

CHALMERS



Made By Sweden Concept

Development of car interior concepts, associated to Scandinavia

Bachelor thesis within the program Design and Product Development

MICHELLE ARBORELIUS

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Institution of Product- and Production Development

The department of Design and Human Factors

CHALMERS UNIVERSITY OF TECHNOLOGY

Gothenburg, Sweden 2016

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Cover:
The final concept, Artistic, presented in chapter 7.

Printed by
Reproservice Chalmers
Gothenburg, Sweden 2016

PREFACE

This bachelor thesis of 15 credits has been conducted at the bachelor program of Design and Product Development at Chalmers University of Technology, within the Department of Design & Human Factors at the Institution of Product- and Production development. The project, assigned by the division of Special Products at Volvo Car Group, has been carried out in collaboration with Alten Sweden.

We would like to thank Olof Wranne, our supervisor at Chalmers University of Technology, for the support and help in steering the project in the right direction and for the guidance we have received throughout the project.

We also want to thank Alten Sweden for providing us with a workplace and substantial knowledge input. A special thanks to our supervisor Magnus Flink, who helped us with the initial contact with Volvo Cars and for the advices and ideas that took the project forward. We also want to thank him for contributing with positive energy and high spirits. Also, thanks to Hanna Svensson, Filip Rosander and Niklas Sjöstrand at Alten for the support and feedback during the project process.

Finally, we would like to direct a special thanks to Kristoff Glogoza, our supervisor at Volvo Cars, for all the time he has dedicated to us and for the mentoring we have received throughout the project. We would also like to thank him for giving us an insight into the company and for the practical help concerning visits to Volvo Cars. Finally we would like to thank Kristoff for giving us free reins to execute the project in our own way.

ABSTRACT

This report describes the development of a conceptual car interior, created to give a Scandinavian experience, for future models within the premium segment. The project has been assigned by the division of Special Products at Volvo Cars and has aimed to create interior concepts that appeal to affluent customers and simultaneously enhance Volvo's Scandinavian heritage. The project has been carried out within the bachelor program of Design and Product Development at Chalmers University of Technology, in collaboration with Alten, Sweden.

The project has involved investigations of the Scandinavian culture for the purpose of identifying characteristics found authentic Scandinavian. Through researching cultural aspects such as design, nature and values, and by conducting a focus group, a survey and several field trips, it was found that the majority of characteristics that were both Scandinavian and implementable in a car interior, were linked to nature.

The final concept, *Arctistic*, is inspired by the cold and barren climate of northern Scandinavia and consists of an interior theme with a related relax mode, allowing the customers a moment of relaxation whenever desired. The concept follows the existing design in the model XC90 Excellence to a large extent with changes in material, coloration and some added new technology.

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1 INTRODUCTION

This initial chapter introduces the assignment, sets the scope and presents the goals and prerequisites of the project.

1.1 Background

Volvo Car Group began manufacturing in 1927 and is now a global manufacturer with production in Belgium, Sweden and China, owned by Chinese Zhejiang Geely Holding (Volvo Cars, 2016). Since the takeover, one of Volvo Cars' main global pursuits has been to become one of the world's most desired premium car brands. Though, historically seen, Volvo has often been perceived as a traditional family car manufacturer and mainly associated with security and safety. The change of direction, towards becoming a premium brand, has partly been achieved through a new design orientation revolving around the term "Scandinavian luxury".

The company is currently investigating ways of creating cars that appeal to premium customers in China, USA and Europe and simultaneously enhance Volvo's Scandinavian heritage. Besides the design orientation "Scandinavian luxury", a new definition of luxury is emerging - the possibility of escaping the busy everyday life whenever desired.

For this particular project, new perspectives on Scandinavian culture and car design are sought. Volvo is interested to investigate how someone, not tinged by their existing designs, thinks about future cars and driving experiences. The assignment, provided by the division of Special Products, includes creating unique driving experiences through concepts that stimulate several senses and express Volvo's innovation.

1.2 Purpose

On behalf of the division of Special Products at Volvo Cars and with the expertise from Alten consulting group, this project will aim to create interior concepts for future car models within the premium segment that appeal to affluent customers and simultaneously enhance Volvo's Scandinavian heritage. Through the stimulation of hearing, sight, feel and smell, these concepts shall create unique driving experiences and offer temporary escapes from the busy everyday life. In order to achieve this, the project team will investigate what parts of the Scandinavian culture that, while integrated in a car interior, can give the customer a sense of Scandinavia.

1.3 Delimitations

This project is limited to interior car design exclusively. The basis for concept generation will be the 2015 and Excellence versions of the model XC90, but created designs shall also be applicable in other models. In order to create concepts that give the customer a sense of Scandinavia, the following aspects of Scandinavian culture will be studied:

- Design
- Nature
- Values and people
- Sounds
- Scents

The project will investigate how these aspects on a conceptual level can be integrated in a car interior through choice of material, design, functionality, new techniques etcetera. Since the assignment only requests ideas on a conceptual level, no manufacturing techniques will be investigated. Neither will eventual laws or demands concerning automotive materials be considered.

The customer analysis will, due to an inaccessible target group, be based solely on material provided by Volvo. They have made thorough mappings of their customers and the result of their studies is considered valid. Therefore, this material constitutes enough basis for this project. Also, material concerning Volvo's work with environmental issues has been provided directly by Volvo. No further research will be conducted within this area.

Since Volvo requested new perspectives on car design, their existing designs will only be studied partly in order to avoid tinging the final results. Finally, this project will not discuss any economic aspects.

1.4 Research questions

- What parts of the aspects nature, design, values, scents and sounds are found characteristic for Scandinavia and how can these be implemented in a car interior to deepen the connection between Volvo and Scandinavia?
- How can a car interior, designed to give a sense of Scandinavia, be adjusted to the premium segment?
- How can a unique driving experience that offers an escape from the busy everyday life by stimulating hearing, scent, feel and sight be designed?

1.5 Disposition and project structure

The project follows the outline presented in Figure 1.1 below. First, the Introductory chapter sets the scope of the project and presents goals and delimitations, followed by chapter 2, Theoretical framework, presenting research relevant to the concept development. Chapter 3, Methods, presents all methods used during the project in chronological order. Chapter 4 describes the pre-study, involving a survey and a focus group and further presents results concerning Volvo designs and Scandinavian design, nature and values. Chapter 5 and 6 cover the development phase, including concept generation, evaluation and finally, elimination. The idea generation described in chapter 5 ends with the concepts presented for Volvo and Alten during the first presentation. Chapter 6 guides the reader through the elimination process and finishes with presenting the final concepts chosen for further development. The final concept is presented in chapter 7, along with several visualizations. Chapter 8 discuss the final concept from an environmental point of view, and links to Volvo's existing work concerning environmental issues. The concluding 9th chapter, summarizes the report and discuss the project concerning the overall process, the final concept and future research & development possibilities.

The following outline has been used in this project:

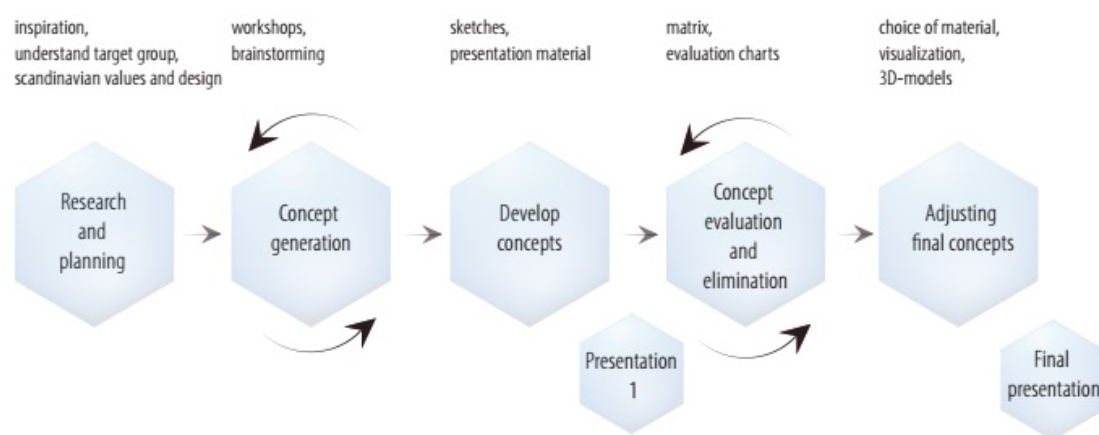


Figure 1.1 - project outline (Arborelius & Eliasson, 2016)

2 THEORETICAL FRAMEWORK

This chapter presents theory related to the assignment which create a greater understanding of the project and the continuing thesis.

2.1 Glossary

Table 2.1, Gloassary

Dashboard	A control panel located in front of the vehicle's front seats.
Center stack	An interior detail which begins in the dashboard and continues backwards through the car, often merging with the transmission tunnel between the two front seats.
A-pillar	The two pillars on each side of the windshield (the front window), holding the glass in place.
Headliner	A composite material structure, covering the inside roof of a car.
Gear lever	A metal lever used to change the gear whilst driving.
Regulator/switch	Control devices such as push-buttons or knobs.

2.2 Cognition and the senses

According to the Oxford Dictionaries, cognition is defined as “the mental action or process of acquiring knowledge and understanding through thought, experience and the senses” (Oxford Dictionaries, 2016). In the human information process, sensory input is acquired from the surrounding world through the senses and then perceived and processed in the human memory before evoking a decision or an action (Bohgard, 2008). The human brain can only de-code sensory input with the help of receptors in the eye, ear, tongue, nose, skin and muscles. The receptors register sensations, for example light or sound, which are then transferred into nerve impulses that can be processed and understood by the brain.

The classical human senses are sight, smell, hearing, taste and feel, but in the acquiring of information, balance and haptics are also important (Bohgard, 2008). Nearly 80 % of all sensory input is received through sight. It is the dominating sense on which humans rely the most. The sensation that is registered by the receptors in the eye is light with different wavelengths, hence light is crucial to how we perceive our surroundings. To complement sight, the hearing is always open to sensory input from

sounds. Hearing helps locate where information is coming from and is the sense that humans are most observant to. Haptics can be divided into two components, the tactile and the kinaesthetic. The tactile component acquires information through touch and the kinaesthetic gives us information about the position and movement of our own body (Bohgard, 2008).

Stimulating both hearing and touch at the same time creates a stronger impact on the human mind (Dijk, 2013). This principle of stimulating several senses in the purpose of communicating a clearer message is called multimodality (Bohgard, 2008). If several senses receive analogous information at the same time, the interpretation of the information becomes clearer.

Since the concepts in this project shall stimulate sight, hearing, feel and smell, the effects on people from light, colour, sound, tactility and scent are described below, and most importantly, the use of these sensory inputs in the purpose of creating relaxed environments.

2.2.1 Light

Light and colour impact wakefulness, well-being and behaviour by affecting our body temperature, metabolism and hormone balance (Anter Fridell & Klarén, 2014). Light also affects our diurnal rhythm, and generally has greater impact on people living far from the equator because of the regular absence of daylight in these countries. In short terms, light affects moods and performances but in a longer term, it affects the overall health.

Spectral distribution with a given intensity gives a certain colour experience, which is affected by the saturation of the colour and temperature of the light. The human eye can identify up to 10 million different colour hues, provided the lighting is sufficient. Colour hues are defined by the dominating wavelength of the light. The saturation defines the brilliance and intensity of a colour, in other words the amount of white light. Less white light implies greater saturation. The colour temperature is defined by the colour composition of the light source and is measured in Kelvin (K), see Figure 2.1, below. In Scandinavia the light temperature at noon generally lies between 4000 and 5000 K.

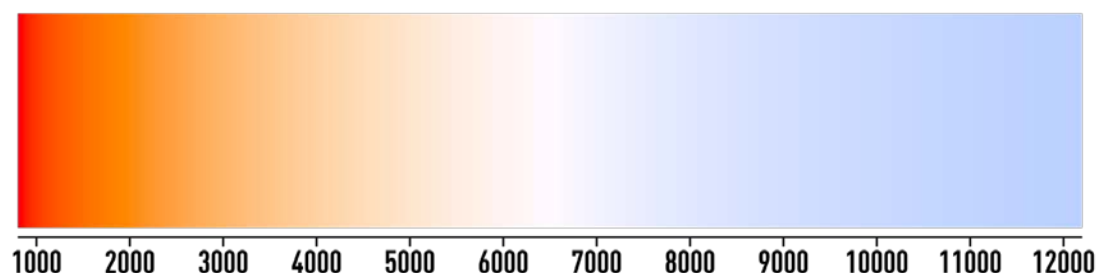
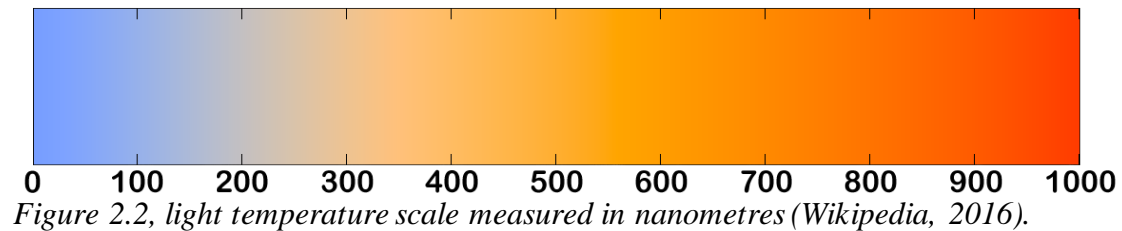


Figure 2.1, colour temperature scale measured in Kelvin (Wikimedia, 2016).

Whether light is classified as warm or cold depends on its wavelength measured in nanometres (nm). Long waved light is classified as warm yellow or red light, while cold light is blue and short waved. The difference between cold and warm light and their relation to human wakefulness is not definitive other than short waved light having greater impact on our wakefulness than long waved light. However, melatonin, a hormone with somniferous impact, is blocked when the spectral of light is around 460nm which is considered as cold light (Anter Fridell & Klarén, 2014). Figure 2.2 below show the light temperature scale, measured in nanometres.



Different light sources emit different types of light. A traditional light bulb emits light with 2700 K which is relatively warm. LED-lights on the other hand emit cold, white light and can be used to create “cool” environments. For example, the ice hotel in Jukkasjärvi use LED-lights to emphasise the ice (Anter Fridell & Klarén, 2014).

In a car, ambient light is important and helps the driver orientate, especially at night. The ambient light illuminates details in the vehicle such as the gear lever and different push-buttons as well as the drivers’ own hand and thereby aides coordination (Klinger & Lemmer, 2008). Furthermore, good eye ergonomics and sufficient lighting is necessary to avoid eye fatigue, sleepiness and headaches while driving (Bohgard, 2008).

2.2.2 Colour

Warm vs. cold colours

Describing a colour as warm or cold is another way of describing its placement on the colour wheel. Traditionally seen, the warmest hues are red-orange or orange and the coolest, those opposite on the colour wheel, which are blue or green-blue.

Consequently, if a colour is closer to the red-orange hues, it is called warm and vice versa (MacEvoy, 2015). Figure 2.3 below shows where the line between cold and warm colours is usually drawn. Generally, cooler colours make humans feel balanced, calm and less stressed. Architects and interior designers therefore often use cool shades of green and blue to create a calm interiors. One common example is waiting rooms at hospitals which usually are designed to calm patients before doctors’ appointments. Another example is the “green room” in theatres where nervous performers can sit and wait for their performance (Wisgeek, 2016).

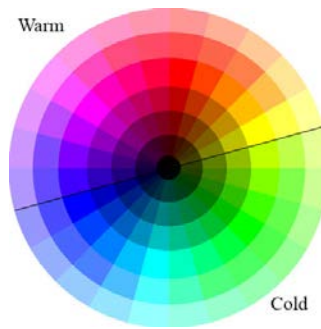


Figure 2.3, colour wheel (Wikipedia, 2012)

Harmonizing colours

“Colours seen together to produce a pleasing affective response are said to be in harmony” (Burchett, 2001, s 28). Combinations of colours can create very different looks depending on their respective placement on the colour wheel. The combinations said to be the most harmonizing and pleasing ones are the analogous colour schemes, which are often found in nature. As shown in Figure 2.4 below, analogous colour schemes consist of colours placed next to each other on the colour wheel and usually match nicely and create serene looks. Therefore, they are found very pleasing for the eye (Tiger colors, 2015). When creating relaxing interiors there has to be balance. The eye has to be allowed to rest. Therefore, the colour scheme should be simple without too many different colours (Abercrombie, 1990).

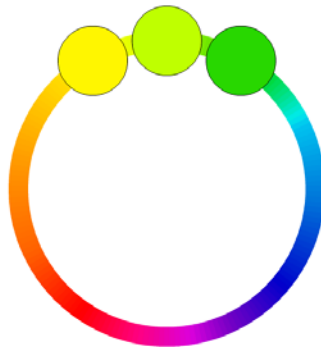


Figure 2.4, analogous colours (Wikimedia, 2015).

2.2.3 Scent

Scent is essential for how we perceive our surroundings. Though, scents are generally perceived very differently throughout the world. According to Kelvin Low, author of the book “Scent and Scent-sibilities: Smell and Everyday Life Experiences”, “Smell is a sociocultural phenomenon, endowed with variegated meanings, symbolic associations and values by different cultures” (Low, 2009, s 3). The differences in perceivance of scents depend on personal experiences and memories. Low further argues that “When we encounter a particular scent that is linked to a past event, and inspite of the passing of time, our vivid memories of objects and events which are

textured with olfactory remembrances, produces the association between an unchanged odour to an object” (Low, 2009, s 6). There is no established measurement to describe scent. Some theories claim that scents only exist in our minds and that we recognise different particles floating in the air as different fragrances, why they are generally hard to recreate (Hoffman, 2013).

Scents can be used in products for different purposes. Usually it is added to create a more pleasurable experience. Some research show that certain fragrances also can be used for stress relief (Warrenburg, 2005). Generally nature scents, especially floral fragrances, are found relaxing (Mangano, 2011). Lavender, Bergamot, Sandalwood, Jasmine, Lilac and Chamomile are some of the most popular ones and are often used to make ethereal oils for aromatherapy. In aromatherapy, scents are used for the purpose of altering psychological and physical well-being. This is common in spa-environments which are designed to be especially relaxing. Within the car industry and especially on the luxury market, scents are often used to differentiate brands. Different manufacturers often have a distinct leather aroma, helping the customer define the specific brand. Leather in itself has little or no smell but absorbs different constituents well. While working with scents in car interiors, it is important to keep in mind that heat releases mechanisms for scent. The amount of fragrance has to be carefully balanced, especially in darker interiors which usually get warm in hot climates (Winter, 2004).

2.2.4 Sound

Acoustic stimulation generally gives people a sense of life, though some sounds are found more pleasurable than others. Typically, nature sounds are found pleasurable and technological sounds unpleasant (Bohgard, 2008). Soft music and sounds from nature, like flowing water or tweeting birdsong, create a sense of calm for many people. Research show that exposure to nature scenery and sounds can reduce pain, anxiety and stress levels (Alvarsson, et al., 2010). Furthermore, nature enhances positive feelings such as sympathy and love and improve our ability to concentrate (Anter Fridell & Klarén, 2014).

Today’s society and our everyday lives contain a lot of high noises. People generally have a hard time finding calm and quiet environments which allow the mind to rest (Bohgard, 2008). According to the American Psychological Association, APA, exposure to what they call “noise pollution”, causes stress and may lead to higher blood pressure and greater risks of heart attacks (Novotney, 2011). One way of coping with “noise pollution” is by using isolation materials and create quiet environments. Another way that is becoming increasingly popular, is to shut the noise out by masking it with “white noise”. The Dictionary of Physics (7 ed.), published by the Oxford University Press, defines white noise as “Random noise in which the energy per unit bandwidth is constant for the whole frequency range of interest” (Law &

Rennie, 2015). Just like white light consist of light of all wavelengths in the electromagnetic spectrum, white noise is a combination of all frequencies of sound. This makes sounds with certain frequencies indistinguishable, unabling the brain to differentiate and make sense of them, which to some people is very relaxing (Howstuffworks, 2016).

2.2.5 Tactility

Tactile stimulation basically means stimulation of the skin through touch, pressure, heat or cold (Rehnberg & Vältalo, 2009). Our skin contains several receptors which register different sensations. Thermoreceptors register temperature, mechanoreceptors register touch and pressure and nerve endings register pain. Hence, our tactile sense can register for example differences in temperature, itching and tickling feelings, movements when the hair on the skin is bent and feelings of pain. Tactile information is a good complement to sight while investigating physical objects. The visual input can give clues about an object's shape, size and movement, while the tactile give clues to temperature, weight, vibrations, friction, surface structures, etcetera (Bohgard, 2008).

2.3 Projections

A projector converts electronic signals to viewable images. While there are many different projectors, the general technique work as shown in Figure 2.5 below. The projected image is enlarged and displayed on a projection surface.

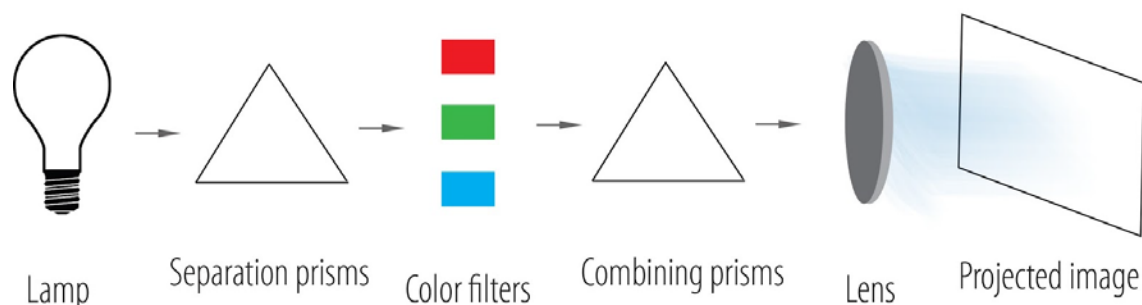


Figure 2.5, projection (Arborelius & Eliasson, 2016)

Head up display, HUD

Head up display, HUD, is a technique where images are projected on windows (Smith & Fu, 2010). It was originally developed for the aerospace industry and was first introduced in the automotive industry in 1988. HUD helps the driver to receive information about driving speed, warnings, gas levels etcetera, through an image projected on the front window. By doing this, the driver does not have to look down on the dashboard to receive this information and can keep the eyes looking forward. Figure 2.6 below shows how HUD can be used to visualize driving speed and distance to the car ahead. The HUD-system consists of a small projector and a transparent screen fixed on the front window. The projector has to be tilted in the right angle to show the projected image correctly. The system does not require large space (Hedili, et al., 2010).



Figure 2.6, Head up display (Flickr, 2014)

2.4 Smart glass

Clear glass can be toned darker or opaque through a technology called smart glass, also known as electrochromic glass, which uses electrical energy to tone the glass (Rudolph, et al., 2009). Two ways of creating smart glass are through Metal Oxide Electrochromics (MOE) or Suspended Particle Device (SPD) technology. MOE is a technology that consists of a five-layer metal oxide coating between two sheets of glass. When voltage is applied to the glass it darkens. This is possible through a lithium tungstate which forms during the process and absorbs light. A reversed reaction can be achieved by reversing the polarity when applying voltage. The SPD technique consists of two panes of glass with conductive coatings on the inside surfaces. Opposed to the MOE technique, this glass turns clear when voltage is applied. Thus, by adjusting the voltage, the glass can be toned from opaque to clear. Switching from opaque to clear only takes one second and switching from clear to opaque, three seconds.

In the automobile industry, Mercedes-Benz launched in 2015 the new Mercedes-Benz SLC with smart glass roof. This enables the driver to adjust the amount of light entering the (Solnik, 2015).

Projections on smart glass

When smart glass is switched to opaque, the glass can act as a projection surface for still or moving images (Intelligent Glass, 2016). The technology can also be applied on smart film, in the same way as on smart glass. Smart film consist of a thin film with self-adhesive surface that can be installed directly onto a glass surface and then used in the same way as smart glass (ProDisplay, 2016).

2.5 Smart textiles

According to Kunigunde Cherenak and Liesbeth van Pieterse, authors of the article “Smart textiles: Challenges and opportunities”, published in AIP’s Journal of Applied Physics, “smart textiles - also known as intelligent textiles, electro or e-textiles fall into the category of intelligent materials that sense and respond to environmental stimuli” (Cherenak & Van Pieterse, 2012, section A, chapter 1). These are fabrics embedded with digital components and electronics that can be integrated through methods such as weaving, knitting or embroidery, in order to provide added value to the product. Examples of sensors that can be integrated are the following:

- Pressure sensors used in mattresses for medical monitoring or textile keyboards.
- Heart rate sensors that detects electrocardiogram (ECG) and respiratory activity when in direct contact with the skin. In this case, conducting transmission lines and electrodes are knitted into the fabric.
- Optical fibres that can identify damages on fabrics by detecting changes in light-patterns or the heart rate and body temperature of the person wearing it.

There are two different categories of smart textiles, aesthetic and performance enhancing. The aesthetic category involves fabrics that, when responding to a certain stimuli, can react by for example changing its colour or light up. The performance enhancing ones on the other hand, can react by detecting heart rate, regulate body temperatures or control muscle vibration (Gaddis, 2014).

Beyond fashion, Cherenak and van Pieterse write that some of the application areas for smart textiles today include healthcare, sports, wellness, defence, safety, packaging, automotive and transport construction (Cherenak & Van Pieterse, 2012). In the automotive industry, smart textile technologies are predicted to have a promising future since cars contain several textile surfaces. Already, applications such as heated car seats and textile dashboard lightning are being developed.

2.6 Automotive materials

The demands on interior materials within the automotive industry are very high and it takes a lot for a material to reach automotive quality. The specific material demands that individual car manufacturers have constitutes some of the differentiating factors, separating them from other brands, and are therefore non-accessible brand secrets.

Though, generally, demands are made within the following areas:

- Durability
 - Stain resistance
 - Washability
 - Tear
 - Lightfastness
- Cost effectiveness
- Flame retardant
- Safety
- Lightweight

Information about these areas has been gathered through interviews with people working in the automotive industry.

2.7 Nation branding

Nation branding was interesting to study in this particular project since it aims to promote the image of a nation abroad. It helps create the mental image and reputation of a nation in the minds of foreigners by promoting positive aspects of the nation. Since this project partly aims to promote Scandinavia in the eyes of the customer, it is important to know what aspects to study and promote in the created concepts.

A nation brand is defined by the people living outside the country and is the total sum of all perceptions, in other words, the mental image of the nation in the minds of these foreigners (Ying, 2010). The branding is a tool within tourism and destination marketing and aims to promote nations not just as a place for visits, but also for settlement, investment and job creation. Personal experiences, stereotypes and media help build the image of a country abroad (Ying, 2006). Nation branding involves not only marketing, but also the majority of aspects deciding a nation's character. Influential elements that can affect this mental image are the people and the spoken language, the existing culture, geographical location, fashion, natural resources, large brands and celebrities etcetera.

3 METHODS

This chapter presents applied methods for project planning, research, idea generation, evaluation and finally elimination in chronological order.

3.1 Methods for project start-up

When a design project is initiated it is important to specify goals, prerequisites, activities and the time scale in order to make sure the direction of the project is clear (Österlin, 2010). This helps eliminating misunderstandings and rationalizes the work.

3.1.1 Determination of status

When assigned a project from an external company, it is important to identify the cause of the problem in order to focus resources in the right directions. One way of doing this is by determine the current status of the company, where they are headed and what stands in the way of getting there (Johannesson, et al., 2004). By doing this, activities that must be carried out in order to reach the goal can be identified. While conducting this method, the following three questions should be answered:

1. What is the situation today?
2. What is the desired situation?
3. What are the differences between these two situations?

The development process can then be focused on eliminating the differences and thereby solving the problem.

3.1.2 Gantt-chart

In the start-up phase it is important to plan the timescale with respect to scheduled activities in order to optimize the use of given time. A good way of doing this is to conduct a Gantt-chart (Johannesson, et al., 2004). A Gantt-chart is an Activity-Time-diagram where the project timeline is listed on the x-axis and scheduled activities on the y-axis. Each activity is represented by a horizontal line, whose length shows the estimated time dedicated to each activity.

For this project, the Gantt-chart provided an overview of the whole time period and was used to verify that all scheduled activities proceeded as planned. To see the full Gantt-chart, go to appendix 1.

3.2 Methods for research

The research phase, also known as the pre-study, aims to objectively research and illuminate the problem in hand (Johannesson, et al., 2004). The purpose is to create a knowledge base on which the continuing process can depend. To get the best possible overview, it is desirable to use a mixture of question based and observation based methods complemented by a thorough literature study.

3.2.1 Literature study

A literature study is done in the early stages of a project in order to gather substantial knowledge about the problem in hand and to create a foundation for the continuing development process (Johannesson, et al., 2004). Relevant information can be sought from literature, recognized research articles, regulations and standards.

In this project, the research was mainly done for the purpose of understanding the Scandinavian culture. Information was sought through the Chalmers library online search motor and in literature covering all the areas within the Theoretical framework as well as Scandinavian design, nature and values.

3.2.2 Market analysis

While developing a new product, it is important to know current and upcoming trends on the specific market (Johannesson, et al., 2004). Both new designs and new technology are important to study in order to place the new product at the cutting edge. Market research can be designed to extract different types of information depending on what kind of results are interesting for the project. Usually, it aims to find information about customer requirements, competing products and the new product's market potential. This information can be sought through interviews, field trips, fairs and online research.

Since the material concerning the customer was provided by Volvo and since one delimitation was to base the customer analysis solely on this material, no research seeking customer's requirements was conducted in this phase. Instead it was interesting to study upcoming trends on the interior market, new technologies within materials and Volvo Cars' current interior designs. Therefore, the information in this market research was extracted through visits to design fairs, field trips and online research.

3.2.3 Survey

Surveys classify as indirect question based research methods where data is collected through written, often digital, forms (Bryman & Bell, 2013). Surveys are particularly suitable when information from many or distant participants is requested. The forms can consist of closed questions, open questions or, preferably, a mixture of both. Closed questions contain pre-written responses which the responders choose between. These are suitable if aspects such as quantities, attitudes or information about the responders' demographical characteristics are requested. Open questions on the other hand require that the participants respond with their own words, which usually is preferred when information about responders' feelings or opinions towards products or ideas are requested. While a closed question survey is easier and quicker to fill in, an open question survey allows the participant to answer more freely, which usually gives a deeper understanding for the participants' opinions.

In this project, the aim of the survey was to identify people's opinions about Scandinavian design, nature, scents, sounds and values. The survey was mainly directed to people who lived or had lived outside of Scandinavia in order to identify "outside" views. The survey consisted of 9 open questions to allow the participants to respond as freely as possible and to avoid tinging their answers. It was published on Facebook and by email and spread further with the help of friends.

3.2.4 Focus group

In a focus group, preferably 6-10 participants discuss a chosen subject or problem with the guidance of a moderator (Bryman & Bell, 2013). This method is recommended for explorative studies aiming to generate hypotheses regarding a certain problem, or ways of solving it. Furthermore it is a good method to identify opinions and attitudes towards products or ideas. It can also be used to identify customer requirements and demands. One aspect of the focus group which is highlighted as one of its' main strengths is the possibility to reach deeper argumentation and additional information which would be less likely to come forward in, for example, surveys. Deeper argumentation is reachable through the possibility to question and associate to each other's statements. Moreover, the moderator has the possibility to use "probing" - follow-up questions that requests the participants to further elaborate their thoughts.

The focus group held in this project sought to identify thoughts about Scandinavia and characteristics highlighted while describing Scandinavia to people living abroad. Furthermore it was also used to verify the results from the survey. Both members of the project team acted as moderators and the following five people were invited to participate:

1. 24 year old man. Studying to become a construction engineer for roads.
2. 22 year old woman. Studying to become an engineer within design and product development.
3. 23 year old woman. Studying surface design. Has lived in the United States.
4. 40 year old man. Working within the Shipping industry. Originally from Australia.
5. 24 year old woman. Studying free arts. Originally from Norway

The focus group contained visual stimuli which helped the participants reflect over Scandinavia and its characteristics. Moreover, discussions based on questions from the survey were conducted.

3.3 Methods for concept generation

The concept development phase aims to find as many solutions as possible (Johannesson, et al., 2004). Therefore, critique is strictly forbidden to avoid the inhibition of ideas. Instead, going beyond the regular and thinking outside the box is desirable. This phase is generally iterated back and forth many times before concepts are evaluated and further developed. Usually, the concept development process is initiated by compiling a function analysis before further ideation methods are practised.

3.3.1 Function analysis

A function analysis lists all functions that a product and its components shall be able to perform (Johannesson, et al., 2004). Each function should be formulated openly and abstractly to avoid inhibiting creativity. The functions are described in one verb and one noun, and classified as main-, sub-, supporting- or unwanted functions. In mechanical products the function analysis visualizes how the complex functionality of the whole product is built up by the collaboration of its components. By visualizing this, solutions to the sub-functions can be sought, which is often easier than seeking solutions to the main function.

In this project, the functions have been listed under the topics “General requirements”, “Looks” and “Experience”. They have not been classified as main-, sub-, supporting or unwanted since all created concepts shall be able to perform the functions, more or less. In addition to being a trigger for idea generation, the function analysis has been used as a checklist during the concept evaluation phase to make sure all concepts meet all desired criterias.

3.3.2 Brainstorming/Brainwriting

Brainstorming is a common ideation method with the aim to generate as many ideas as possible (Johannesson, et al., 2004). While some books advocate groups of 3-6 people (Österlin, 2010) others suggest that 5-15 people is more suitable (Johannesson, et al., 2004). Either way, one person is appointed leader and is responsible to make sure the group follows the four rules of brainstorming:

1. Critique is not allowed
2. Quantity is prioritized over quality
3. Go beyond ordinary ideas
4. Combine ideas

Another version of this method is Brainwriting. Instead of discussing ideas out loud, all participants sit by themselves and write down their ideas (Österlin, 2010). This is a way to avoid too much association between ideas, making them too alike.

The brainstorming and brainwriting sessions conducted by the project team were focused around the four senses: hearing, scent, feel and sight and the topics Scandinavian nature and Scandinavian design. Below, each focus point and the areas discussed during its session are listed.

- Hearing
 - What sounds can be heard while driving in the mega city?
 - What sounds can be interesting to implement in the car?
 - What sounds are typical for Scandinavia and the Scandinavian nature?
 - How can quieter car environments be designed?
- Scent
 - What scents are typical for Scandinavia?
 - What brands are specialized in Scandinavian scents?
- Feeling
 - How can the feelings that the customer want to feel while driving be evoked by changing the interior?
- Sight
 - What is seen while seated at different places in the car? What areas/details draw most attention?
- Swedish nature
 - What is typical for the Scandinavian flora and fauna?
- Scandinavian design
 - The study of Scandinavian design classics and their respective characteristics.

The brainstorming and brainwriting sessions were carried out in order to find focal areas in the car that could be interesting to develop, to clarify what is typical for Scandinavia and to find characteristic elements that could be brought into the car interior.

3.3.3 Combining words

Combining words is a modification of the method “Random words” where two words are picked randomly from a dictionary (Österlin, 2010). Combined they can give an unexpected “solution” to the problem. This method aims to boost creativity and forces the user to think outside the box. In this project, words were not chosen from a dictionary but from a list of 30 words that was a part of the result from the survey and focus group. These words were combined with interior details that had been identified as interesting focal points for development. Each combination was written down on a white board and all ideas that came up were documented as a mind map surrounding the two combined words. All ideas that were found interesting were further developed.

3.3.4 Moodboards

Moodboards, also known as Inspirationboards or Expressionboards, are picture collages that are used to inspire and lead concept generation in the right direction (Österlin, 2010). Moodboards can visualize environments and attributes that appeal to the target customer or that symbolizes the customer’s values. Furthermore they can be used to show desired colour schemes, materials or details.

In this project, the moodboards served both as inspiration and a way to visualize concepts in an early stage. All interesting ideas from the method “Combining words” were visualized in moodboards. When choosing what pictures to use, knowledge gathered from the pre-study about Scandinavian colour schemes, light and moods, along with internal discussions within the project group formed the base for each decision. Pictures were gathered through online research and photography.

3.4 Methods for concept evaluation and elimination

Methods for concept evaluation and elimination are applied to reduce the number of concepts and to find one or a few concepts for further development (Johannesson, et al., 2004). In this project, this was primarily done through a presentation with Volvo Cars and Alten consulting group, combined with an evaluation matrix and the project team’s own opinions.

3.4.1 Presentation of concepts for Volvo Cars and Alten

While working with projects assigned by a company, it is valuable to get input from experienced employees during the development process. In this way, both parties can ensure that the project is on the right track and in phase. Furthermore, it may be valuable to see what ideas the company find interesting and to make sure the company have not already investigated similar ideas.

A presentation of the first concepts was held in order to enable the client, Volvo, and the supervisor, Alten, to give feedback regarding the concepts and which of them they found interesting to develop further. All the concepts were discussed concerning whether they were authentic Scandinavian, if they were achievable and which concepts Volvo cars considered innovative. Furthermore, ways of visualizing the final concepts were discussed.

3.4.2 Evaluation matrix

In a traditional evaluation matrix, concepts are scored according to their level of fulfilment of chosen requirements (Österlin, 2010). All concepts are listed on the x-axis, and chosen requirements on the y-axis of the matrix. If desired, the requirements can be weighted according to their respective importance, so called concept scoring. When the evaluation is finished, the concepts with the highest scores proceed. The evaluation matrix is a quick and objective way of showing what ideas that are interesting or need further development, and in that case, within which areas.

The evaluation matrix used in this project aimed to decide one concept for further development, based on its level of fulfilment of the most important functions from the function analysis. It was also used to investigate whether the chosen requirements went in line with the requirements from Volvo. The chosen criteria were listed and then weighed on a scale from 1-3 according to their level of importance. This was done in order to ease the evaluation. Since all concepts were developed to fulfil the requirements, the weighing helped to identify the concepts that fulfilled the most important requirements the best. All functions from Volvo's original brief were given the highest score, 3. Concepts were then given a yes or a no, depending on whether they fulfilled the requirement or not.

4 PRE-STUDY

This chapter presents the results of the survey and focus group along with analyses of the customer, Volvo designs and the Scandinavian design, nature and values.

4.1 Problem analysis

The brief assigned by Volvo was analysed and interpreted based on the three questions presented in chapter 3.1.1, Determination of status. This method was used to find ways to undertake the assignment and to identify the areas of research that had to be investigated along the way.

1. *Current status*

A car within the premium segment with customers worldwide.

2. *Desired status*

A car interior that appeals to premium customers in USA, China and Europe and enhances Volvo's Scandinavian heritage. It shall bring a unique driving experience by stimulating sight, hearing, smell and feel in the "Scandinavian way" and offer customers a temporary escape from the busy city life.

3. *Differences*

Differences, presented in table 4.1, describe milestones on the way towards reaching the desired status and areas to research in order to pass each milestone, along with individual activities for gathering the information within each research area.

Table 4.1, differences

<i>Milestones</i>	<i>Research areas</i>	<i>Individual activities</i>
Understanding the customers and their needs and wishes.		Customer analysis
Understanding of the Scandinavian culture and what is found as Scandinavian by the customers	Scandinavian design, nature and values	Survey, focus group, field trips and literature study
Finding solutions to implement Scandinavian characteristics into a Volvo interior	Volvo interiors	Identify focal areas in the interior, analyse characteristics in Volvo interiors and field trips
Finding out how to stimulate the four senses and through this, give the driver a sense of Scandinavia	Scandinavian scents, sounds, materials, upcoming trends and new techniques within fabrics.	Online research, field trips and literature study

Concerning the possibility of escaping the busy everyday life whenever desired, which is a part of the original assignment, the project team's own interpretation of such an escape includes a moment of quiet relaxation by creating a sense of Scandinavia and shutting out the outside world.

4.2 Customer analysis

The following analysis is based on confidential material provided by Volvo (Volvo Cars 3, 2016).

This project involves customers in three different regions, America, Europe and China. The core target customers are characterized as successful, affluent business people of upper higher class and of high social status, living in megacities. They are in the age-span between 25 and 60 where the Chinese are generally younger and Americans and Europeans generally a bit older. Depending on where they are in the age-span, they are in a pre- post- or in-family situation.

The target customers are generally characterized as strong and independent people who are very aware of what is happening in their surrounding world. They stay updated on the latest news, technology and sports and are active on social networks and social medias, thus connectivity is very important. They are also very aware of their image and how they are perceived by others. For these people, the car is a central piece in conveying their image to others, and a mean to differentiate themselves from the crowd.

Consumption is generally used as a reward for achievements and the car is seen as a reflection of status and personal style. As customers, they have high demands on design and innovation, and enjoy true craftsmanship which brings a sense of luxury. Furthermore, they require an in-command, exciting, but at the same time relaxing driving experience that allows an escape from the busy city life and some temporary cocooning. Affording this escape is what makes them unique. The car should express capability and strength and convey a sense of superiority. The customers want to feel superior, active and sexy whilst driving. They see the car not only as a way of satisfying technical needs but emotional needs as well. Size and price are aspects that matter and bring status, especially for the Chinese. Comfort and convenience are king.

While there are characteristics that describe the target group as a whole, there are some accruing differences depending on what region they live in. Chinese purchase cars for their own sake and for their own well-being and emotional satisfaction. Europeans and Americans on the other hand focus more on impressing others and conveying a certain level of status. Chinese seek a feeling of luxury through materials, craftsmanship and looks while Americans and Europeans care more about functions

and innovative solutions. For them, innovation and sophisticated solution are luxury. Americans and Europeans focus more on their own experience while the Chinese are more concerned with the comfort and pleasure of their passengers. This might be linked to the fact that in America and Europe, the owners usually drive the car while in Asia, the owner often sit in the backseat. Americans are the most brand-conscious customers and care not only about what level of status that the brand brings, but also the values and visions of the brand. Generally they like sophisticated and innovative brands with good values.

4.3 Outcome of survey

Since the responses from the survey were expected to vary, because of the open questions and the varied personal experiences of Scandinavia that responders were expected to have, a relatively large response rate was desired. The goal rate was set at 100, but altogether, 92 responders answered during the time the survey was available. As shown in Figure 4.1 below, 78% of the responders currently live in Scandinavia and as much as 97% have some time during their lives lived in or visited Scandinavia. The ages of the responders varied but a majority of 73% were between 25 and 50 years old.

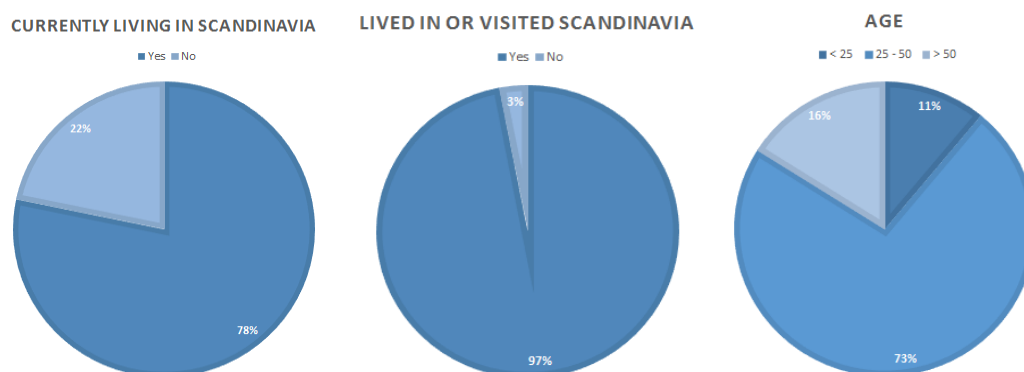


Figure 4.1, respondent group characteristics (Arborelius & Eliasson, 2016).

In order to avoid tinging or inhibiting the responses, neither the client, Volvo, nor the assignment were presented. The main five questions were:

- What do you associate with Scandinavian design (materials, colours, idioms etc)?
- What do you think is typical for Scandinavian nature (climate, habitat types; forest, archipelago, mountains etc)?
- Are there any scents/smells that you find typical for Scandinavia?
- Are there any sounds/types of music that you find typical for Scandinavia?
- How do you perceive Scandinavians (lifestyle, values etc)?

To see the whole survey along with a list of the most common answers, go to appendix 2.

Since the core target customers of this project aren't Scandinavian, and since the created concepts shall enhance the customer's' view on Scandinavia in a positive way, the answers from the 3% that had never visited Scandinavia were found particularly interesting and therefore analysed separately. Their collective opinion was that Scandinavia is cold and beautiful, with a lot of rural environments and forests. Concerning design characteristics, "IKEA", "wood", "white" and "clean and simple design" was the overall view. Regarding smells, sounds and the Scandinavian people, the opinions differed a lot. One person claimed that electro music was typical for Scandinavia while another one said ABBA. Someone found the smell of baking as a Scandinavian smell while another said the smell of pine trees. While compared to the rest of the answers, the responses from this 3% went well in line with the overall opinions. Generally the thoughts about nature and design were similar, while the thoughts on smells, sounds and the Scandinavian people were more individual and varied.

All answers were compiled and analysed, and Figure 4.2 below shows the most common answers within each area.

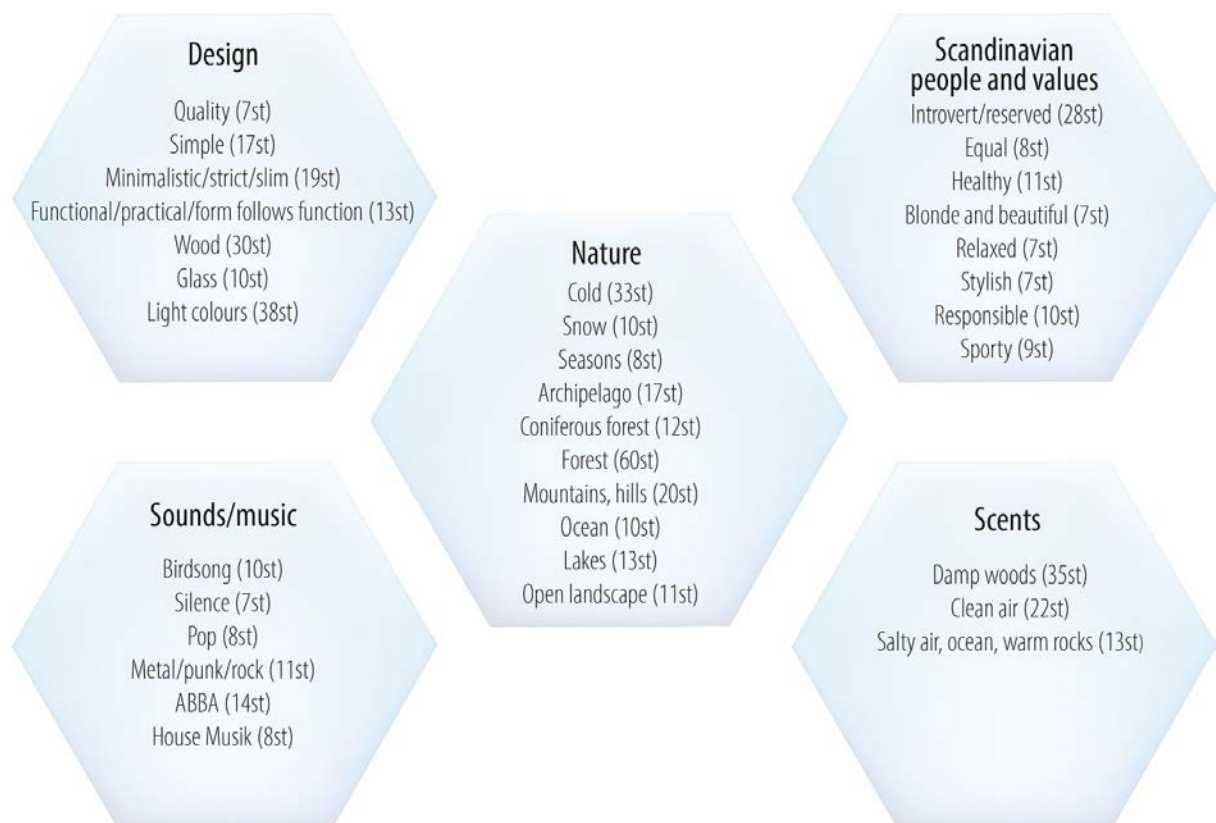


Figure 4.2, outcome of survey showing the most common results and how many people that gave the same responses (Arborelius & Eliasson, 2016).

4.4 Outcome of focus group

The aim of the focus group was to identify thoughts about Scandinavia as well as characteristics that participants would use to describe Scandinavia to foreigners. Moreover it was used to verify the results from the survey, hence, all topics from the survey were discussed. In order to provide participants with a clearer context and to clarify the desired outcome and what it would be used for, both the client and assignment, were briefly introduced.

The focus group started off with a slideshow showing pictures of landscapes, interiors, materials, design classics, colour schemes and car interiors. The participants were asked to score each picture according to if they found them typically Scandinavian or not. Afterwards, the pictures that had gotten the most varied scorings were discussed, and the participants' reactions to them were compared. The slideshow was mainly used as a warm up activity to make the participants reflect over Scandinavia and its characteristics. Many of the pictures with the highest scores were nature images. Figure 4.3 below shows images similar to the original ones that got the highest scores, which cannot be published due to write-protection. After the warm up, a discussion based on some of the questions from the survey was held. Scandinavian scents, sounds, design characteristics, nature characteristics and values were addressed and the essences of each discussion was written down on white boards. To summarize the evening, the participants chose 10 of the words written on the white boards which they wanted to highlight, and which they would use to describe Scandinavia to a foreigner.

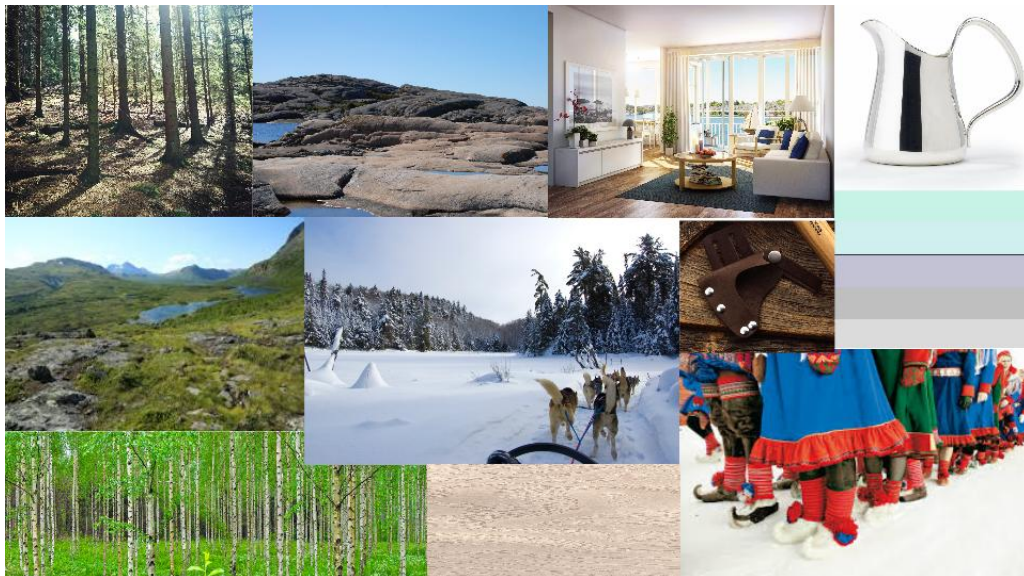


Figure 4.3, Moodboard 1, showing pictures found to be typically Scandinavian (Arborelius & Eliasson, 2016; Wikimedia, 2013; Flickr, 2010; Flickr, 2010; Wikipedia, 2016; Flickr, 2010; Flickr, 2011; Flickr, 2009; Wikimedia, 2014; Wikimedia, 2013).

Many of the things written down on the white boards during the focus group confirmed what had emerged earlier, both from the survey and the pre-study. When comparing Figure 4.2 above, and Figure 4.4 below, showing the respective results from the survey and the focus group, 13 of the words are the same or similar.



Figure 4.4, outcome of focus group showing the most common answers (Arborelius & Eliasson, 2016).

4.5 Analyse of Volvo interiors

During the project, field trips to the Volvo museum, the Volvo Brand Experience Centre, the division of Special Products at Volvo Cars and the car retailer Bilia in Gothenburg have been made to study the Volvo brand and its designs. Both old and new interiors, the design of separate details and the use and placement of different materials and colour schemes have been observed, and the latter is further analysed below.

Since the 90-series is the most recent release, the interiors in these models, and the XC90 in particular, have been studied separately. The 90-series consist of the models V90, S90 and XC90. In this project, the 2015 and the Excellence version of the XC90 have been analysed. Observations have shown that in these models, the interior material placement follows a similar pattern. This pattern enables anyone, familiar with Volvo's most recent cars, to know the material of a specific detail, based upon that material of another detail within the same placement pattern. The schematic

pictures below show material placement patterns found in the XC90, which are similar to ones in the V90 and S90. These pictures show the patterns for the insertions. Appendix 3 contains schematic pictures showing the patterns for the upholstery, splines and plastic details. For each pattern the alternative materials the buyers can chose from are listed. Same coloured areas in the pictures have the same material. This knowledge of material placement patterns and used materials will be applied later in the process during further development of concepts.

Insertions

The material offers for insertions differ slightly between the 90-models. There is a total of 6 different materials, but some are only available for one single model. The materials are shown in Figure 4.5 below in the following order from left to right: Carbon Fibre, Dark Flame Birch, Linear Walnut, Iron Ore, Cross Brushed Aluminium and Metal Mesh.

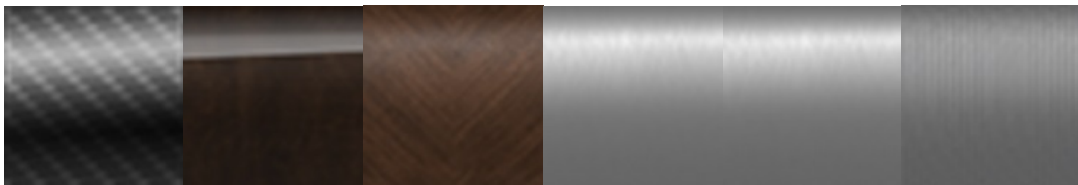


Figure 4.5, insertion materials (Volvo Cars, 2016).

These materials are placed in the placement pattern, shown in Figure 4.6 and Figure 4.7 below.

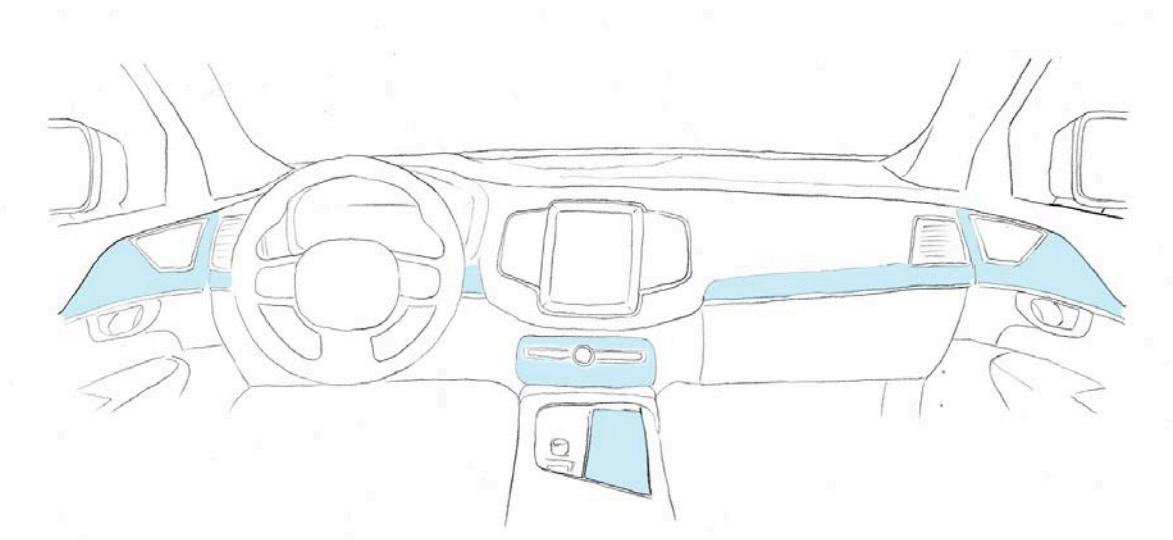


Figure 4.6, insertion placement (Arborelius & Eliasson, 2016).

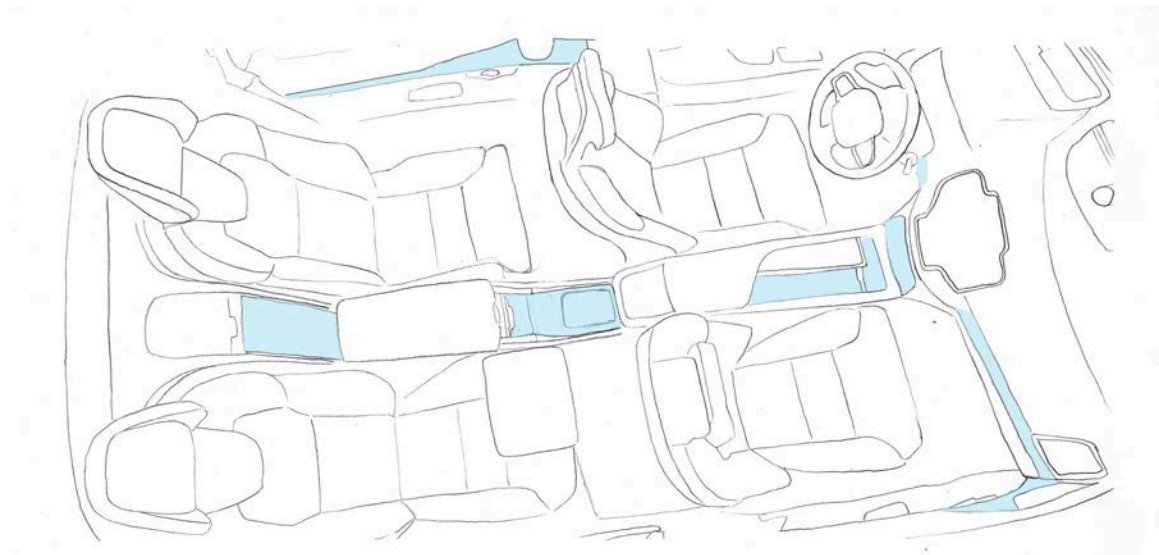


Figure 4.7, insertion placement (Arborelius & Eliasson, 2016).

Upholstery

The upholstery can consist of regular textile, but only as Charcoal-coloured. Otherwise, the upholstery is made of leather in the following variations from left to right; Amber, Blond UA00, Blond WA00 and Charcoal, showed in Figure 4.8. In the schematic pictures in Figure 5 and 6 in appendix 3, the dashboard is also covered in black leather. This is an option possible for the whole 90-series.



Figure 4.8, leather upholstery (Volvo Cars, 2016).

According to retailers at Bilia Sävedalen, darker interiors are preferred in northern Europe, especially in Germany, while light interiors are more popular in southern countries, partly because of the warmth. In Sweden, dark interiors are mainly requested within the family market.

Plastic details and splines

The coloured areas in Figure 1 and 2 in appendix 3 show details made of black plastic. The areas in Figure 3 and 4, also found in appendix 3, show the splines, which in the 90-series are all made of aluminium. The lighter blue areas in these pictures symbolize the speakers. The cover on the speakers can be made of either aluminium or black coloured plastic.

4.6 Analyse of Scandinavian design

Design is an important part of the Scandinavian image and a popular commodity for export. The Scandinavian design is characterised by the term “form follows function”, and aspects such as efficiency and user friendliness are generally prioritized over looks. This simple design has emerged from the farmer societies of the medieval times, from the desire of luxury and abundance in a reality tinged by poverty and barren climate (STF, 2009). The heritage of creating products from available natural resources has helped creating the modern reputation of Scandinavian craftsmanship and skill in the use of native materials. Some of the more modern factors that have influenced Scandinavian design are socialistic ideals, an isolated economy and accessible raw materials. These factors have shaped Scandinavian products into becoming rationalized, dedramatized, sympathetic, non-luxury and practical (Lueg, 1998). Furthermore, Scandinavian design has been highly influenced by other countries and cultures. Many of the most characteristic design and architectural elements in Scandinavia have foreign origins. For example, the red cottage with white corners, often found as one of the most characteristic elements within Swedish architecture originates from ancient Greece, and the timber jointing technique used to construct it from Asia (STF, 2009). What has made these foreign elements Scandinavian is the over-time-modification, from being exotic and unfamiliar to becoming a part of the Scandinavian folk soul. Concerning the timbered cottage, it was the appliance of the calcimine red paint, a Swedish invention from the 18th century that made it a part of the Scandinavian heritage (STF, 2009).

While trends and ideals have changed, practicality, functionality and simplicity still make up the base for what is perceived as good Scandinavian design (Kristoffersson, 2015). It is characterized by clean lines, genuineness, craftsmanship and by materials such as pine wood, Greystone, leather, metals, linen and wool. Historically, pale and neutral colour schemes have been favoured, giving products a cool look (Sommar, 2003). The British designer Jasper Morrison used the phrase “Refreshing as an iceberg”, to describe the work of his Scandinavian colleagues in 1988. More specifically, he said “There’s a purity which is not just about form and material but about concept and atmosphere, and the effect which things have on space. It’s about colour without being merely decorative. It’s about the poetic everyday possibilities which materials, processes and function allow. It’s new without forgetting old. It’s refreshing as an iceberg” (Lueg, 1998, s 11).

The skill in using native materials and the frequently used nature motives and natural colour schemes testify to the strong nature influences that tinge the Scandinavian design (Lueg, 1998). Many great Scandinavian designers have been influenced by nature. The famous tulip vase from Alvar Aalto, the organically shaped chandeliers from Georg Jensen and the armchair “Pernilla” from Bruno Mathsson, are all inspired by nature and its organic shapes. While Scandinavian design is often advertised as one

entity, historically, the expertise within various design areas have differed between the countries. Sweden has been known for its glass industries, Denmark for its furniture design, Finland for its architecture and Norway for its arts and crafts (Lueg, 1998).

The design elements that were found most characteristic by the responders in both the focus group and survey go well in line with the above research. Words like “simple”, “minimalistic”, “strict”, “genuine”, “form follows function”, “light colours” and “wood” were frequently used to describe the characteristics of Scandinavian design.

New trends and upcoming techniques

While looking at upcoming trends within Scandinavian design, the two design fairs *FORMEX* and *Stockholm Furniture and Light Fair*, both taking place in Stockholm, created a good platform for research. Stockholm Furniture and Light Fair is the world’s biggest fair for Scandinavian furniture and light design while FORMEX is the biggest one for Nordic interior design (Stockholm Furniture and Light Fair, 2016; FORMEX, 2016) In this project, both fairs were visited in order to study upcoming trends, mainly within furniture design. The main focuses for research were materials, use of colours and the separate idioms of the different exhibitors. Observations showed that many of the materials used in new furniture design are traditional Scandinavian materials like the ones presented earlier. Different kinds of stones, metals, wool, leathers and woods were skilfully used showing a high degree of craftsmanship. The overall idiom shown at both fairs was simple and minimalistic with distinctive, yet sobre detailing. Many of the furniture and armature presented were clearly nature inspired. Also, colour schemes mainly consisted of hues found in Scandinavian nature. There were a lot of pale pastels and colour combinations of blues, greys, beige, greens and white. Figure 4.9 below show examples of materials, colour schemes and detailing observed during the fairs.

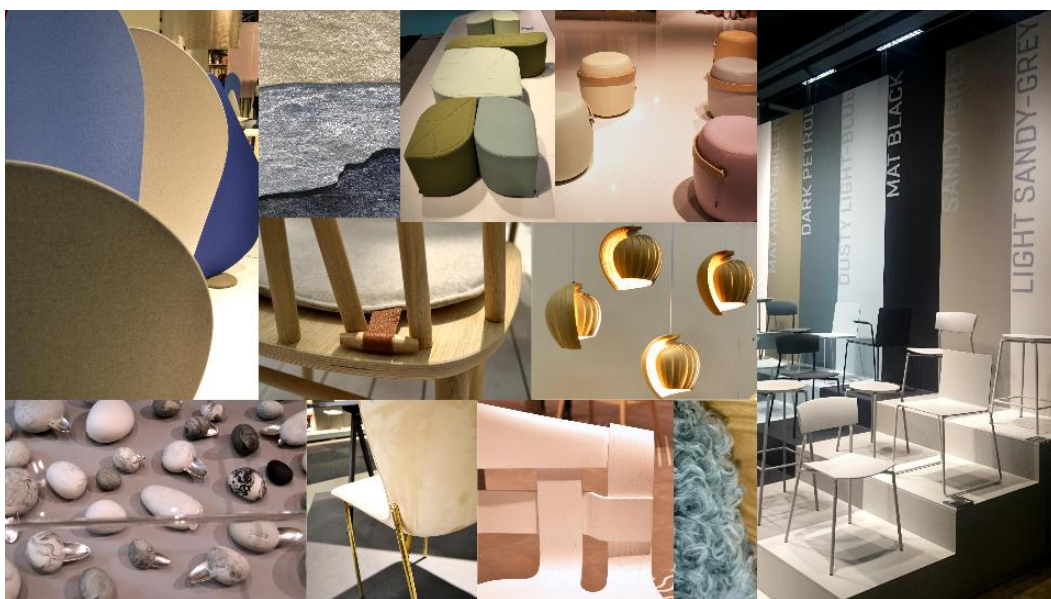


Figure 4.9, Moodboard 2, showing pictures from *FORMEX* and *Stockholm Furniture and Light Fair* (Arborelius & Eliasson, 2016).

To study new techniques within fabrics, another field trip was made to the Smart Textiles Showroom at Borås School of Textiles. These types of fabrics are becoming more and more popular within the automotive industry, where traditional textiles are replaced with ones embedded with technology, see chapter 2.3 Smart Textiles. This field trip was made to investigate how these fabrics could be implemented for both technical and decorative purposes in the car interior. Three kinds of textiles were found especially interesting for this project. The first one reacts to UV light by changing the colour of the textile. This opens up possibilities for more personalized interiors where drivers can create a completely different look by just shifting the lighting in the car. The second fabric reads heart rates. The project team found this fabric interesting since it potentially could read the heart rate of the driver. If this fabric was connected to the various systems in the car, it would perhaps be possible to adjust these systems according to the driver's pulse. The third interesting item was optical fibres, shifting in intensity and colour. Weaved together, they can create mesmerising light and colour patterns, which could be used for decorative purposes in the car.

All these different techniques offer possibilities for personalization of the car, which is an increasingly important aspect of being a premium brand. Other premium brands such as BMW and Audi both offer various opportunities for customization and personalization, either through separate details or through "individual collection series" (Akshay, 2015; Audi, 2015).

4.7 Analyse of Scandinavian values and people

Scandinavians today live in globalized societies where the cultural identity is ever shifting and where influences and inspiration constantly move across national borders (Kjeldsen, 2012). Because of its export of music, fashion and design, Scandinavia has become sensitive to trends and attentive to new techniques, influences and inspirations (STF, 2009).

Some of the core values, in this case specific for Sweden, that have been presented by the Swedish Institute which partly works with nation branding, are (Kristoffersson, 2015):

- Re-thinking and innovation
- Openness
- Genuinity
- Consideration

The idea of Scandinavians as nature loving people started taking shape during the national romantics (Kristoffersson, 2015). Still today, Scandinavians are seen close to

nature and conscious about the environment. During the focus group in this project, the “Public Right to Access to nature” was one of the things seen as very distinctive for Scandinavia. In both the survey and focus group, Scandinavians were portrayed as healthy, beautiful and stylish people equal to one another. Justice and equality were pointed out as important matters, which goes in line with the view of Scandinavians as responsible and conscious. There is a common opinion that Scandinavians are introvert and reserved but friendly.

The “Jante” law is another distinct characteristic claiming no one is better than anyone else. This might be why the concept of “lagom” is so popular. Furthermore, Scandinavians are seen as relaxed people who like cosiness and hold on firmly to traditions.

4.8 Analyse of Scandinavian nature

The analyse of Scandinavian nature has besides finding opinions through the survey and focus group, mainly involved studying the climate and flora through online research.

Geographically, Scandinavia consists of Sweden, Norway, Denmark and in some contexts, Finland (NE, 2016). Since it is so widespread, Scandinavia contains a lot of different habitat types which entails large variations in landscape and climate. There are snowcapped mountains, deep coniferous forests, vast open landscapes, archipelagos, lush deciduous forests and farm lands. Abroad, Scandinavian nature is generally known to be barren and specifically beautiful (Sommar, 2003). The image of the barren, almost melancholic Scandinavia, is conveyed in several modern commercials and is becoming a part of the Scandinavian identity (Kristoffersson, 2015).

The nature elements that were found characteristic for Scandinavia by the responders in both the focus group and survey reflect its varied habitat types. Elements such as birch and pine trees, clear lakes, the smell of damp woods, snowcapped mountaintops, coastal landscape, ocean rocks, cold climate, northern lights and snow were frequently shown in the results of these two research methods. By many of the responders, the Scandinavian nature is considered vivid and ever shifting because of the four seasons controlling it. Another more major aspect that was found characteristic was the Right of Public Access. In both Sweden and Norway, the nature “belongs” to the people and everyone has the right to move about freely in it. Hence, Swedish and Norwegian nature has become symbols for democratic ideals (Kristoffersson, 2015). Before nature, everyone is equal and historically, the Scandinavian nature has been promoted as a bridge between social ranks.

5 CONCEPT DEVELOPMENT PHASE

This chapter covers the ideation process and ends with a presentation of the concepts that were presented for Volvo and Alten during the first presentation.

5.1 Function analysis

The function analysis follows the structure presented in chapter 3.3.1, but without the classifications of functions as main-, sub-, supporting or unwanted. All functions were listed under three different topics: “General requirements”, “Looks” and “Experience”. The function analysis served as a guideline for the continuing development process. The functions listed in Table 5.1 below originate from the assigned brief, the customer analysis and the project team’s own thoughts.

Table 5.1, function analysis

<i>Verb</i>	<i>Noun</i>	<i>Remarks</i>
General requirements		
Appeal to	Target customer	<i>Satisfy both technical and emotional needs</i>
Enhance	“Outside” view on Scandinavia	<i>Regarding nature, values, design etc, in a positive way</i>
Accentuate	Volvo’s Scandinavian origins	
Deepen	Connection between Volvo brand and Swedishness	
Express	Volvo’s innovation	<i>By applying new material, design, functionality etc.</i>
Looks		
Express	Simplicity	
Express	Sophistication	
Express	Minimalism	
Express	Elegance	
Contain	Materials from Scandinavian nature	
Express	Quality	
Express	Luxury	<i>Through material, detailing, craftsmanship, innovation, and personalization etc.</i>
Express	Superiority	

Experience		
Offer	A sense of Scandinavia	<i>Nature, design, lifestyle and values.</i>
Offer	A sense of uniqueness	
Stimulate	Four senses	<i>Sight, hearing, smell and feel.</i>
Offer	Relaxation	
Offer	Escape from busy city life	<i>Cocooning/shielding</i>
Offer	A sense of luxury	
Offer	Comfort	
Offer	Joyful driving experiences	
Offer	Pleasure for passengers	
Offer	Adaptation to the driver	

5.2 Focus Points

Since the concepts created in this project should give unique customer experiences through stimulating sight, hearing, smell and feel, several workshops were conducted for the purpose of finding out how, where and when to stimulate each sense. Each workshop focused on one sense at a time, and the base for all workshops was the model XC90 Excellence. Moreover, visualizing the whole interior was found to be too big of a task. The workshops were therefore also used to find interior details which convincingly could convey the idea of the whole interior concept. While discussing how Scandinavian culture could be integrated into the interior to stimulate all the senses, the following ways came up:

- Choice of material
- Choice of colours
- Creating illusions
- Integrate characteristics and elements from the Scandinavian flora or Scandinavian design classics
- Lighting (intensity, hues and light temperature)
- Use fragranced materials or “fragrance on demand”

Some of these ways of integrating Scandinavian culture could possibly be found disturbing whilst driving. Therefore, these should only be used when the car stands still.

The first workshop, “Sight” focused on identifying attention-drawing interior details and ways of integrating the Scandinavian culture into these details and the overall interior. Besides obvious development possibilities such as changing the material, six

separate details with development potential, all listed below, were identified. These are all distinct details typical for the Volvo XC90 Excellence, and attention-drawing while seated at different positions in the car.

- Dashboard
- Steering wheel
- Regulators/switches
- Gear lever
- Center stack
- Backseat table
- Wine cooler

Figure 5.1 to the left below shows the dashboard, containing several materials and a two-toned steering wheel, a crystal glass flip switch gear lever from Orrefors and regulators with a distinct surface structure. To the right, Figure 5.2 shows the centre stack which all passengers can see, the backseat table and the beverage cooler, placed between the two back seats.

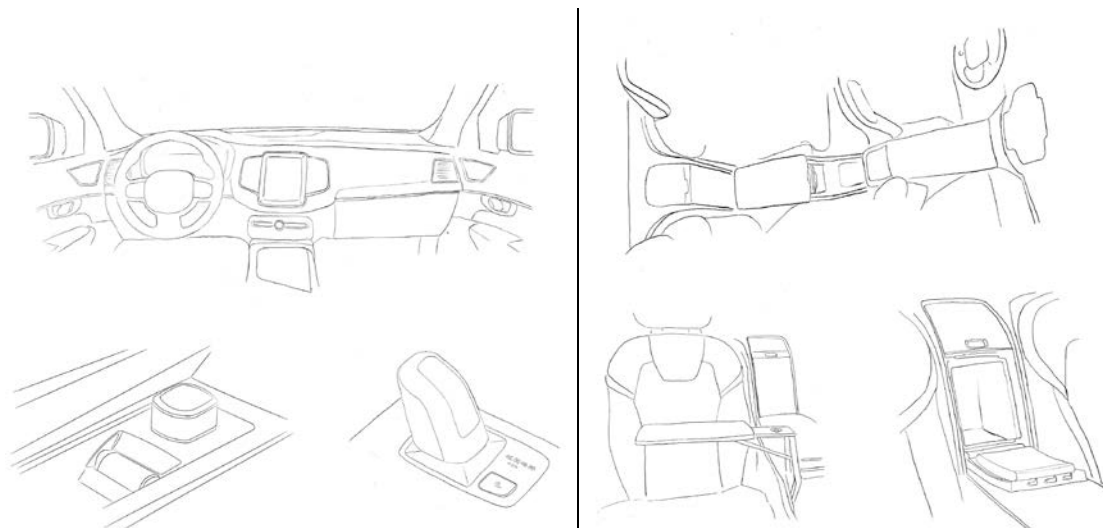


Figure 5.1, showing the focus points dashboard, regulators and gear lever (Arborelius & Eliasson, 2016).

Figure 5.2, showing the focus points center stack, table and wine cooler (Arborelius & Eliasson, 2016).

The workshop “Smell” was conducted to find scents that exist in cars today as well as scents that could be linked to Scandinavia. Also, when and how to involve scent in a new interior were discussed. Either the scents could be present all the time through fragranced materials, air filters etcetera, or they could be emitted on demand. Besides the scent of the leather, fragrances such as pine, birch, grass, Scandinavian flowers and different berries were potential choices.

The workshop “Hearing” was carried out to investigate which sounds that can be heard in a car, both wanted and unwanted ones, and which sounds that could be linked

to Scandinavia. In this case, sounds such as wind in treetops, waves hitting rocks and birdsong were listed as typical for Scandinavia. However, while working with sounds in the car, it is important that warning signals, honks from other cars or other important information are not masked. Since sounds or music also can be found intrusive whilst driving, or distract the driver's attention away from the road, sounds were listed as potentially disturbing and should mainly be used while the car is standing still.

“Feel” was conducted to understand what type of experience the driver would want while sitting in the car and how to enhance the Scandinavian sense in the interior. Feelings found typical for Scandinavia, based on the pre-study, were:

- Looking out over the ocean or a lake
- Walking in a deep forest
- Looking out over snowcapped mountains
- A sense of coldness
- Clean

Besides these feelings, ways of working with tactility were discussed, and the most obvious one was surface structures.

5.3 Idea generating process

When all focus points were determined, they were combined with the results from the pre-study, according to the methodology described in chapter 3.3.3, in order to create ideas. However, some results were not found suitable to implement in a car. For example, some responders in the survey claimed that the smell of damp forests or ocean alga were typical for Scandinavia, but these scents are not likely to be appreciated in a car interior. Furthermore, results concerning the Scandinavian society and the Scandinavian people have not been implemented in the car interior. Values such as justice, equality and democracy, all found characteristic for Scandinavia, are hard to interpret into a design and are therefore overlooked in the rest of the idea generating process. Therefore, a selection of results which the project group found suitable for further development was compiled. A small choice of the selected words are listed below.

- Frost
- Snowcapped mountains
- Forest
- Minimalistic
- Birch
- Sea
- Seasons

All combinations of words were documented using mind maps and Figure 5.3 below shows an example. During the combination, ways of stimulating the different senses were discussed and documented for further development.

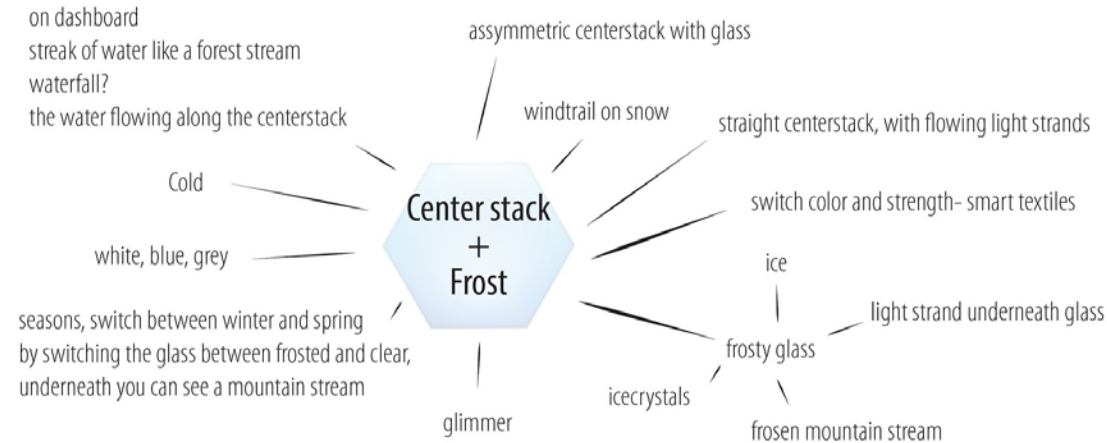


Figure 5.3, example of a mind-map from combining words. The focus point is center stack and the word from the pre-study is frost (Arborelius & Eliasson, 2016).

During the idea generating process, ideas that stimulated all four senses were developed into different “modes”. A mode is started by the driver through interaction with the car, for example by pushing a button, and creates an exciting experience using light, sounds, scents and/or hearing. Since additional stimulation of the senses could be found disturbing when added to the sensory input a driver usually gets, the modes are only supposed to be activated when the car is standing still.

5.4 First concepts

While looking at the ideas found through the method “Combining words”, two different courses of ideas were identified. One satisfied physical and functional needs and consisted of interior details. Many of these interior details were found to be similar and could be categorized under different themes. The other course satisfied emotional needs and consisted of ideas around the experience and feeling in the car. These latter ideas were combined to create different modes.

Themes

When all ideas had been studied, three interior themes had emerged; Forest, Archipelago and Arctic. These were visualized in moodboards, showing desired nature elements and materials. Each theme contains several concepts for details that combined could create an overall concept for the whole interior. Below, all theme moodboards are presented followed by a presentation of the developed modes. Along with the interior theme Archipelago, one example of a concept of a separate detail is shown.

The *Archipelago* theme, visualized in Figure 5.4, contains materials such as sun-bleached woods, glass, uneven rocks and pebbles. The theme should bring the driver closer to the Scandinavian seaside by the use of these materials and effects such as light reflections from water. The colour scheme consist of light grey and brown, different hues of blue and white.

ARCHIPELAGO

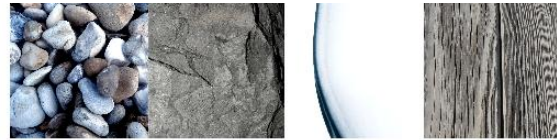


Figure 5.4, Moodboard 3, *Archipelago* theme (Flickr, 2013; Wikipedia, 2016; Flickr, 2010; Flickr, 2014; Flickr, 2011, Arborelius & Eliasson, 2016; Wikimedia, 2013).

The exemplifying detail, showed in Figure 5.5, within the theme *Archipelago* is a result of combining the words “gear level” and “blue mussel”. The gear lever consists of glass, shifting in different hues of blue, purple and mother-of-pearl. Surrounding parts are made out of brushed aluminium.

Mytilus Edulis - Blue Mussel.
Mother-of-Pearl and shifting blue glass
complemented by brushed aluminium. Oval shape.

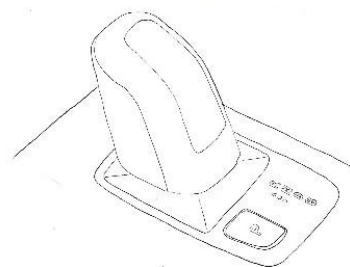
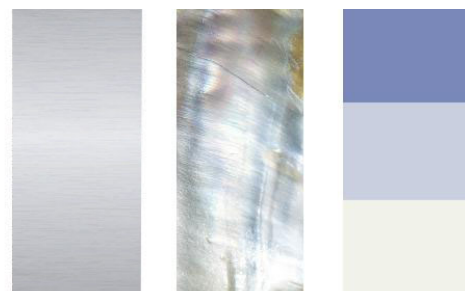


Figure 5.5, Moodboard 4, exemplifying detail from *Archipelago* theme (Flickr, 2004; Publicdomainpictures, 2016; Wikimedia, 2012; Arborelius & Eliasson, 2016).

The *Forest* theme, Figure 5.6, contains leather in different grey hues, glass and woods. The colours are earthy in hues of grey, brown and beige. The driver should get a feeling of craftsmanship and skilful use of nature materials. Effects used to enhance the feeling of Scandinavian forests are for example light coming down through thick foliage or through tree trunks.

FOREST

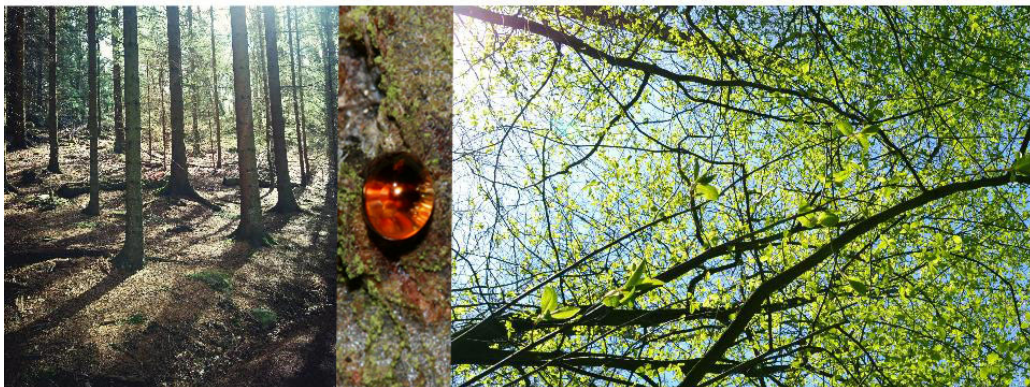


Figure 5.6, Moodboard 5, Forest theme (Flickr, 2009; Flickr, 2010; Wikipedia, 2016; Arborelius & Eliasson, 2016; Flickr, 2012).

The *Arctic* theme, Figure 5.7, contains glass, dark stones and brushed aluminium, which combined should give a cold, barren feeling. The colour scheme consist of white, greys, black and light blue, lighted by cold blue light. The feeling should be cold and fresh, and the interior barren and minimalistic.

ARCTIC

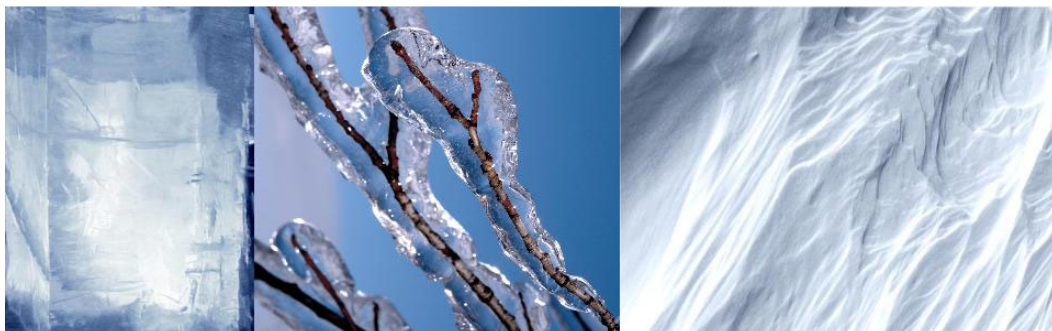


Figure 5.7, Moodboard 6, Arctic theme (Wikimedia, 2015; Wikipedia, 2016; Publicdomainpictures, 2016; Wikipedia 2016; Wikipedia, 2016; Wikimedia, 2016).

Modes

Altogether, five modes were developed. All except one represented a season. The modes were developed separate from the interior themes since they were not supposed to be a part of the interior design, and only be activated on demand.

The first mode *Birchgrove*, visualized in the Figure 5.8 below, represents spring. In this mode, an illusion of leafage is projected on the panorama window. Between the projected tree branches, glimmering lights, white clouds on a blue sky and a bird flying harmoniously can be seen. The sound of wind through treetops and birdsong is heard in the background. To stimulate smell, a fragrance of fresh leaves and birch sap is released through the air vents.

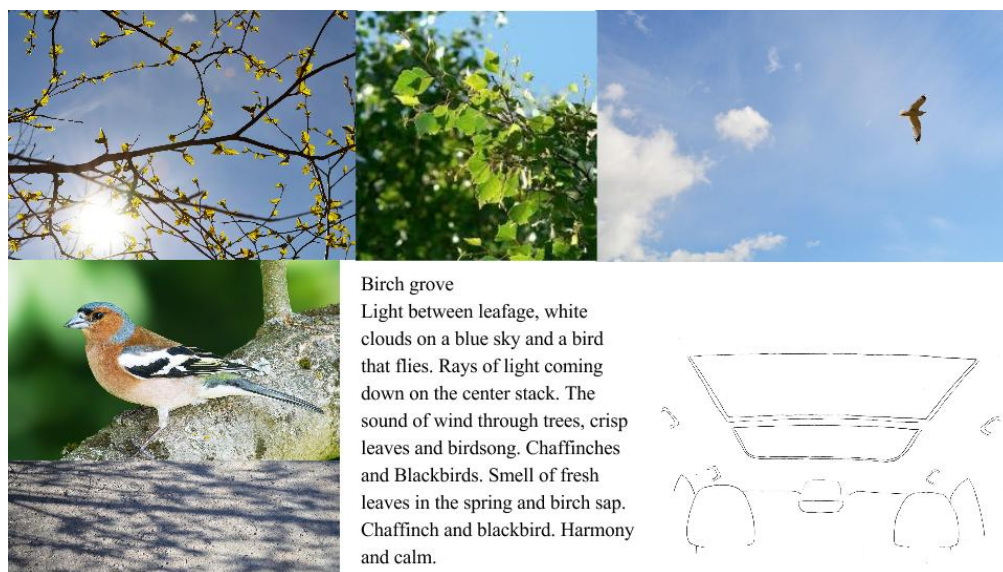


Figure 5.8, Moodboard 7, *Birchgrove mode* (Arborelius & Eliasson, 2016; Public-domain-images, 2014; Wikimedia, 2016).

The mode that represents summer is called *Seaside*. In this concept, the headliner is illuminated with a light play, like the reflections from water moving slowly. The centre stack is illuminated with glimmering lights, like sun shining on the ocean. Simultaneously, the sound of waves and a scent of salty air can be felt.

The next mode, representing autumn is called *Rain*. This is a melancholic mode, allowing the driver some quiet rest. The panorama window is covered with an illusion of raindrops falling into a pool of water. The side windows are opaque with raindrops drizzling down. There is a scent of warm summer rain and the sound of raindrops hitting the windows can be heard in the background.

The last season-mode is called *Frostynight* and represents winter. All windows are frosted and illuminated by cold, blue light. The headliner and panorama window is illuminated by a subtle green and purple light, creating an illusion of Aurora Borealis, Northern lights. The sound of wind blowing over treeless mountaintops can be heard quietly in the background, creating sounds almost like white noise.

Another mode that was developed, but did not classify as a season-mode, is called *Starry skies*. In this mode, the headliner contains small light sources, shifting in intensity, creating an illusion of a star spread sky.

One idea that emerged during the development of modes was the concept *Personalized*. This concept is a way of meeting the customer's wishes regarding innovation and customization, but it does not classify as a mode. Instead, it can be integrated in all of the interior themes. The idea is to put Smart textiles, see chapter 2.4, that can register heart rates on the steering wheel or on a back door, depending on where the owner of the car sits. The Smart textile then connects the heart rate to the different systems in the car, and thereby adjusts the car to the owner's current mood. For example, if the owner's heart rate goes up, relaxing music starts to play, the light fades into a warmer nuance and the air conditioner releases cool air. If the reversed scenario happens and the driver is getting sleepy and the heart rate goes down, up-beat music, cold intense light and a whiff of cold air is released.

6 CONCEPT ELIMINATION PHASE

This chapter covers the evaluation and elimination of concepts and ends with a presentation of the concepts chosen for further development.

6.1 Concept elimination outline

The elimination phase contained three separate activities; a concept presentation with Volvo Cars and Alten, evaluation through visualization of some ideas and an elimination matrix. These three activities helped narrow down the concepts and finally, to choose one for further development. Figure 6.1 below shows the outline for the elimination of concepts. The final choice consist of one interior theme, visualized through some interior details, one related mode, combined with the concept *Personalized*.

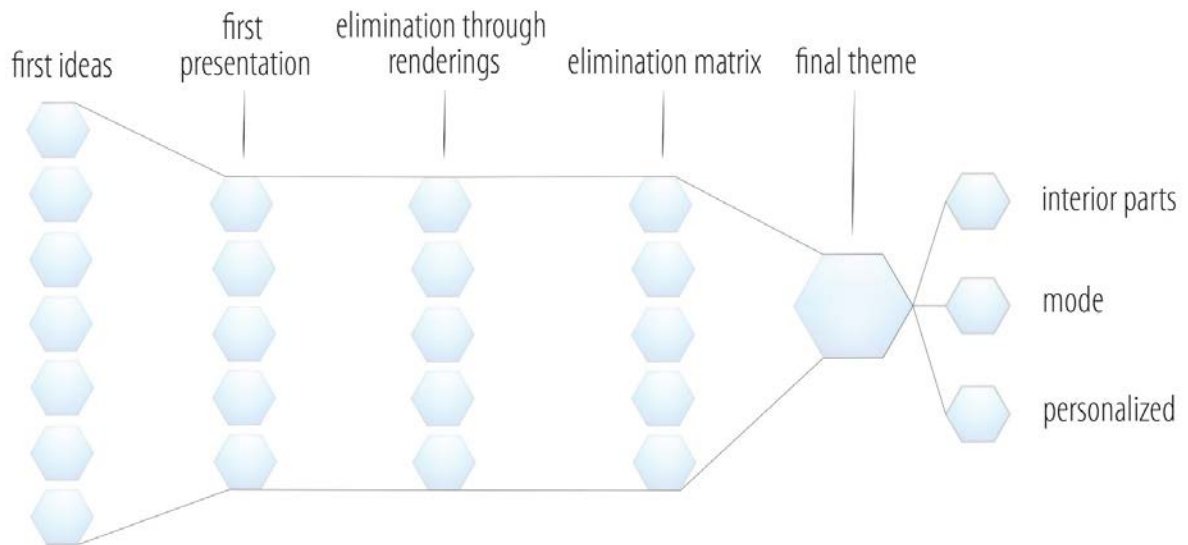


Figure 6.1, a schematic picture of the eliminations phase (Arborelius & Eliasson, 2016).

6.2 Comments from Volvo Cars and Alten

The concept presentation for Volvo Cars and Alten was held to see which concepts they found interesting to develop further. Altogether, 18 concepts within the themes Forest, Archipelago and Arctic were presented along with the modes and the idea of customizing the car through the concept *Personalized*. Five people attended the presentation, the supervisor from the division of Special Products at Volvo Cars, the supervisor at Chalmers, the supervisor at Alten and two additional employees at Alten, both working towards the automotive industry. After the presentation, all ideas

were discussed regarding their level of luxury, achievability, innovation and whether they would be found authentic Scandinavian by the customers. In this case, bringing in a third part consisting of the two additional employees at Alten brought new perspectives and helped keeping an open mind while evaluating the concepts. Below, the reactions regarding the themes, modes and the concept Personalized are presented separately.

Themes

The feedback from Volvo concerning the interior themes was very positive. The Volvo supervisor reacted especially positively to the idea of working with cold blue light within the Arctic theme, the pebbles within the Archipelago theme and one concepts within the Forest theme where the regulators were designed to resemble resin. Generally, working with different lighting was seen as promising. Though, the reactions to blue light varied. While some attendants thought it would give a cold feeling and create an inhospitable and somewhat unpleasant environment, others claimed that this interior was developed mainly for customers living in warm climates and that a cold feeling might be found exotic. Furthermore, blue light was found to give a clean look.

According to the attendants, the Archipelago theme was found harder than the other themes to realise in an appealing way. Some of the details, for example “Gear level - blue mussel” and the material sun-bleached wood were found to be too rough or tacky for the premium segment. Furthermore, the association between archipelagos and Scandinavia might exist in the minds of Scandinavians, but not necessarily for the customer. Therefore, if using this theme, the customer’s association to Scandinavia might be lost and thereby also the enhancement of Volvo’s Scandinavian heritage. To conclude the discussion after the presentation, the Arctic theme was stated as the theme which probably would go best in line with the customers view of Scandinavia.

Some of the presented ideas had already been investigated by Volvo. For example, there is an established cooperation between Volvo Cars and Smart Textiles at Borås School of textiles. They have also investigated the possibility of using different kinds of stones but have had a hard time finding one which is automotive approved.

Modes

The modes were also perceived positively even though some of them did not receive much feedback. The modes that got the most reactions were Frosty Night, Birch Grove and Starry Skies. Concerning Frosty Night, the light play imitating Northern lights, was found to be in the risk zone of being tacky. If it was to be used, it had to be very subtle. Also, the sound of wind blowing over treeless mountain tops was found to bring a cold feeling by one attendant. However, another claimed that it resembled white noise and that it could be soothing and relaxing to many people. The Birch Grove mode was highly appreciated, mainly for the illusion of leafage on the panorama window and the sound of birds singing. Starry Skies was found neither

innovative, nor interesting, since it already exists in cars made by brands such as Rolls Royce.

Personalized

This concept was appreciated for its level of innovation, even though Volvo already investigates Smart textiles. The idea of connecting various systems in the car to the mood of the owner was found re-thinking.

By the end of the presentation, the conclusion drawn by all attendants was that a combination of a theme and a mode would be the best way of fulfilling the original task and stimulating the four senses. To raise the level of innovation, they should be complemented by the concept Personalized. When choosing the theme and the mode, the attendants thought their views should be taken into consideration, but that the final choices should be made based on the project team's own opinions. When visualizing the final concept, a video sequence containing renderings, moving pictures and pictures of the nature elements that had inspired the ideas, was found to be the best way to show the intended look and feel of the whole interior and its related mode.

6.3 Evaluation through renderings

This step of the evaluation process was made to visualize separate details within each interior theme to see how they could look in reality. All renderings were made in Photoshop, based on the tutorial "How to visualize a realistic car wrap" (Youtube, 2010). This tutorial shows how hues, saturations, shadows and highlights in a picture can be copied and put in different layers. The layering enables other materials to be wrapped onto the original picture, without losing light reflections and shadows etcetera, which makes the picture more realistic. The Photoshop visualizations were based on photos of details in the XC90 provided by Volvo. Creating these renderings clarified the project team's visions and made it easier to form opinions about the concepts and which ideas would fulfill desired functions best. Moreover, it showed how ideas performed relative to each other, which further ensured that the elimination process was just. The three concepts that were visualized were results of combining the following words:

- Regulators - Resin (Forest)
- Gear level - Blue mussel (Archipelago)
- Regulators - Ice (Arctic)

Regulator - Resin

The idea of this concept was to take the original regulators and make them even more distinct by putting a resin-like stone or plastic behind the glass surface. In nature when resin hardens, it resembles amber which was the desired look in this concept.

Together with insertions in light brown wood, it gives an earthy and calm feeling, shown in the visualization, Figure 6.2 below. While the materials and nature elements used in this concept can be found characteristic for Scandinavia, the colour scheme consisting of brown, grey, beige and orange, was found neither modern, nor in line with traditional Scandinavian design, which rather is light and airy, not dark and earthy.



Figure 6.2, regulator- resin visualized (Volvo Cars, 2016; Wikipedia, 2016).

Gear lever - Blue mussel

This concept visualizes Moodboard 4 presented in chapter 5.4. with a gear lever of glass shifting in blue, purple and mother-of-pearl. Around it, there are pebbles beneath a thin sheet of glass, resembling a seabed. The colour scheme in this concept, with different nuances of light grey, light brown, blue and white goes better in line with traditional Scandinavian design. Though, pebbles might not be perceived as simple or minimalistic, nor be easily implemented in a car interior because of their uneven surface finish. The visualization in Figure 6.3 below show the intended look of this concept.



Figure 6.3, visualization of gear lever- blue mussel (Volvo Cars, 2016; Flickr, 2012).

Regulator - Ice

In this concept, which is shown in Figure 6.4 below, the idea is to create an illusion of water that has frozen inside the regulators by placing an asymmetrical piece of glass behind the surface. The insertions are made of glass or a glass-like material with cracks, resembling blocks of ice. The inspiration for this concept partly comes from the Icehotel in Jukkasjärvi, Sweden. In this concept as well, the colour schemes can be found as typically Scandinavian with nuances of white, blues and greys. However, glass may be problematic, because of the risk of breakage and the weight.



Figure 6.4, visualization of regulator- ice (Volvo Cars, 2016; Wikimedia, 2015).

6.4 Elimination matrix

The elimination matrix showed in Table 6.1 below, was used as a final method for evaluating and eliminating concepts. The chosen criteria consist of the functions found most important from the function analysis. Since these functions concern experiences and looks, which generally are perceived individually, deciding whether a concepts fulfilled a criteria or not was difficult. All decisions were eventually based on the project team's opinions, the results from the pre-study and the interpretations of the criteria. Moreover, the themes and modes differ a lot, meeting physical respectively emotional needs, which makes them difficult to compare justly. Therefore, the most salient arguments concerning each criteria complement the elimination matrix in the paragraphs below. The weighing of different criteria, see chapter 3.4.2 concerning concept scoring, was decided based on the project team's own opinions. All criteria that concerns the assignment from Volvo were given the highest score since fulfilment of these criteria was found crucial for completing the task. Generally, the criteria concerning experiences got the same or higher scores than those concerning looks.

Table 6.1, elimination matrix

Functions	Score (1-3)	Themes			Modes						
		Forest	Archipelago	Arctic	Birchgroove	Seaside	Rain	Frosty night	Starry skies	Personalized	
Accentuate Volvo's Scandinavian origins	3	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	
Enhance "outside" view on Scandinavia	3	Yes	No	Yes	Yes	No	No	Yes	No	No	
Express Volvo's innovation	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Express simplicity	2	Yes	Yes	Yes	No	No	No	No	No	Yes	
Express luxury	1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Stimulate four senses	3	No	No	No	No	No	No	No	No	Yes	
Offer an escape from busy city life	3	No	No	No	Yes	Yes	Yes	Yes	Yes	No	
Offer pleasure for passengers	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Offer adaptation to the driver	2	No	No	No	No	No	No	No	No	Yes	
Total		13	12	13	14	11	8	14	9	10	

Accentuate Volvo's Scandinavian origins

This criteria is directly linked to the criteria *Enhance "outside" view on Scandinavia*, why these two are discussed together. Whether concepts are found to enhance the "outside" view on Scandinavia, and thereby accentuate Volvo's Scandinavian heritage or not, is based on the result from the survey along with the discussion held during the first presentation. As earlier argued, the theme which most likely will meet the customer's views on Scandinavia is the Arctic theme. This thought is not based on any published studies on the subject, but only on prejudice about the Scandinavian climate and nature, which are believed to exist abroad. Though, results from the survey suggest that the Forest theme is also closely linked to Scandinavia why both themes were considered to meet the criteria.

Express Volvo's innovation

Considering the innovation level, the scoring is based on how well the separate concepts meet the project team's own interpretation of innovation as the integration of new materials, new techniques and overall re-thinking. Since all concepts contain materials and techniques relatively new within the automotive industry, they are all found to meet this criteria.

Express simplicity

The opinions of what is perceived as simple vary. In some contexts, simplicity could mean clean surfaces and minimalistic expressions, but in other, it could mean simplicity as in user friendliness or customization and adaptation to the user. While discussing simplicity as clean design, the interior themes can be found to meet this criteria since they are all developed with simplicity and minimalism in mind. But the other concepts, which stimulate several senses simultaneously through lighting, illusions, sounds, climate systems and fragrances, might be found intrusive and thereby not simple. However, while discussing simplicity as user friendliness and customization, all modes and the Personalized concept could be found as simple.

Express luxury

Just like simplicity, luxury can have various meanings to different people. Except giving a luxurious feel through meticulous design and skilful use of materials, luxury in this project is defined as relaxation, personal time, innovative technologies and customization. This definition is based on the customer analysis. In the interior themes, usage of carefully chosen materials, new to the automotive industry is found to be innovative and thereby luxurious. But, as argued in the discussion following the first presentation, some of the materials used in the Archipelago theme might not be found luxurious enough for the premium segment. The modes and the concept Personalized are all considered luxurious since they contain innovative technologies and offer customization and relaxation.

Stimulate four senses

The concept Personalized is the only one that affects all senses; touch/feel through the climate system, smell through fragrances, hearing through music and sight through shifting light and illusions. The other concepts all have to be combined to stimulate all the senses since the modes do not contain any tactile elements and the interior themes do not have any sounds or fragrances.

Offer an escape from busy city life

The modes are developed specifically for the purpose of meeting this criteria. As described in chapter 4.1, the escape is interpreted as closing out the outside world for a moment and experiencing the Scandinavian nature. The modes are created to move the attention from the busy everyday life to the Scandinavian experience, offering a moment of relaxation. The other concepts do not offer this escape themselves, but if combined with a mode, they can add to the Scandinavian experience.

Offer pleasure for passengers

All the concepts have potential to offer pleasure for passengers. Though, Personalized is developed specifically for the owner of the car and therefore not considered to meet this criteria.

Offer adaptation to the driver

This criteria is only met by Personalized.

The conclusion of this method was, once again, that a combination of a theme, a mode and Personalized is the best way of fulfilling the original assignment. The matrix shows that combining the theme Forest or Arctic with the mode Birch Grove or Frosty Night and complementing these with Personalized will fulfil all the criteria.

6.5 Concepts for further development

The most natural combinations of themes and modes were found to be Forest combined with Birch Grove and Arctic combined with Frosty Night since they interpret different nature habitats and different seasons.

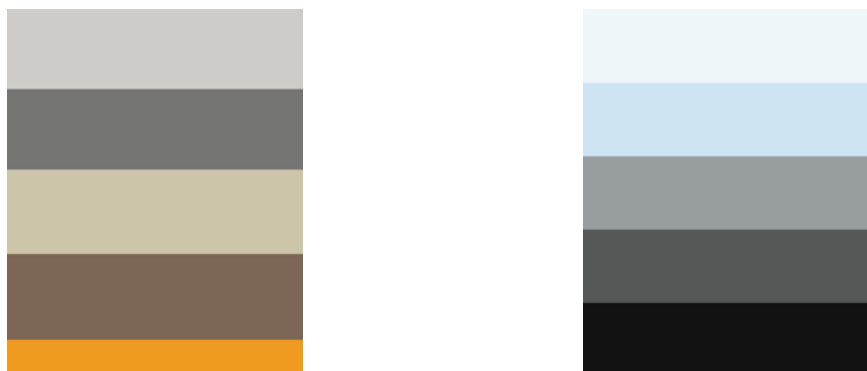


Figure 6.5, Colour scheme Forest (Arborelius & Eliasson, 2016).

Figure 6.6, Colour scheme Arctic (Arborelius & Eliasson, 2016).

The colour scheme shown in Figure 6.5 above in the *Forest* theme was found unmodern, dark and earthy and the interior theme as a whole, to express a lower level of luxury and freshness than the Arctic theme. It was also considered not to meet the customer's views on Scandinavia as well as the Arctic theme. The colour scheme in

the Arctic theme, shown in Figure 6.6, was found lighter, airier and cleaner. Furthermore, the nature elements used in this theme, such as snow and ice, will most likely be found more typical for Scandinavia in the eyes of the customer. These were the main reasons the Arctic theme was favoured by the project team. Moreover, according to Volvo and Alten, the Arctic theme had the most development potential and would probably meet the customer's views on Scandinavia the best.

With all results from the evaluation and elimination phase taken into consideration, the Arctic theme along with the related mode Frosty night, complemented by Personalized, was the combination chosen as the final concept for further development.

7 FINAL CONCEPT – *Arctistic*

This chapter presents the design, material choices, coloration and intended experience of the final concept along with several visualizations.

7.1 Description of *Arctistic*

The combination of the Arctic theme, Frosty Night and Personalized is called *Arctistic*, visualized in Figure 7.1 below. *Arctistic* aims to give a sense of the barren arctic climate and an authentic Scandinavian experience. The harshness in the materials and the cold colouring and lighting creates a cold, yet clean feeling. The related relax mode allows a moment of quiet relaxation, with elements from the arctic night.



Figure 7.1, *Arctistic* visualized (Volvo Cars, 2016; Flickr 2014; Wikipedia, 2016).

7.2 Interior theme

Design

The interior design is simple and minimalistic with clean lines and surfaces. It contains materials typical for Scandinavia and colours from the arctic winter - white, different greys and hues of cold blue. The interior follows Volvos existing design, with changes in material and coloration, on all accounts but one. The gear lever has been developed based on the lower demands on hand ergonomics that flip switches have compared to traditional gear levers, and is designed with asymmetrical shapes. The new design is inspired by Figure 7.2 below, showing an ice crystal. The final result, shown in Figure 7.3 to the right, has been built in Alias Autostudio.



Figure 7.2, ice crystal (Flickr, 2008)



Figure 7.3, new gear lever design (Arborelius & Eliasson, 2016)

The regulators still have the same shape and surface structure. To emphasise the feeling of winter, a snowflake made of glass has been placed behind the transparent surface.

Materials

The *Arctistic* interior contains glass, Schist, brushed aluminium and grey leather. These materials are applied to the earlier presented material placement patterns, shown in chapter 4.5, in order to make the interior look authentic Volvo. Also, repetitions of similar materials, lines and shapes make it easier for the viewer to group elements and read the design. The contrasting materials with different structures and surface finishes also aid this process by distinguishing separate elements (Abercrombie, 1990). The Insertion pattern consists of an uneven surface of Schist. Since Schist is a layered and relatively soft stone, it is easy to split and shape into thin flags which more easily can be installed. It is a durable material, needing hardly any maintenance, and has a long lifespan (Bülow, 2016). The upholstery is made of light

grey leather. Splines and speaker covers are made of aluminium, as in the existing interior, and most of the plastic details have been replaced with clear Soda-lime glass.

Glass, stone and metals are classified as “dead” materials, neither moving, expanding nor emitting any scents. In contrast to living materials, such as leather and wood that often are considered to give a warm and living feeling, these “dead” materials are implemented in the design to give a sense of stillness (Moelven Töreboda AB, 2014). All materials used in the interior are presented below in Figure 7.4.



Figure 7.4, the materials in the following order from left to right, glass, Schist, brushed aluminium, glass with cracks and grey leather (Flickr, 2010; Wikipedia, 2016; Publicdomainpictures, 2016; Flickr, 2009; Wikipedia, 2016).

Coloration and light

The colour scheme shown in Figure 7.5 consist of cold, wintery colours and is analogous, which means that the different hues are placed next to each other on the colour wheel, see chapter 2.1.2. The hues of blue are found in the enlarged circle sector in Figure 7.6 below, though, somewhat lighter and less saturated. All applied colours are placed within the “cold” half of the colour circle. As earlier argued, cold colours have a calming effect, generally making people feel more balanced, calm and less stressed. The lighting is also blue and cold, blocking the hormone melatonin and thereby making the driver and passengers more alert. The upholstery has been given a light grey hue since the interior mainly will be used in warmer climates where light interiors generally are preferred.

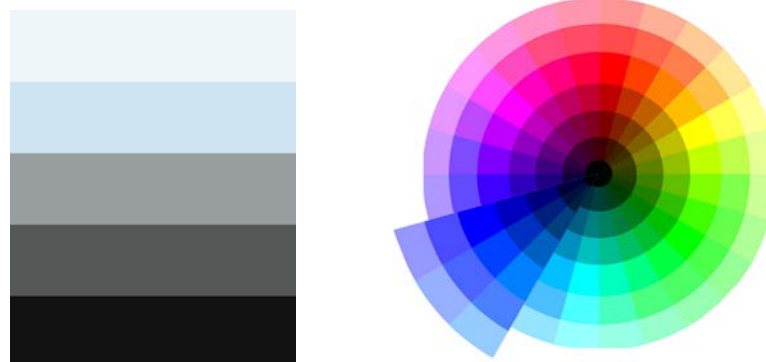


Figure 7.5, Arctistic's colour scheme (Arborelius & Eliasson, 2016)

Figure 7.6, colour wheel with enlarged blue circle sector (Wikipedia, 2012)

Visualizations

The final concept has been visualized in Photoshop and Alias Autostudio to create as photo realistic finishes as possible. The visualizations are all based on photos provided by Volvo and have been rendered to show the new materials, colours and details, using the earlier presented Photoshop tutorial “How to create a realistic car wrap”, see chapter 6.3. The gear lever has been built in Alias Autostudio and rendered in Showcase, a computer-aided industrial design tool for sketching and visualization. The following pictures have been rendered:

- Inside of the front door, shown in Figure 7.7. This image has been visualized in order to show the different materials and colours combined.
- Centre stack, shown in Figure 7.8. This image shows the how the distinct details on the center stack look together.
- Beverage cooler, shown in Figure 7.9. This concept has been inspired by the Icehotel in Jukkasjärvi, Sweden and has been visualized since it is one of the most distinct features in the XC90.
- Center stack with regulators, shown in Figure 7.10. The regulators in Arcticic contain large glass-snowflakes and have been altered from the concept of frozen water, shown in chapter 6.3, since they are found to represent winter and the arctic's in a better way.
- Center stack with gear lever, shown in Figure 7.11. The gear lever has been designed to resemble an ice crystal with asymmetrical shaped glass.

These distinct interior details, typical for the Volvo XC90 2015 and Excellence versions, communicate the idea of the whole interior by showing, apart from the individual details, parts of the material placement patterns and the colour schemes. The following 3 pages show all the visualizations listed above.



Figure 7.7, inside of front door (Volvo Cars, 2016; Wikipedia, 2016).



Figure 7.8, Center stack (Volvo Cars, 2016; Flickr, 2014; Wikipedia, 2016).



Figure 7.9, beverage cooler (Volvo Cars, 2016; Wikipedia, 2016).



Figure 7.10, center stack with regulators, showing the glass snowflake (Volvo Cars, 2016; Flickr, 2014; Wikipedia, 2016).



Figure 7.11, center stack with gear lever (Volvo Cars, 2016; Flickr, 2014; Wikipedia, 2016).

7.3 Relax Mode

The escape from the busy city life is possible through stopping the car at the side of the road and starting the relax mode. When activated, the car will close out the outside world by toning the windows opaque or frosty using Smart glass technology which is described in chapter 2.3. The side windows will be illuminated by a vague, blue light. Projected onto the panorama window, moving images of subtle green, purple and white light, are symbolizing northern lights. This projection is visualized in Figure 7.12 below.



Figure 7.12, relax mode activated (Volvo Cars, 2016; Flickr, 2008; Wikipedia, 2016; Flickr, 2014).

Sounds

When the relax mode is activated, the sound of wind over treeless mountain tops is played quietly in the background. It is a swishing and murmuring sound, somewhat like white noise, creating a relaxed feeling.

Scent

Cold climates make nature processes slow down which makes it hard to experience any natural scents during winter. Though, an activity that traditionally have been carried out during winter in Scandinavia is the logging of forest (SkogsSverige, 2006). Even today, many forest owners honour this tradition. In northern Scandinavia, coniferous trees are the most common types of trees and the survey conducted in this project showed that many link Scandinavia to the smell of pine. Therefore a hint of pine chip scent will be released in the car during the relax mode.

Personalized

When being in direct contact with the steering wheel, the Smart textiles embedded with heart rate sensors, will read the driver's pulse and adjust the sound system, lighting and climate accordingly. This enables a high level of customization, adding to the innovative feel. As explained in chapter 5.4, the car can both relax and alert the driver depending on the situation. If the driver's pulse becomes too low, the car will indicate that the relax mode should be activated and give examples of exits the driver can take to find a spot where the car can be parked for a moment.

8 SUSTAINABILITY ANALYSIS

Generally, demands concerning sustainability issues are becoming increasingly important within all product development. Customer demands are also becoming more substantial why sustainability nowadays constitutes an important mean of competition. Within the automotive industry, the European Union have demanded that all new vehicles shall be 95 percent recyclable, 85 percent of these counted as material recycling or material reuse (BilSweden, 2007).

Even though sustainability is an important subject, analyse of environmental, social and economic impacts of the final concept was not a part of the original assignment and will thereby only be discussed briefly. Moreover, since the assignment demanded results on a conceptual level, no manufacturing techniques have been investigated, which makes this analysis further limited.

According to Volvo Cars, they “design cars with people and environment at the heart” (Volvo Cars, 2016, 2). Their sustainability agenda is described through four dimensions: people, societal, economic and environmental (Volvo Car Group, 2014). For this specific project, the environmental dimension is found to be the most important one. It contains goals within the following areas:

- Energy efficiency
- Zero environmental accidents
- Harmful emissions from production & cars
- Water & waste management
- Materials & recycling

The most important areas out of these five are Energy efficiency and Materials & recycling. While working to increase the environmental performance and fuel efficiency of vehicles, weight reduction is a crucial aspect. Though, the *Arctistic* concept is expected to perform worse than existing interiors concerning this matter because of the heavy materials, such as stone and glass that are used. Increased weight generally entails increased emissions, which obviously is a negative aspect of the *Arctistic* concept.

Concerning Materials & recycling, an important matter for Volvo Cars is to avoid using materials that are Red-listed. Glass, aluminium and leather already exist in Volvo interiors, but Schist had to be investigated. According to the IUCN Red List of Threatened Species, Schist has not been assessed as endangered (IUCN, 2015). The used materials were studied using the program CES Edupack to investigate whether they are recyclable or not. All materials but Schist are listed in the program archive. The investigation showed that both Soda-lime glass and aluminium are recyclable.

Unfortunately, leather is not. Neither is Schist, since it is a non-renewable natural stone. Though, both these materials can be reused (Luleå Kommun, 2008). One positive aspect of the used materials is that they are durable, maintenance-free and have long life-spans. To meet societal sustainability demands, it is important to use Schist from Scandinavia and not from for example China where the conditions for the workers quarrying the stone are said to be very poor (Bülow, 2016).

9 DISCUSSION

This chapter discuss the overall project process, the final result and potential development possibilities.

9.1 Project process

The process in this project followed the initially planned outline, presented in chapter 1.5. The Gantt-chart, which was compiled according to this outline was also followed, apart from some slight changes. Since the project team before the start-up had very little or no experience within car design and the automotive industry, the understanding of the prerequisites within the industry and the overall pre-study required more time than expected. Since the knowledge base constituted the backbone for this project and the base for the whole development process, the pre-study had to be thorough and could not be compromised. Hence, the original time scale was somewhat altered, allowing more time for research and less for the continuing process. One effect of this alteration was that a planned iteration, following the first presentation, had to be eliminated. Thus, the lack of time made the process relatively linear, perhaps narrowing down the number of generated ideas. But since the project team found the original task very wide, this narrowing of ideas was in fact a welcomed effect. Instead of widening the realm of ideas, the process became more focused and existing ideas could be further developed.

9.1.1 Usage of methods

Altogether, the methods used during the project all gave separate and significant results. All methods have been suitable for this kind of design-focused project, and have carried the process forward. The modifications that have been made have adjusted the methods to the project and thereby generated more relevant results.

Concerning surveys in general, different respondent groups give different results. In this project, a respondent group more alike the customers, consisting only of people living outside of Scandinavia, could be argued to have mirrored the customers views on Scandinavia better. Thereby the final results could have been better adjusted to the core target customers. Though, the answers from people living outside of Scandinavia were similar to the answers from those who were in fact Scandinavians. Therefore, the results from the survey are still found valid enough to constitute a base for the concept development in this project.

During the focus group, the argumentation and reasoning was quite general and some subjects were only briefly discussed. Perhaps, this was an effect of the project team wanting to discuss too many topics. If the focus of the discussions had been more specific, the argumentation probably would have become deeper. On the other hand, it was desirable to verify all the answers from the survey.

Concerning the evaluation and elimination phase, the comments from Volvo Cars and Alten weighed heavily. Their reactions and opinions tinged the project team's views on the different concepts and were perhaps taken into too much consideration. Maybe, the results would have been different if concepts would have been evaluated more objectively.

9.1.2 Research

Since the assigned brief from Volvo Cars was found to be very wide and did not contain many specific requirements, the project team had to interpret it in order to identify what areas that had to be researched and what activities had to be conducted during the process, hence the implementation of the method *Determination of status*. Thus, the assignment has partly been determined by the project team. To ensure that the process still went in the right direction, regular meetings with Volvo Cars were held. The lack of requirements also meant that the design had to be based on the project team's own interpretation of Scandinavian design, nature and values. If there had been specific requirements concerning the design, the development process would have been adjusted accordingly.

The customer analysis has been based solely on material from Volvo. Even though the information was found valid and enough base for the concept development in this project, it was limited and did not give a comprehensive picture of the customer. The delimitation to not seek any further information beyond the material from Volvo, and the fact that the target group is inaccessible, inhibit a customer-oriented concept development where the customers are more involved in the process. So, if this project was to continue, a better understanding of the customer would be desirable in order to make sure the final result meet their demands.

Since there was no real contact with the customers, the process has at times been based on prejudice about Scandinavia that the team and the attendants during the first presentation believed exist in the minds of the customers. For example, the Arctic interior theme was favoured because it was believed to meet the customer's views on Scandinavia best. This may not be true and should be further investigated if the project was to continue.

9.2 Final concept

The development of the concept has circled around soft values such as looks and feelings and around stimulating hearing, smell, feel and sight. These values are generally perceived very individually and people usually have different experiences of fragrances, sounds and colours. Thereby, the designed interior might give a different feeling than the one intended. The final concept has partly been developed based on the project team's own thoughts about simplicity, luxury, Scandinavia and elements that can create cold, clean environments. These thoughts might differ from other people's thoughts. However, the evaluation of concepts has partly been based on the results from the survey and the focus group, ensuring that the final concept meets the views of not only the project team, but others too. Furthermore, while handing out the assignment, Volvo sought new thoughts and perspectives on Scandinavian culture, car design and future driving experiences, which argues that the project team's own thoughts are significant and should be communicated.

Concerning the materials used for the final concept, some are expensive and non-renewable. From a sustainability point of view, the new design will probably perform worse than the existing design concerning fuel efficiency. This is a natural effect of adding weight to the interior. Furthermore, the assignment has not had a sustainability focus, making this inferior to aspects such as looks and experiences of materials. Since the assignment was limited to not involve any further evaluation of the chosen materials, the project team cannot be sure that these materials are implementable in a car interior. Concerning additional expenses, these are not found to be problematic since the concept is designed for the premium segment. No consideration has been taken to eventual laws or demands concerning automotive materials. If the project was to continue, this matter would demand further attention.

In the beginning of the project, the outcome was unclear. The project team was not sure if the result would constitute of an overall interior, some specific details or completely new products with new functionality. Therefore, there were no pre-defined ways of visualizing, so these had to be determined during the process. In the end, the final concept was visualized using pictures provided by Volvo showing the existing interior in the XC90 Excellence. These were modified to show the new design. Using pictures of the existing interior might be argued to have inhibited or limited the visualization. However, the existing design was in fact kept to a large extent why this way of visualizing was found motivated and effective.

One demand from Volvo was that the concepts created during the process should be applicable in more models than the XC90 which the project team believe has been achieved. The main focus of development has been to alter materials which are not limited to the XC90 but can be applied in all models. The new design on the gear lever could be applied to all cars with a flip switch gear lever, even if it may be more

suitable in more exclusive models. The technique that has been implemented by the concept Personalized is also applicable in other models. The only concept which currently is limited to the XC90 Excellence version is the beverage cooler which only can be applied to a four-seated model.

9.2.1 Fulfilment of purpose and project goals

This paragraph discusses the fulfilment of listed goals and research questions. The questions that the project team wanted to answer during the process were the following:

- What parts of the aspects nature, design, values, scents and sounds are perceived as characteristic for Scandinavia and how can these be implemented in a car interior to deepen the connection between Volvo and Scandinavia?
- How can a car interior, designed to give a sense of Scandinavia, be adjusted to the premium segment?
- How can a unique driving experience that offer an escape from the mega city by stimulating hearing, scent, feel and sight be designed?

The *Arctistic* concept, inspired by the arctic climate and nature elements is found to give an authentic sense of Scandinavia that meets the customer's views and expectations. By doing this, it also deepens the connection between Volvo and Scandinavia. The cold interior with blue lighting is believed to appeal to the customers who mainly live in warmer climates. Hopefully they will find the coldness exotic and appreciate the clean feeling it brings. However, there is a conflict between the Scandinavian design theory and the luxury segment. The project team has struggled finding the golden mean between the barren Scandinavian nature, the minimalistic Scandinavian design and extravagant luxury. Though it is believed to have been fulfilled through the materials, colour schemes, distinct details and new techniques that have been implemented. All these design aspects are also believed to have brought a high level of innovation which further places the interior within the premium segment.

9.3 Future research and development possibilities

Besides the development possibilities mentioned in the paragraphs above concerning for example further investigation of the customer and the chosen materials, the following aspects have been identified as possible development focuses.

The final concept is on a conceptual level and would demand research regarding manufacturing techniques and the intended materials if it was to be further developed. Also, the functions using Smart textiles and Smart glass would have to be further researched to see whether they are implementable in a car interior. The project team is

currently unsure whether a fabric detecting heart rate could in fact be connected to the various systems in the car.

It would be desirable to implement and investigate more aspects of the Scandinavian culture and to verify them the target customers.

A natural continuation of this project would be to estimate the costs that the would entail in order to see if it would be profitable in the long run. Since one of the main aims with this concept is to deepen the connection between Volvo Cars and Scandinavia, the new design might give advantages even if it may not generate profit margins. An interior like this one is perhaps more likely to be sold for marketing purposes rather than to generate large profits.

The concept in itself could be developed to include more relax modes, giving the owner additional choices and possibilities for customization. One idea has been to adjust the mode and perhaps the entire interior according to the seasons so that the owner could experience more elements from the Scandinavian nature.

If starting the project over again, with the knowledge that the project team has today, some things would have been done differently and some would have been kept the same. For example, the choice to only study Volvo and other car manufacturers briefly, which meant that tinging of the process could be avoided, would be recommended. The survey and the focus group on the other hand, would have been directed to a respondent group more alike the target customers. Had the project been more substantial and conducted over a longer time period, it would be recommended to investigate possibilities of changing the design of more details and not to follow the existing design to the same extent.

The concept developed during this project is believed to be implementable in future autonomous cars where the experience whilst driving probably will be even more important than today. With autonomous cars, the driver and passengers can get different experiences, stimulating several senses, also whilst driving. Elements from *Arctistic*, such as the relax mode, could with autonomous cars be activated whilst driving.

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Figure 2.1,

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Figure 2.2

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Figure 2.3

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Figure 2.6

- Touring Club Suisse/Schweiz/Svizzero TCS (2014) *Headup- display* [Electronic image] https://www.flickr.com/photos/touring_club/22668458208 [Accessed 2016-05-31]

Figure 4.3, Moodboard 1.

- *Ramsvikslandet - Grosshamn 04* (2013) [Electronic image] <https://commons.wikimedia.org> [Accessed 2016-05-31]
- *Veidekke_SE* (2010) *Vardagsrum* [Electronic image] <https://www.flickr.com/> [Accessed 2016-05-31]
- *Iliazd* (2010) *Henning koppel jensen milk jug* [Electronic image] <https://www.flickr.com/> [Accessed 2016-05-31]
- *Fell* (2016) [Electronic image] <https://en.wikipedia.org/wiki/Fell> [Accessed 2016-05-31]
- *Winterdance Canada Dog Sledding Huskies* (2010) [Electronic image] <https://www.flickr.com/photos/bearmann/4834248491> [Accessed 2016-05-31]
- *Belt-Axe-26D2101_1* (2011) [Electronic image] <https://www.flickr.com/photos/garrettwade/5726510787> [Accessed 2016-05-31]
- Eliasson & Arborelius (2016)
- *Birch Forest K(2009)* [Electronic image] <https://www.flickr.com/photos/miguelvirkkunen/4233818813> [Accessed 2016-05-31]
- *Fraxinus excelsior wood ray section beentree* (2014) [Electronic image] <https://commons.wikimedia.org> [Accessed 2016-05-31]
- *Norske samer, Karin Beate Nosterud* (2013) [Electronic image] <https://commons.wikimedia.org> [Accessed 2016-05-31]

Figure 4.5

- *Insertion materials* (2016) [Electronic image] <http://byggdinvolvero.volvocars.se/> [Accessed 2016-05-31]

Figure 4.8

- *Leather upholstery* (2016) [Electronic image] <http://byggdinvolvero.volvocars.se/> [Accessed 2016-05-31]

Figure 4.9, Moodboard 2.

- Eliasson & Arborelius (2016)

Figure 5.4, Moodboard 3

- *ID3E* (2013) *Pebbles* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-05-31]

- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer> [Accessed 2016-05-31]
- *Empty Wine Glass* (2010) [Electronic image] <https://www.flickr.com/photos/davedugdale/5080257300/> [Accessed 2016-05-31]
- *Sun bleached dock , free wooden texture* (2014) [Electronic image] <https://www.flickr.com/photos/sarabbit/15817129450> [Accessed 2016-05-31]
- *Brygga Falsterbo_IMG_0363* (2011) [Electronic image] <https://www.flickr.com/photos/vellingekommun/7995756724> [Accessed 2016-05-31]
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Figure 5.5, Moodboard 4

- *Vellinge kommun* (2004) *Blue mussel* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-05-31]
- *Borstad metall Texture Bakgrund* (2016) [Electronic image] <http://www.publicdomainpictures.net> [Accessed 2016-05-31]
- *Mother of pearl* (2012) [Electronic image] https://commons.wikimedia.org/wiki/Category:Mother_of_pearl [Accessed 2016-05-31]
- Eliasson & Arborelius (2016)

Figure 5.6, Moodboard 5

- *Webtreats White Leather Pattern* (2009) [Electronic image] <https://www.flickr.com/photos/webtreatsetc/4520808057> [Accessed 2016-05-31]
- *Empty Wine Glass* (2010) [Electronic image] <https://www.flickr.com/photos/davedugdale/5080257300/> [Accessed 2016-05-31]
- *Fraxinus excelsior* (2016) [Electronic image] https://en.wikipedia.org/wiki/Fraxinus_excelsior [Accessed 2016-05-31]
- Eliasson & Arborelius (2016)
- *S. Rae* (2012) *Resin drop - Grand Fir* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-05-31]

Figure 5.7, Moodboard 6.

- *Ice Water (5685106294)* (2015) [Electronic image] [https://commons.wikimedia.org/wiki/File:Ice Water \(5685106294\).jpg](https://commons.wikimedia.org/wiki/File:Ice_Water_(5685106294).jpg) [Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer> [Accessed 2016-05-31]
- *Borstad metall Texture Bakgrund* (2016) [Electronic image] <http://www.publicdomainpictures.net> [Accessed 2016-05-31]

- *Icehotel (Jukkasjärvi)* (2016) [Electronic image] [https://en.wikipedia.org/wiki/Icehotel_\(Jukkasj%C3%A4rvi\)](https://en.wikipedia.org/wiki/Icehotel_(Jukkasj%C3%A4rvi)) [Accessed 2016-05-31]
- *Freezing rain* (2016) [Electronic image] https://en.wikipedia.org/wiki/Freezing_rain [Accessed 2016-05-31]
- *Wind-blown Snow Pattern (6967217151)* (2016) [Electronic image] <https://commons.wikimedia.org> [Accessed 2016-05-31]

Figure 5.8, Moodboard 7

- Eliasson & Arborelius (2016)
- *Birch, leaves, green (6967217151)* (2014) [Electronic image] <http://www.public-domain-image.com/free-images/> [Accessed 2016-05-31]
- *Chaffinch (Fringilla coelebs)* (2016) [Electronic image] [https://commons.wikimedia.org/wiki/File:Chaffinch_\(Fringilla_coelebs\).jpg](https://commons.wikimedia.org/wiki/File:Chaffinch_(Fringilla_coelebs).jpg) [Accessed 2016-05-31]

Figure 6.2, regulator – resin visualized.

- Volvo Cars (2016)
- *Amber* (2016) [Electronic image] <https://en.wikipedia.org/wiki/Amber> [Accessed 2016-05-31]

Figure 6.3, visualization of gear lever – blue mussel.

- Volvo Cars (2016)
- Eliasson & Arborelius (2016)
- *Erik Mörner (2012) Mussla* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-05-31]

Figure 6.4, visualization of regulator – ice

- Volvo Cars (2016)
- *Ice Water (5685106294)* (2015) [Electronic image] [https://commons.wikimedia.org/wiki/File:Ice_Water_\(5685106294\).jpg](https://commons.wikimedia.org/wiki/File:Ice_Water_(5685106294).jpg) [Accessed 2016-05-31]

Figure 7.1, Arctic visualized

- Volvo Cars (2016)
- *Frankieleon (2014) Ice trees* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer> [Accessed 2016-05-31]

Figure 7.2, ice crystal

Mark Welker (2008) *Quartz* [Electronic image] <https://www.flickr.com/photos/> [Accessed 2016-06-01]

Figure 7.4

- *Empty Wine Glass* (2010) [Electronic image] <https://www.flickr.com/photos/davedugdale/5080257300/> [Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer> [Accessed 2016-05-31]

- *Borstad metall Texture Bakgrund* (2016) [Electronic image]
<http://www.publicdomainpictures.net>
[Accessed 2016-05-31]
- *Icehotel (Jukkasjärvi)* (2016) [Electronic image]
[https://en.wikipedia.org/wiki/Icehotel_\(Jukkasj%C3%A4rvi\)](https://en.wikipedia.org/wiki/Icehotel_(Jukkasj%C3%A4rvi))
[Accessed 2016-05-31]
- *Webtreats White Leather Pattern* (2009) [Electronic image]
<https://www.flickr.com/photos/webtreatsetc/4520808057>
[Accessed 2016-05-31]

Figure 7.6, colour wheel with enlarged blue circle sector

- *ColourShading* (2012) [Electronic image]
<https://en.wikipedia.org/wiki/File:ColourShading.png>
[Accessed 2016-05-31]

Figure 7.7, inside of front door.

- Volvo Cars (2016)
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer>
[Accessed 2016-05-31]

Figure 7.8, center stack.

- Volvo Cars (2016)
- *Frankieleon* (2014) *Ice trees* [Electronic image]
<https://www.flickr.com/photos/>
[Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer>
[Accessed 2016-05-31]

Figure 7.9, beverage cooler.

- Volvo Cars (2016)
- *Icehotel (Jukkasjärvi)* (2016) [Electronic image]
[https://en.wikipedia.org/wiki/Icehotel_\(Jukkasj%C3%A4rvi\)](https://en.wikipedia.org/wiki/Icehotel_(Jukkasj%C3%A4rvi))
[Accessed 2016-05-31]

Figure 7.10, center stack with regulators.

- Volvo Cars (2016)
- *Frankieleon* (2014) *Ice trees* [Electronic image]
<https://www.flickr.com/photos/>
[Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer>
[Accessed 2016-05-31]

Figure 7.11, center stack with gear lever.

- Volvo Cars (2016)
- *Frankieleon* (2014) *Ice trees* [Electronic image]
<https://www.flickr.com/photos/>
[Accessed 2016-05-31]
- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer>
[Accessed 2016-05-31]

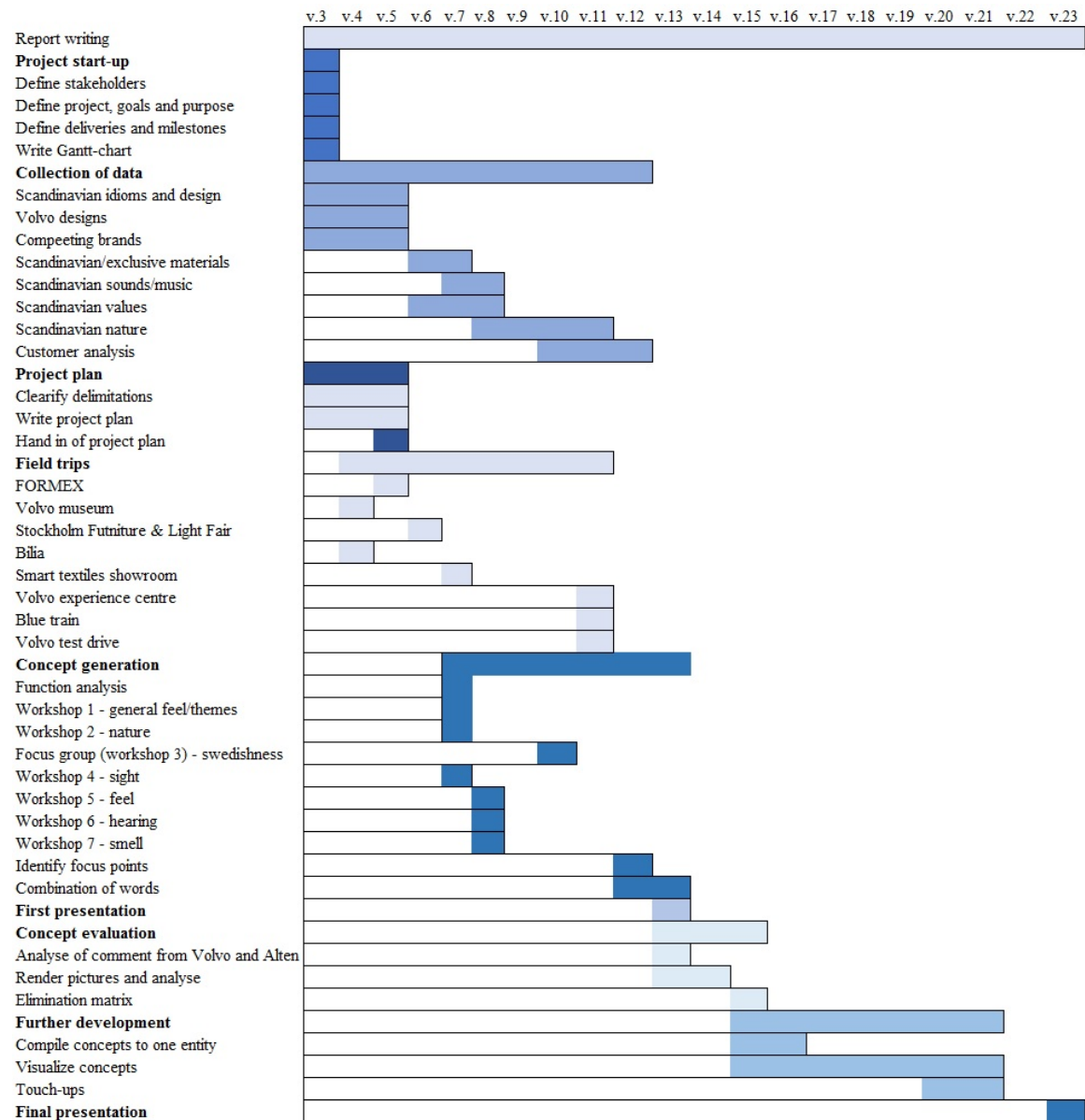
Figure 7.12, relax mode activated

- Volvo Cars (2016)
- *Frankieleon* (2014) *Ice trees* [Electronic image]
<https://www.flickr.com/photos/>
[Accessed 2016-05-31]

- *Schiefer* (2016) [Electronic image] <https://de.wikipedia.org/wiki/Schiefer>
[Accessed 2016-05-31]
- Jorma Luhta (2008) Aurora Borealis in Finnish Lapland [Electronic image]
<https://www.flickr.com/photos/>
[Accessed 2016-06-02]

Appendix

Appendix 1 – Gantt-chart



Appendix 2 - Survey and most common answers

Introduction, Hi!

This is a survey about Scandinavia that is a part of a bachelor thesis within the program "Design and Product Development" at Chalmers University of Technology, Gothenburg, Sweden. The thesis involves investigating Scandinavia regarding design, nature, values etc. It's ok to answer with short sentences or single words, but if you would like to write longer answers, it's very welcomed.

Questions,

1. How old are you?
2. In which country are you currently living?
3. Have you ever lived in or visited Scandinavia?
4. What is the first thing that pops up in your head when you think of Scandinavia?
5. What do you associate with Scandinavian design (materials, colours, idioms etc)?
6. What do you think is typical for Scandinavian nature (climate, habitat types; forest, archipelago, mountains etc)?
7. Are there any scents/smells that you find typical for Scandinavia?
8. Are there any sounds/types of music that you find typical for Scandinavia?
9. How do you perceive Scandinavians (lifestyle, values etc)?
10. Do you have any other views on Scandinavia that you would like to share?

Most common answers,

- | | |
|---|---|
| • Midsummer (4st) | • Seasons (8st) |
| • Introvert/reserved (28st) | • Clean (8st) |
| • Equal (8st) | • Archipelago (17st) |
| • Healthy (11st) | • Coniferous forest (12) |
| • Blonde and beautiful (7st) | • Forest (60st) |
| • Relaxed (7st) | • Mountains/hills/treeless mountain tops (20st) |
| • Stylish (7st) | • The ocean (10st) |
| • Responsible (10st) | • Lakes (13st) |
| • Sporty (9st) | • Open landscapes/meadows (11st) |
| • quality (7st) | • Bird song (10st) |
| • Simple (17st) | • The sound of silence (7st) |
| • Minimalistic/strict/slim (19st) | • Pop music (8st) |
| • Functional/practical/"form follows function" (13st) | • Metal/punk/rock (11st) |
| • Scent of damp forest (35st) | • ABBA (14st) |
| • Scent of cinnamon buns (6st) | • House Musik (8st) |
| • Clean air (22st) | • IKEA (9st) |
| • Scent of rain on a hot summer day (6st) | • Vikings (5st) |
| • Scent of salty air/the ocean/warm rocks (13st) | • Wood (37st) |
| • Cold (33st) | • Glass (10st) |
| • Snow (10st) | • Birch (15st) |
| | • Light colours (38st) |
| | • Neutral colours (9st) |

Appendix 3 - Interior material placement patterns

Plastic details

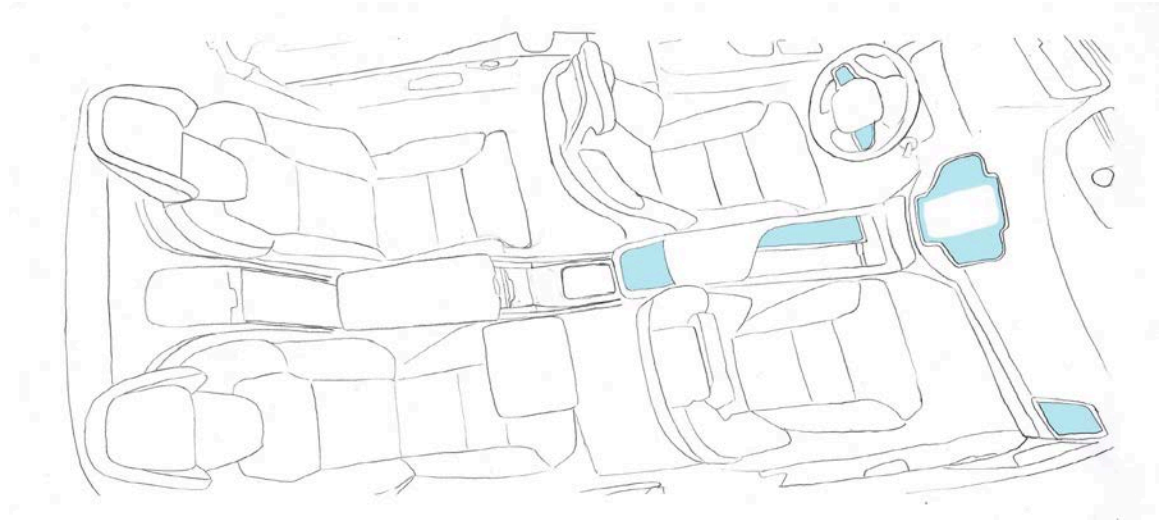


Figure 1, appendix 3

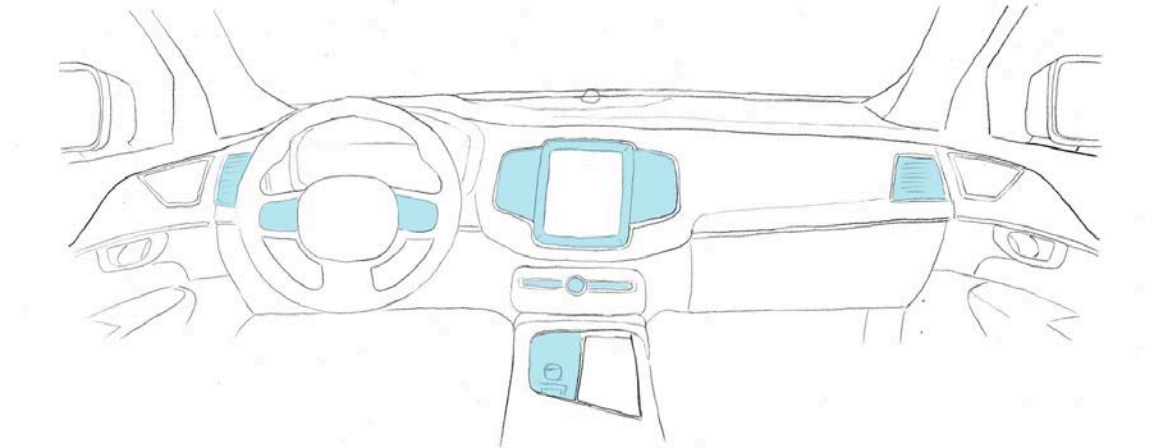


Figure 2, appendix 3

Splines and speakers

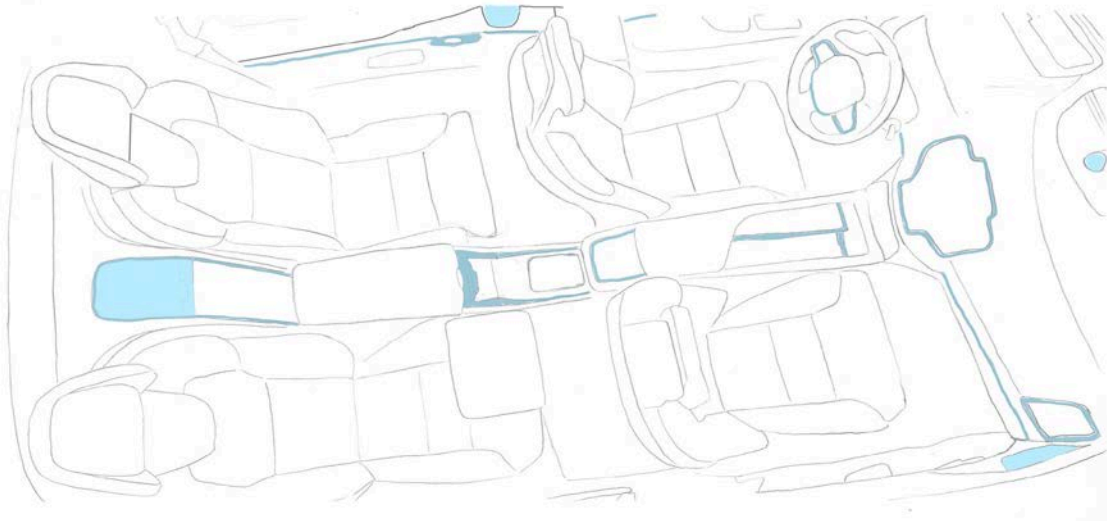


Figure 3, appendix 3

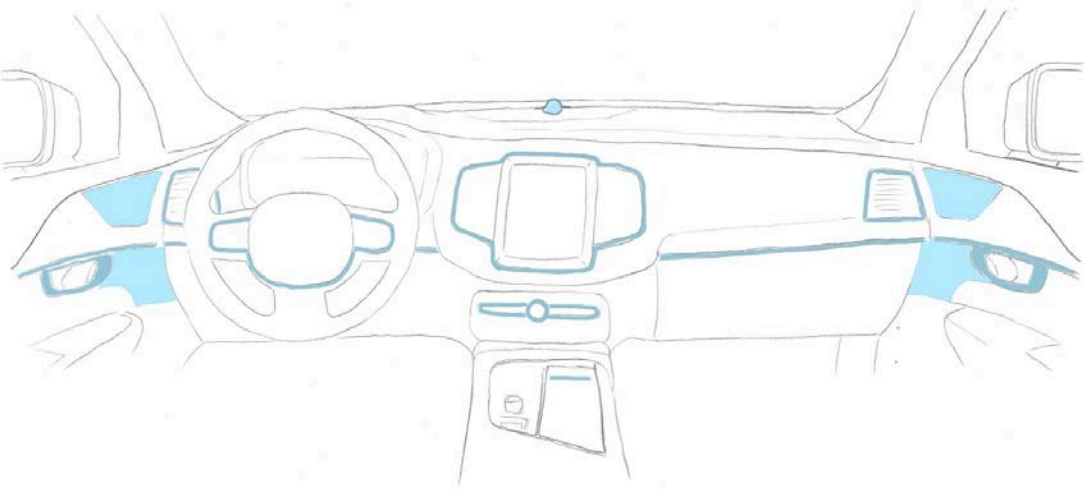


Figure 4, appendix 3

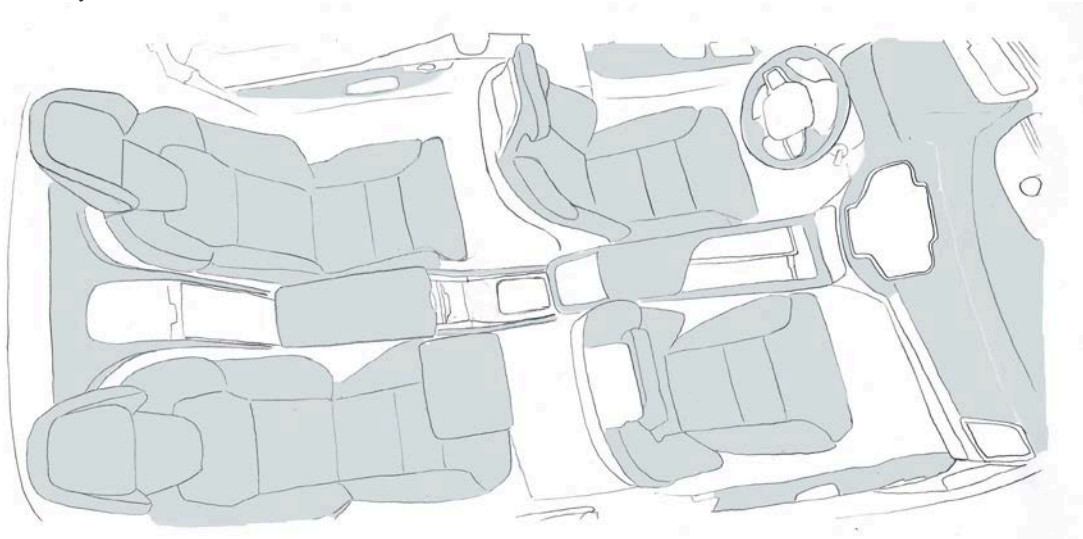
Upholstery

Figure 5, appendix 3

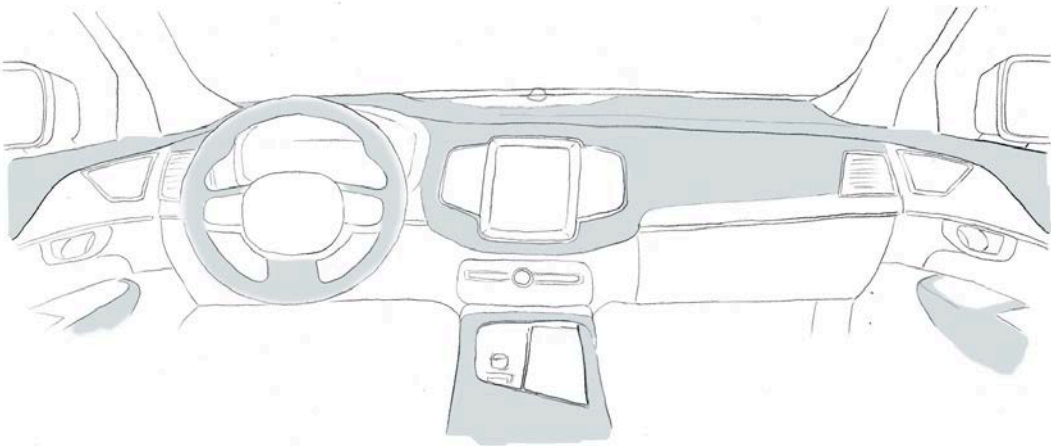


Figure 6, appendix 3