGURE 6.9 Virtual Reality implementation - Optimized

Due tot the insights gained using VR in the final stage of the project, it became clear that this technology could have been helpful in other parts of the projects as well. Figure 6.9 shows where VR could have been a valuable tool to further optimize the structure of the process. The section below explains why, how and where virtual reality should be used throughout an optimized process.

BRAND & PRODUCT - EXPLORE AND INSPIRE

The internal analysis and valuable field researches helped to gain substantial knowledge and insights about the old and current models. However, A substantial amount of design work that has been explored in internal research and design projects in the studio never make it into production. However, the sketches and 3d models are available for graduate students as well. Using virtual reality offers an interesting opportunity to take a closer look at these concepts in a 3d environment and by doing so, gaining even more inspiration for an unexplored future direction.

CONCEPTS - IMPROVE DECISIONS

After creating a variety of concepts it is important to be able to make proper decisions about which options would be most suitable for a future context. Making sketches and building basic 3d proportion models in polygon modeling programs is currently the most common way of exploring a concept's potential. These renders are then being presented at a big screen to the design chiefs. It is however easy to convert the created data into VR ready material. By actually sitting 'inside' the concept - even in its most basic architectural form - the designer can gain insights that would not have been possible to get by looking at 3d data on a computer screen. Using VR in early stages of a design project can help to improve decisions about the potential of the created concepts.

CONCEPTS - ARCHITECTURE & PROPORTIONS

One of the most common ways to explore and perceive the true feel of architectural elements and proportions in 3 dimensions is to make full scale clay models. Working with clay offers a variety of benefits. It can be explained as using an erasable pencil versus permanent ink. Clay lets you go back and make changes. Secondly working on a 3d clay model is a great collaborative tool. Every designer can get around it, brainstorming three-dimensionally. It is however, an expensive way of working which is often being used in later stages of a design project. Virtual reality can not compete with the experience of looking at a clay model (yet). However, it can be used earlier in the project and, just like with clay, offers the opportunity to "get around it and brainstorm three-dimensionally". Without saying clay models will become obsolete, I do think that virtual reality can offer a substantial amount of insights and recognize problems that might occur when converting designs into actual 3 demential products. Looking at it like this, virtual reality is a strong tool, collaborating with clay.

CONCEPTS - EXPERIENCE 3D MOVEMENT

Just like described in the section above (architecture and proportions), it is even harder to make the right assumptions about the impact of 3d movement on a 2d computer screen. 3d movement however, has a substantial impact on the way the final design and product is being perceived by the potential market and its buyers. Using VR is a great way to explore the way 3d movement is playes on the senses of the user and offers a lot of flexibility within this process, allowing you to make various tweaks before going to a stage of actually making physical 3d concept models.

6.3 Personal Reflection

This final section concludes the report by evaluating the project as a whole by the graduating student. It provides the personal insights of the graduating student as a reflection on the overall project and process.

PORSCHE & TU DELFT

This project came about, together with the the TU Delft and the design studio of Porsche AG at the development centre in Weissach, Germany. It was a truly interesting experience to graduate in Porsche's design studio. However, during the project it became clear that the studio is used to work mainly with transportation design students. For this type of graduation projects, the focus is for the biggest part on working on only a styling proposal. Even though the project has been finalized with a successful result, it was sometimes uncomfortable to find myself "trapped" in the middle of both parties' different wishes and ways of thinking. Where the TU Delft expects a good and academic implementation of structure and method, the design studio is approaching and evaluating the project from an industry point of view. Although this sometimes costed a lot of energy, it also was a valuable learning experience.

ASSIGNMENT

During the internship I did, prior to my Master thesis, I noticed that the way projects in the industry are approached is fairly different from how we do this at the TU Delft. Taking this observation into account, during the presentation of the initial direction of my thesis I proposed to give structure to the project with the 'Vision in Design - ViP' method. The initial proposal of my thesis topic was: "A UX based interior vision, focussing on real people's problems". This was not a bad start, however, in the month where my internship transitioned into my thesis I made the mistake not to specify my project more in order to "Keep things open". Although the ViP method is a method that works well with a properly formulated goal that at the same time leaves a lot of directions undefined, I definitely experienced a need for more structure in the initial stage of the project.Next to this, a difficult factor in the project was that during the further specification of the design topic, the design studio politely requested me to stay away from projects that focus on autonomous mobility. Since this is a topic that a lot of graduate students already explore, Porsche expressed to appreciate it if the project's focus was to explore a direction that was based on other Porsche core brand values. Where I thought in the beginning this would not be a problem, I noticed during the project that there were a lot of interesting and valuable possibilities in this direction as an outcome of my method used.

Learning experiences

NETWORK

Before the start of my internship, my goal was to not only continue to enhance my skills in the automotive design field, but also to become more acquainted with the internal structure of the studio and all different expertises and professions that can be found in there. For this reason, I established a goal for myself: "to stand at the desk of a designer I never had a conversation with before every day". Even though this sounds a bit forced, it was an extremely helpful experience. All people in the studio where always willing to elaborate more about their profession and current (or older) projects. This experience has helped me to understand the full context of an automotive design studio and even made me a better designer.

DECISIVENESS

At university most deadlines are set for you. Therefore the structure and pace of a project are relatively well defined from the point where the project is first initiated. As a result, there are enough predetermined moments where a design freeze is built into the project. The results of these design freezes is that there is that it does not allow the designer much time to procrastinate important decisions. Being your own design boss throughout the thesis project logically resulted in the fact that I had to apply these design freeze moments on my own. Due to this fact a familiar problem occurred: I started to postpone design related decisions which would frame the direction of my project too much. The idea of committing to a certain direction sometimes feels uncomfortable to me. Reason for this is that I fear to find a more promising design direction or a better solution after I commit to a design. After struggling with this during my thesis project, I realize now that in many occasions it is better to commit to a direction in

an earlier stage so that you can go through more design iteration cycles throughout the project. Not only does this create a more elaborate result, it also creates the opportunity to learn more about the topic since you are able to go through design phases which otherwise would not have been possible.

PRESENTING

When I started studying at the TU Delft, I tried to make a habit out of being the person to present in group projects as much as possible. This noticeably increased my presenting skills and resulted in the fact that I can stand and speak in front of bigger crowds without feeling uncomfortable. However, the design studio was an unknown environment to me. Surrounded by numerous renowned car designers I wanted to leave a strong impression. This resulted in a type of pressure I had not experienced in a long time. Presenting for a group of people like this elevated my presentation skills and confidence about presenting in a future professional context. Next to this, all the interim presentations I had for my company mentor and design colleagues Iv did in German. This was a goals I set for myself before going to Germany and I am happy to have reached a level of German where I was able to do so.

PROJECT MANAGEMENT

Although throughout my years of study at the Faculty of Industrial Design Engineering I always managed to realize good final project results, planning has never been one of my strongest skills. In this project, I surely made some mistakes in my planning and in the way I managed the project. Nevertheless, I am proud on how I managed to handle the overall project over the last half year. Throughout my thesis, a various amount of unexpected situations occurred. All in all, I managed to handle these situations with a positive and flexible attitude. On top of that, the earlier mentioned effort I invested into building a valuable network within the studio really paid off in these type of situations. People were always more than willing to help. For this I am grateful.

Result

When it comes to my own work, I am always pretty critical. I am often left with the feeling that a design is never truly finished and always remains to have room for improvement. Looking realistically at the entire project and proces I can say that I am pleased with most of the results and less happy with a few minor elements throughout the project. Based on the ease with which the designers around me handled and created beautiful content, I established a strong idea on what the outcome of my project should look like. Like mentioned before, the internship prior to my thesis resulted in the fact that I started to see the level of design around me as the overall benchmark. Subsequently, in many occasions I definitely misjudged how difficult and time consuming certain steps in the design process are/ were. Due to this fact, I made many mistakes throughout the project and had to gain a lot of extra knowledge and experience within a relatively small timeframe. By overcoming these ‘barriers’ and stepping out of my comfort zone I gained a lot of valuable experience and eventually made great leaps forward as a designer.Keeping everything mentioned above in mind I think it is safe to say I am pleased with the overall outcome of the project. I am happy with how the 3D model turned out and think the model is a good reflection of the overall level of design I was able to realize in my first big industry solo project. Looking back at this thesis with the knowledge I have gained, I would probably change more than half of it when I had to do it all over again. This might sound negative at first, but in my opinion there is no greater outcome for a study related project.

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The fundaments of this report are based on a vast amount of literature. In this section the references to this literature can be found.

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