

# DUCK CHAIR

By Nordic Easy Chair 2013

process  
report







M.Sc. 4 Industrial Design  
Architecture, Design and Planning  
Aalborg University  
June 2013

Project title: Duck chair - by Nordic Easy Chair

Project period: 1<sup>st</sup> of February 2013 -  
22<sup>nd</sup> of May 2013

Collaboration partner: Nordic Easy Chair A/S

Supervisor: Finn Schou

Issues : 7

Number of pages: 180

Appendix: 18 (A-R)

CD included. In addition to the Process report: Product report,  
Method report and Technical drawings.

## SYNOPSIS

This Master Thesis project is titled “Duck chair – by Nordic Easy Chair” and is based on a collaboration with the furniture company Nordic Easy Chair A/S. The company was interested in a new point of view on their existing products and strategy. The project started with an analysis of the market to find a less competitive market for Nordic Easy Chair to approach. The outcome of the analysis and research is a new recline chair for Nordic Easy Chair that approaches a younger segment through a new sales channel. The concept is a recliner that transforms between the active sitting position and relaxed reclined position. The product “DUCK chair” is the outcome of the concept and strategy and is visualized as a product in a new sub brand for Nordic Easy Chair’s current product portfolio.

The focus of this Master Thesis has been to incorporate functionality, comfort and aesthetics in the final product as well as strategic development for an existing company.



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## PREFACE

The design team would like to give a special thanks to Ole Kjærsgaard Hansen and Torben Thodsen Petersen from Nordic Easy Chair A/S who have been a great help through the Master Thesis and given the needed information and feedback when needed. A thanks is also given to Simon Sønderby Nielsen from Gabriel A/S who has provided the design team with information and samples of their textiles. Furthermore the design team would like to thank Jette Andersen from A-Polstring for her advise on upholstery and the focus group members for being at the design teams disposal throughout the project period.

## READING GUIDE

This project consists of three reports and technical drawings.

The process report documents the design process from *Align* through *Researching & Analysing* and *Concept & Strategy* to *Drafting*. After each chapter the design team will reflect upon the design process of the chapter. This report will refer to Appendix for additional information.

A Method report is made to explain the methods used in the design process. This report will be referred to through the process report as additional information, but will not influence the coherence of the process report.

The last report is the Product report, which is addressed at Nordic Easy Chair by the design team, as a group of Master Thesis students.

The technical drawings are attached in a separate booklet and on the CD where all reports also can be found.

### End-user and customer

During the report the end-user of the product will be mentioned as end-user, consumer, customer or segment. This is done because the interviews and meetings with Nordic Easy Chair, Sales people and the design team have used different terms and therefore several words will appear in chapters.

# INTRODUCTION

The theme for this Master thesis has been furniture design to get an insight in the furniture business and the design development of furniture. The design team teamed up with the recliner company Nordic Easy Chair A/S, because they were interested in a new point of view of their company and products. In order to use and show the proficiencies developed through the time of study the design team chose a project with focus on product design and how this could approach the market as a strategy.

The design team saw great potential in a project that could move a traditional company away from the competitive market they were situated in. Furthermore the design team had little knowledge about the recliner market and upholstered furniture, which they could refine through the Master Thesis while using the tools and methods that were learned on previous semesters.

Nordic Easy Chair did not give the design team a specific assignment, instead they mentioned early in the collaboration different directions that the design team could take. In order to understand the recliner market better and get mutual set of references the design team was invited by Nordic Easy Chair to the Stockholm Furniture Fair 2013. This field trip made the foundation of the problem statement, which was how styling and comfort could be achieved in recline furniture and develop a strategy that could move Nordic Easy Chair into a less competitive market.

The project will take its point of origin in collaboration with Nordic Easy Chair A/S however the design team will keep the focus of the Master Thesis as a study project, which some of the choices during the design process will indicate. Nordic Easy Chair's current strategy will not define the project, instead the design team will see it as an opportunity to re-define recline furniture they have a focus on today and define a possible new strategy.

As a project scope the design team have chosen to focus primarily on the product development. In the start of the Master Thesis the design team had intentions of reaching a completely detailed product however during the process, Nordic Easy Chair and the design team showed interest in one of the more innovative concept, which meant that the initial goal had to be redefined.

The final product of this Master Thesis is intended to be a part of a collection that the strategy will define however the process will only focus on the recliner designed for Nordic Easy Chair. Nordic Easy Chair also showed an interest in approaching the global market however due to the time period the design team decided to focus on the Danish market.

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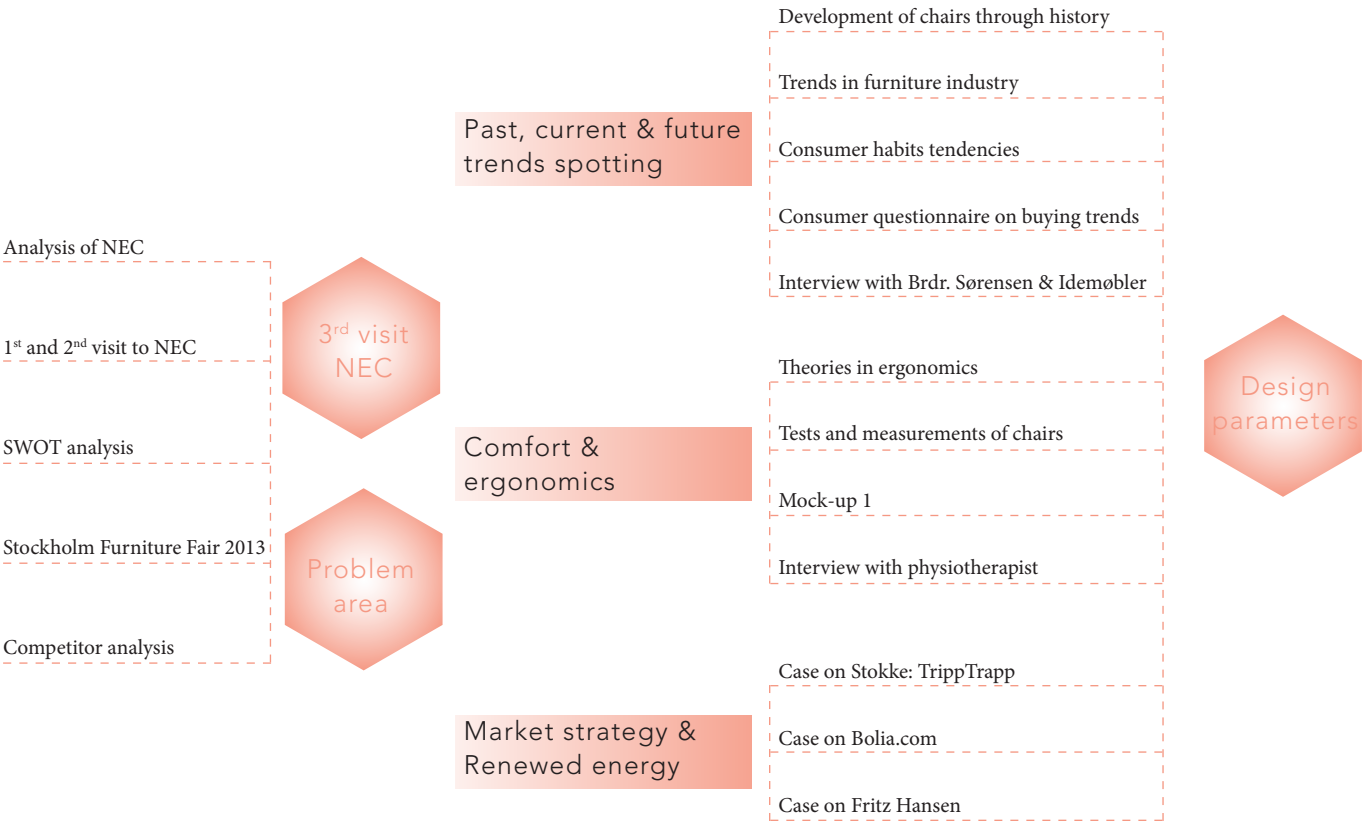
# PROCESS OVERVIEW

The diagram below shows the primary steps in the design process. The design process that the design team have followed is a merge between the product design process by Gerhard Heufler [Heufler, 2004, p. 78] and the design model "Stepping Stones" by Marianne Stokholm, that the design team were introduced to in their Bachelor project. [Method report p. 6] In *Align* the design team introduce the collaboration partner and define the overall problem. *Researching and Analysing* is collecting knowledge in different fields and will result in specific needs and wishes as well as a problem statement. *Concept & Strategy* is where the output of the previous phase is defined as concepts and market strategies. In *Drafting* the

further concept development of the product and detailing of materials, production methods, construction, interface, aesthetics etc. will be introduced. Last the design process, final product and strategy will be concluded upon in the *Evaluation*.

## ALIGN

## RESEARCHING & ANALYSING



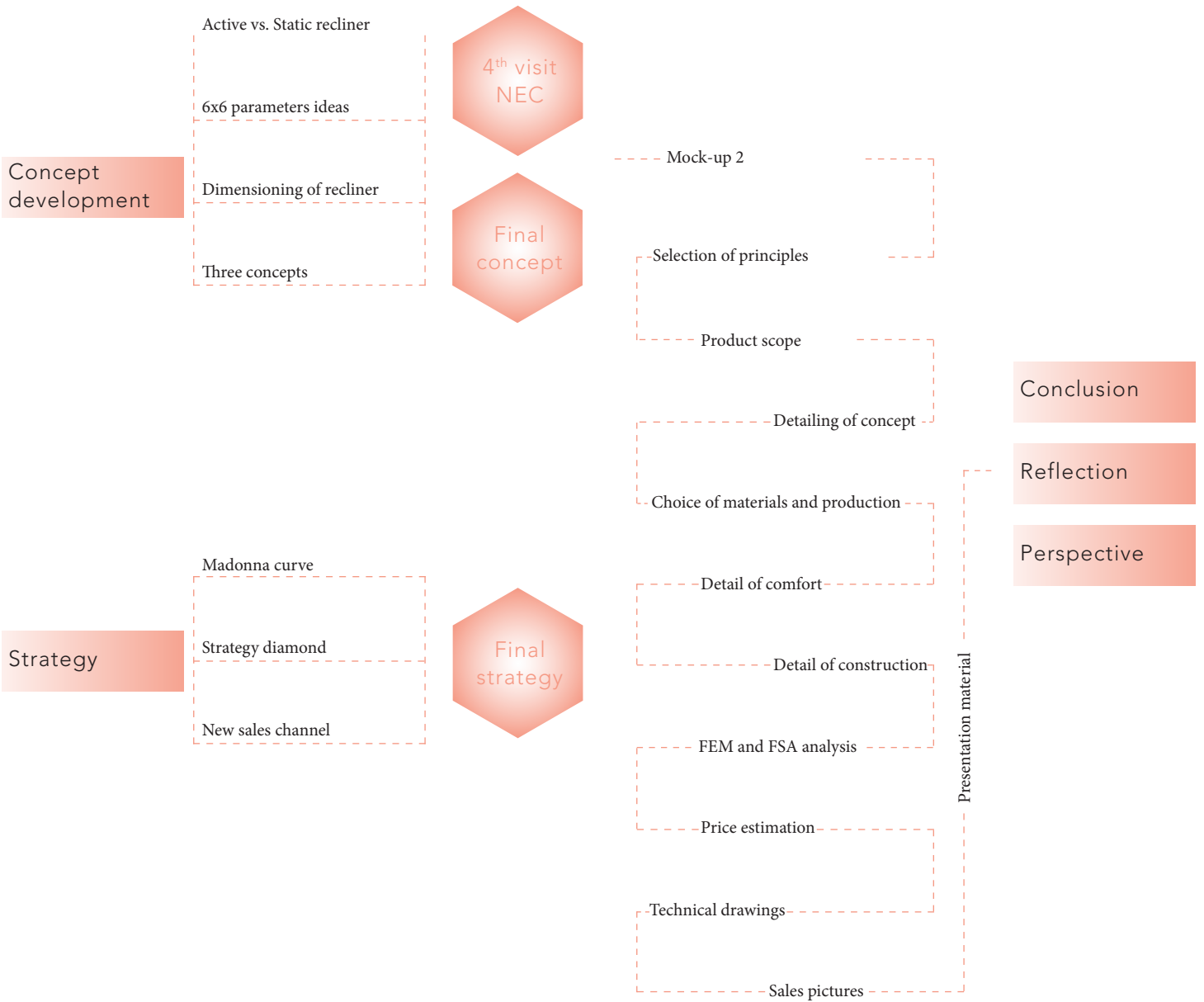
**Reading guide**

The rectangles illustrates main categories of work, the lines lists the work carried out and how they are connected. The hexagons shows where key decisions has been made.


CONCEPT & STRATEGY

DRAFTING

EVALUATION







## Introduction

The *Align* chapter will present the collaboration partner Nordic Easy Chair. Their current profile, products and customer segment are analysed. Based on this information and Nordic Easy Chair's current position, a SWOT analysis will be made. This SWOT analysis will concern future challenges and critical changes in their customer range and how they are positioned among their competitors. This information will result in a scope defining the critical areas the design team will approach.





*Align*



# NORDIC EASY CHAIR

## Introduction

Nordic Easy Chair Group A/S is established in 2003 as a result of a merger of Sömo A/S and Möbelteam AB under the Swedish Bonnier Group. In 2007 New Balance is established as a separate company to Nordic Easy Chair Group A/S. The three companies, Sömo A/S, Möbelteam AB and New Balance A/S merge in 2008 with the name Nordic Easy Chair A/S. (Ill. 13.b) The company is situated in Aars and has facilities such as administration and part of the upholstery team. [nordiceasychair.com 1]

Their products are dominantly recliners (P. 16 for definition) and seating units, for a segment that is 65 years or older. The furniture is currently sold in In2House group, which holds the national furniture warehouses: Danbo and Smag&Behag. Nordic Easy Chair's furniture can also be found in other European countries. (Ill. 13.a) Since 2008 the company has been reorganizing and is reducing the product portfolio that prior existed of furniture from Sömo, Möbelteam and the New Balance range. [Method report p. 16]

Nordic Easy Chair states that their furniture has a long durability and their products are timeless and comfortable upholstered furniture. They characterize the design as Scandinavian with a "solid workmanship and the right balance between price and quality"(Ill. 12). [nordiceasychair.com 2]

## NEC as collaboration partner

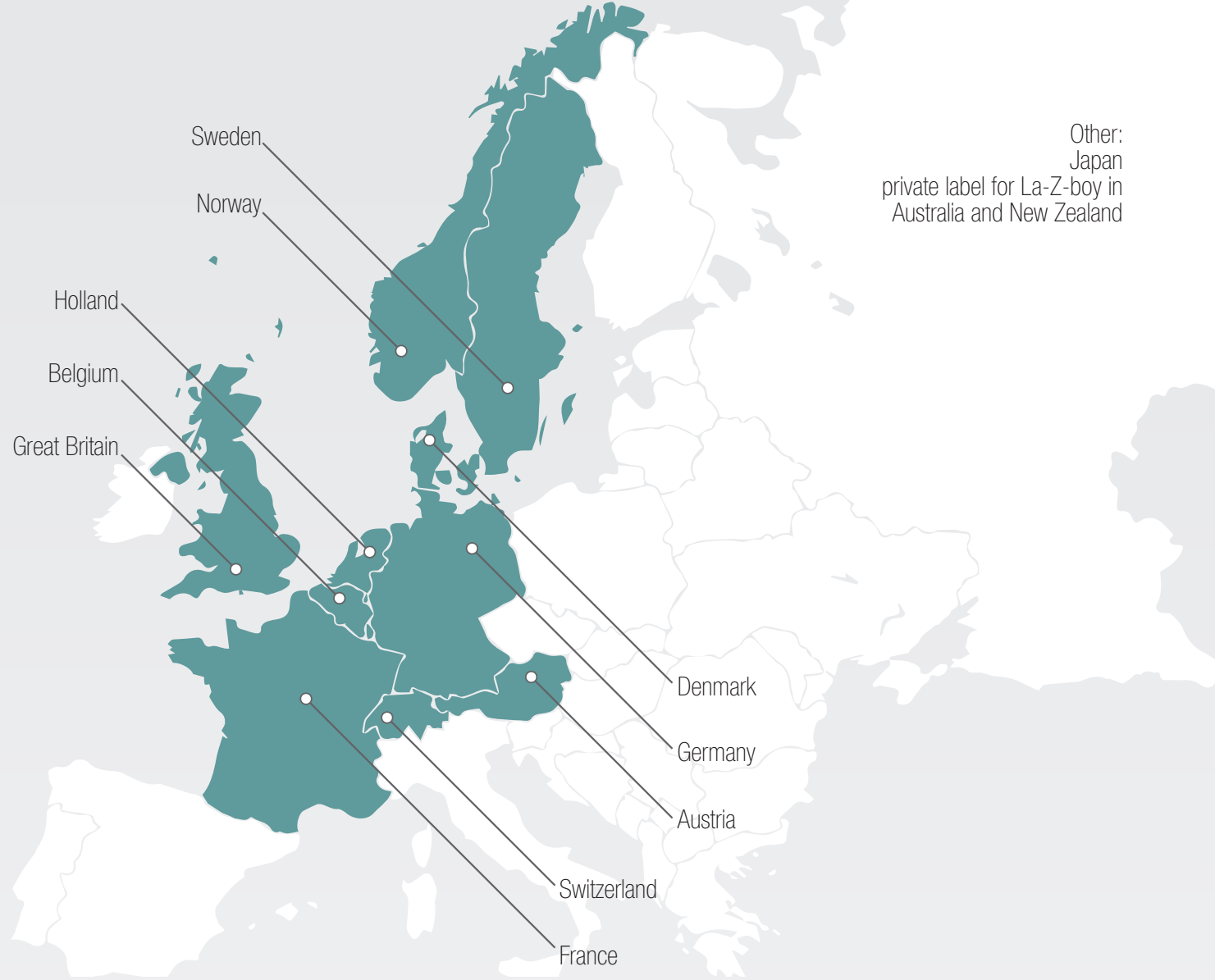
Nordic Easy Chair is a traditional furniture manufacturer that faces the challenge of differentiating themselves on a market with many competitors. At the initial meeting Nordic Easy Chair pointed towards the following directions that the project could take:

- A recliner for the health system
- A new series of recliners for their existing segment
- A recliner for online sales
- A recliner for a younger segment

They address this collaboration as a realistic proposal for a product that could potentially hit the market. Nordic Easy Chair expressed that the possible directions are suggestions to the collaboration, and that they are open to new directions that the project may take.

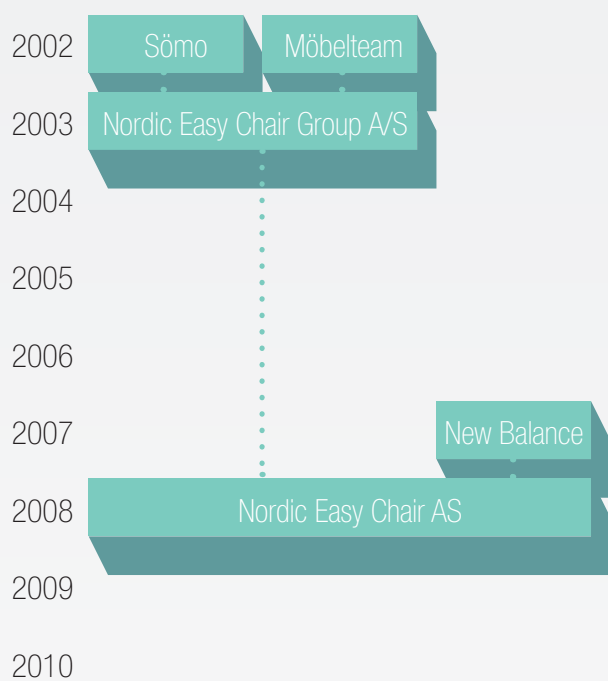
The company is chosen as a collaboration partner because it was found interesting to work with a traditional furniture manufacturer, finding a new direction based on research that will place them ahead of their competitors. The challenge is to maintain the core values of the company while finding new business opportunities.





### III. 13.a

The countries where Nordic Easy Chair's furniture are sold either as Nordic Easy Chair or private label.



### III. 13.b

The companies that the current Nordic Easy Chair A/S is a merger of.

## Product portfolio and development

Nordic Easy Chair has a large selection of recliners and few sofas but little variation in design rooted in fixed idioms and functionality. Their current strategy is focused on a large quantity of few models with a high level of quality. [Method report p. 16]

Their production line has been optimized so only few elements are changed in the creation of a new product series. Recliners from the Balance series have the same inner construction as chairs from the Nordic Harmony series. This also represents the level of product development that the

company practices, as changes in the design typically only differentiate in new types of stitchings and base for the chair. Within the Tradition series several of the chairs also uses the same frames but are made individual by different upholstery on the seat, armrest and Ottoman. Each line provides many options for customisation such as; Textile (type and colour), base (type, material and colour), seat width and height and additional comfort options such as lower back support. [Appendix 2 for information on Balance, Tradition and Nordic Harmony. CD]



### **Balance**

This series is comfortable soft upholstered, multi-adjustable chair with a wooden swivel base. The series consists of 13 recliners with separate Ottoman, two LUX versions that has integrated leg rest and six sofas. Each product provides a different seating height and width. The upholstery and stitching are what makes each chair identifiable. This, Nordic Harmony and Tradition are the most popular series.



### **Basic**

According to Nordic Easy Chair, this series is aimed at the younger customer. Basic consists of two chairs with Ottomans and one chair with integrated leg rest. The styling is a mix of leather and metal.



### **Classic**

This series consists of eight swivel chairs and Ottomans that has been part of Nordic Easy Chair's product catalogue for many years. Their bases are available in six types. The chairs have a soft upholstered look that gives the impression of a comfortable soft chair.

## Visit to Stockholm Furniture Fair 2013

Nordic Easy Chair invited the design team to the Stockholm Furniture Fair 2013 from the 5<sup>th</sup>-9<sup>th</sup> of February. [Method report p. 8] Nordic Easy Chair was exhibiting at the fair, and the design team was invited to join the company. The purpose of the trip is to carry out trend research and to collect information on Nordic Easy Chair and their competitors, while understanding where there is a need for a new product, and what this product may be.



### ***Nordic Harmony***

Nordic Harmony is a new series that have eight recliners with Ottomans. One LUXc recliner and a sofa. The seating is similar to the Balance series, but it is positioned on a different base and has a different stitchings. The recliners are available in different heights and widths.



### ***Tradition***

This series is one of Nordic Easy Chair's most popular series. It offers recliners of the "light" (P. 16-17) type with Ottomans and sofas. Some recliners are customizable in size and functionality. The Sorø chair is available in three different sizes and can be adjusted to contain electrical comfort adjustments, such as seat lift.

### **III. 15.a-f**

Nordic Easy Chair's product portfolio.



### ***Trend***

This series is defined by Nordic Easy Chair as a contemporary and stylish series with an elegant Scandinavian look. The series consists of three idiom types that are placed on a circular steel base. The recliners are aimed at the design conscious consumer and contains recline function and leg rest.

# THE RECLINE FURNITURE

## Definition

There are several types of resting chairs, such as lounge chair, fauteuil and chaise longue. Nordic Easy Chair's products are recliners; Armchairs with reclining backrest and in some cases with associated ottoman. Nordic Easy Chair's segment are seniors, 65+ (P. 22), where the comfort of the recliner is an essential part according to Nordic Easy Chair. These qualities can be seen in the soft upholstery and features, that fully supports the body when relaxed.

At Stockholm Furniture Fair 2013 it were noticed that many recliners did more than make the user sit and lie comfortably, but additional features could be purchased. An example is a feature that helps the user getting carefully into and out of the recliner. Several recliner furniture manufacturers presented recliners where the seat or the whole recliner was lifted and tilted, making the user able to leave the furniture in a more upright position.

Some of the extra features that Nordic Easy Chair is offering e.g. removable or integrated incontinence cloth, built in air-pillow that adjusts the lower back support and storage in the Ottoman cater to the needs of their segment. In order to hit as broad an audience as possible, manufacturers offer chairs with various heights and widths and other customizable features. A chair is purchased with the preference of size and comfort for the buyer, and can be viewed as an "egoist chair" because they are bought to fit one user.

## Idioms

Functionality and low price are dominating the market and design is left to be compromised. The recliner market is characterized by competitors offering chairs with little variation on design and materials. This became apparent at Stockholm Furniture Fair 2013 where it was noticeable that the manufacturers of recliner chairs are very similar in their design.

Although the design expression was very uniform from company to company, a clear division of the styles among recliners are established to categorize three main directions. These expressions are: Heavy, medium and light (Ill. 17).

### Light

The light chair is the least dominant type. Although this recliner is light in its expression, it still provides the same adjustability as the two other types. An incorporated seat lift and leg support can also be provided. These chairs have a four-legged wooden frame that is offered in different types of woods. The seat is often in textile.

The light and medium version have laminated wood as bases, which gives allow for soft curved shapes in the base.

### Medium

This type has upholstered seat and back and is raised on a swivel base, which makes the overall impression lighter and less dominant. The base gives opportunities for other materials to be used such as metal and wood. A trend spotted at Stockholm Furniture Fair 2013 was that the furniture manufacturers are referencing furniture classics from the 50's and 60's. This is seen in several of versions of recliners where the seat and back part is a leather and wood veneer combination similar to the Charles and Ray Eames Lounge Chair. (P. 37, Ill. 37.3)

### Heavy

This is the fully upholstered recliner where the base is upholstered and extended to the floor. There are different versions of this type of chair but the heavy and stationary expression is present in all. The price range is often noticeable in the general design and the attention to detail in assembly points, control panels and handles. These chairs are often made in leather, imitation leather or velvets.



**III. 17.a-c**  
Design of the three  
types of recliners.

### Highlights

- 1 - Leather surface covering soft wadding and thick cold foam (PUR).
- 2 - Swivel base.
- 3 - Bridge with build-in recline gas spring.
- 4 - Recline lock handle.
- 5 - Flexible inner steel frame.
- 6 - Headrest angle adjustment.

## Construction

To understand the construction a recliner, the Balance PLUS by Nordic Easy Chair is analysed. This will give an understanding of how Nordic Easy Chair creates a comfort in their existing product range.

The construction can be divided into five main parts: Headrest, backrest, seat, armrest and base. The seat and back consists of a metal pipe frame spanning multiple zigzag springs (5). Moulded cold-cured foam (PUR) is cast around the metal frame and afterwards upholstered in wadding and leather or textile (1). The seat and back are joined with an rotational fixation by their meeting point at the corner of the lower back and seat. This rotational function is the basics of the recline function. How much and how easy the chair reclines is defined by a gas spring connected to the bridge of the base of the chair (3).

In connection with the backrest most chairs have height adjustable headrests, that may also be tilted. The Balance PLUS angle is adjustable for a more upright position of the head when reclined (6).

The base is the most varied element of the recliners. Mainly it defines if the chair is a swivel chair or not. On some of the newer models by Nordic Easy Chair, other functions have been integrated in the base such as control handles (4) and gas spring (3). Balance PLUS has joined gas spring and bridge in one piece, meaning that the regulator is less visible than on earlier models. The placement of the swivel mechanism is in this recliner placed close to the floor in the swivel base (2), and not as usual in a point under the seat. This makes the expression more clean and coherent.





### III. 19

The typical construction of a swivel base recliner. Note highlighted information to the left.



Nordic Easy Chair



III. 20.b-g

Pictures of how Nordic Easy Chair presents their products on their homepage.





Ill. 20.a

Nordic Easy Chairs stand at the Stockholm Furniture Fair 2013.

## VISUAL IDENTITY

### Web site and printed media

Nordic Easy Chair's website hosts a selection of presentation images (Ill. 20.b-g). These images show a living room environment with furniture from Nordic Easy Chair. The rooms are neutral; light airy and Nordic in their presentation, while products are decorating the images, such as an expensive car in the background or contemporary art. The persons in the presentation material are content-looking women in their 30's or in their 60's.

The quality of Nordic Easy Chair's furniture can by the viewer, subconsciously be associated with the surrounding products. The neutral, relaxed and soft images show their brand as accessible and friendly, but it is not an easily recognizable brand, as it is very neutral. The women in the images are engaged in different activities. They seem approachable and the potential customers of the furniture are shown that an age group from 30 years of age are using Nordic Easy Chair's products.

The brochures of the brands; Tradition, Nordic Harmony and Balance also contribute to the neutral branding. [Appendix 2. Nordic Easy Chair brochures. CD] Besides setting the surroundings of the products they have also shown the customizable possibilities the costumer has when choosing a Nordic Easy Chair recliner.

### Trade Fair

At the Stockholm Furniture Fair 2013 Nordic Easy Chair had a simpler and clear image, where the few chairs provide an open and inviting space with different sections within the stand (Ill. 20.a). It is a clean and simple setup that allow for the furniture to be presented well. The colour scheme of the stand is neutral using light flooring and white walls. A circle of chairs are presented on a bright red circular carpet. The carpet provides a reference to their logo, while drawing attention to their series of Balance recliners.

This correlates with the simple and clean image that Nordic Easy Chair displays in their press images. However the red carpet gives an eye-catcher that makes the company more recognizable.

# NEC'S CURRENT SEGMENT

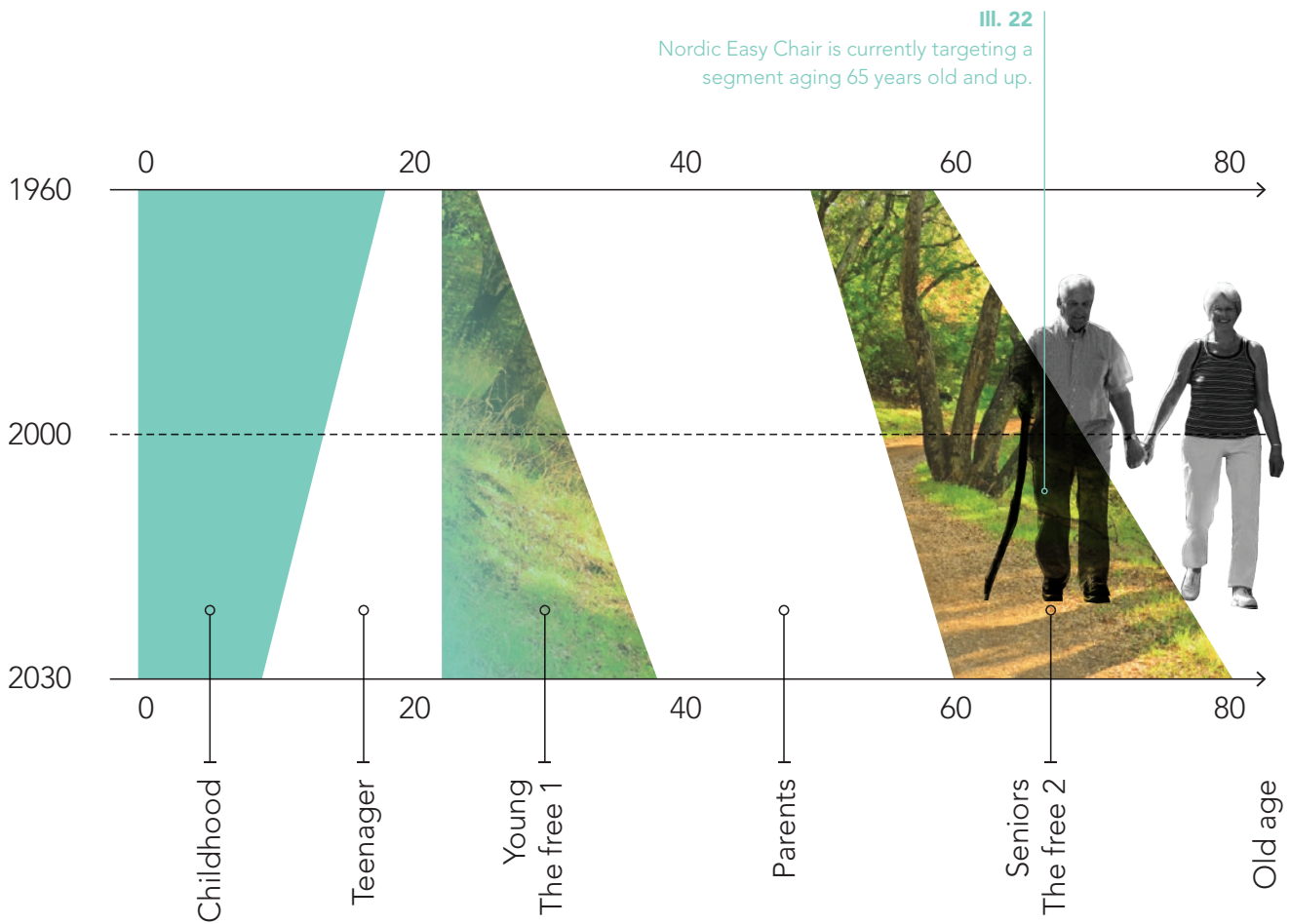
Futurologist Jesper Bo Jensen created a model that explains how the life phases have shifted from the 1960's to the 2030's. [Jensen, 2001, 25-31]

Nordic Easy Chair defines their segment as being an age group that is 65 years old or older. Their products offers helping solutions for the users. This indicates that chairs are designed for a the segment that is defined in the model as “Old age”, where the body is in need of assistance. Jensen’s model shows how “Old age” in 1960 started when the person were 60 years old, in 2000 this has been shifted to 70, because of a general better health. Jensen expects that in 2030 a person will enter old age when this person is closer to 80 years old, due to the people become parents later in life compared to the 1960's or 2000's. He predicts that the Old age and the physical decay is a thing of the past, and that this old age will be a short phase (possibly a year or two) at the end of one's life. [Jensen, 2001, 25-31]

Due to this shift, it is expected that Nordic Easy Chair’s current segment is becoming limited when the Old Age phase is changing from many years into just a few.

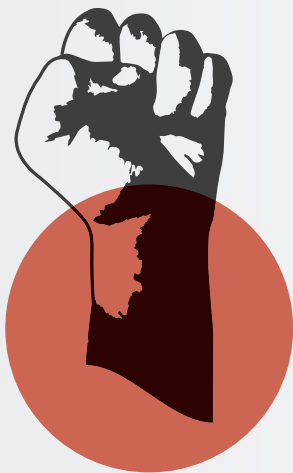
## New segment

As mentioned in the “The recline furniture” (P. 16) there is a vast competition on the market for the recliner furniture for the elderly, which means that there are many suppliers for a limited market. Instead of creating a product for their existing segment as Nordic Easy Chair presented as possible directions (P. 12) it is chosen to work with a younger segment.



# SWOT ANALYSIS

The SWOT analysis is created to give the design team knowledge about Nordic Easy Chairs internal strengths and weaknesses and external opportunities and threats. Furthermore it should help to make opportunities in a future strategy more visible. It is based on the meetings at NEC and competitor analysis. [Method report p. 7]



## Strengths

- Good reputation
- High quality
- Customization
- Short delivery time on most popular products
- Good client relationship
- Aware of own situation and wants to move out of red ocean



## Weaknesses

- More expensive than competitors
- Late follower regarding design and new features
- Their sales focus primarily on an elderly segment



## Opportunities

- New markets in Asia
- Opportunities in private labelling e.g. La-Z-Boy
- Increase sales in existing market
- Collaboration in production of accessories e.g. sofas, tables



## Threats

- The competitive red ocean
- Only sales through in-2-house e.g. Danbo, Smag&Behag
- Changing trends

III. 23  
SWOT analysis of Nordic Easy Chair.



Ill. 24.a-c

Little variation in the design of recliners.  
Three different companies but same style.

## COMPETITORS

### Primary, secondary and indirect

Several of the competitors to Nordic Easy Chair were visited at the Stockholm Furniture Fair 2013, and are divided into three groups: Primary, secondary and indirect. [Further reading about competitors can be found in Appendix A]

#### Primary competition

This is manufacturers who are targeting same segment, with almost same price and aesthetics. (Ill. 25). These are e.g. Hjort Knudsen, Fastrup, Ekornes, Stordal, Hjellegjerde, Kebe, Himolla and Brunstad.

Ekornes, with their well-known brand Stressless, is primary competitor to Nordic Easy Chair, because they are present in several of Nordic Easy Chairs markets. Hjort Knudsen and Fastrup are Danish competitors, which uses the same sales channels as Nordic Easy Chair. Hjort Knudsen is manufacturing furniture for a lower price. Fastrup is similar to Nordic Easy Chair, but they have alternative sales methods that reach the customers that are not able to visit retailers. Fastrup offers private visits with their “chair bus” so the customers can try the recliner at home before they buy one. [farstrup.dk]

#### Secondary competition

This is companies with a different aesthetic and/or segment or they are a small company. However these companies can become primary competitors in the future if Nordic Easy Chair does not change.

The secondary competitors are NC Nordic Care, Elano/Sitbest, Schou Andersen, Isfjord, Skalma and Nelo, which were all present at Stockholm Furniture Fair 2013. Equal for them all are that are not directly are competing with Nordic Easy Chair because they have other sale channels or targeting another segment.



Monterey by  
Nordic Easy  
Chair

#### Indirect competition

This is companies with own sale channels and other target group. However for a future product change they can become competitors. [Each company are further explained in Appendix A]

The indirect competitors are Bolia.com, IKEA, MIO and HighSeatChairs. Several other retail stores could be added however these companies has Nordic Easy Chair mentioned at meetings. They are indirect competitors of different reasons. Some of them do not target Nordic Easy Chair’s segment or they do not produce recliners themselves. Both MIO and HighSeatChairs are channels that Nordic Easy Chair have shown an interest to enter. A visit to a MIO store in Stockholm showed that Nordic Easy Chair has to change design aesthetics and segment to have success on this channel. Bolia.com and HighSeatChairs have great success selling furniture through the internet.

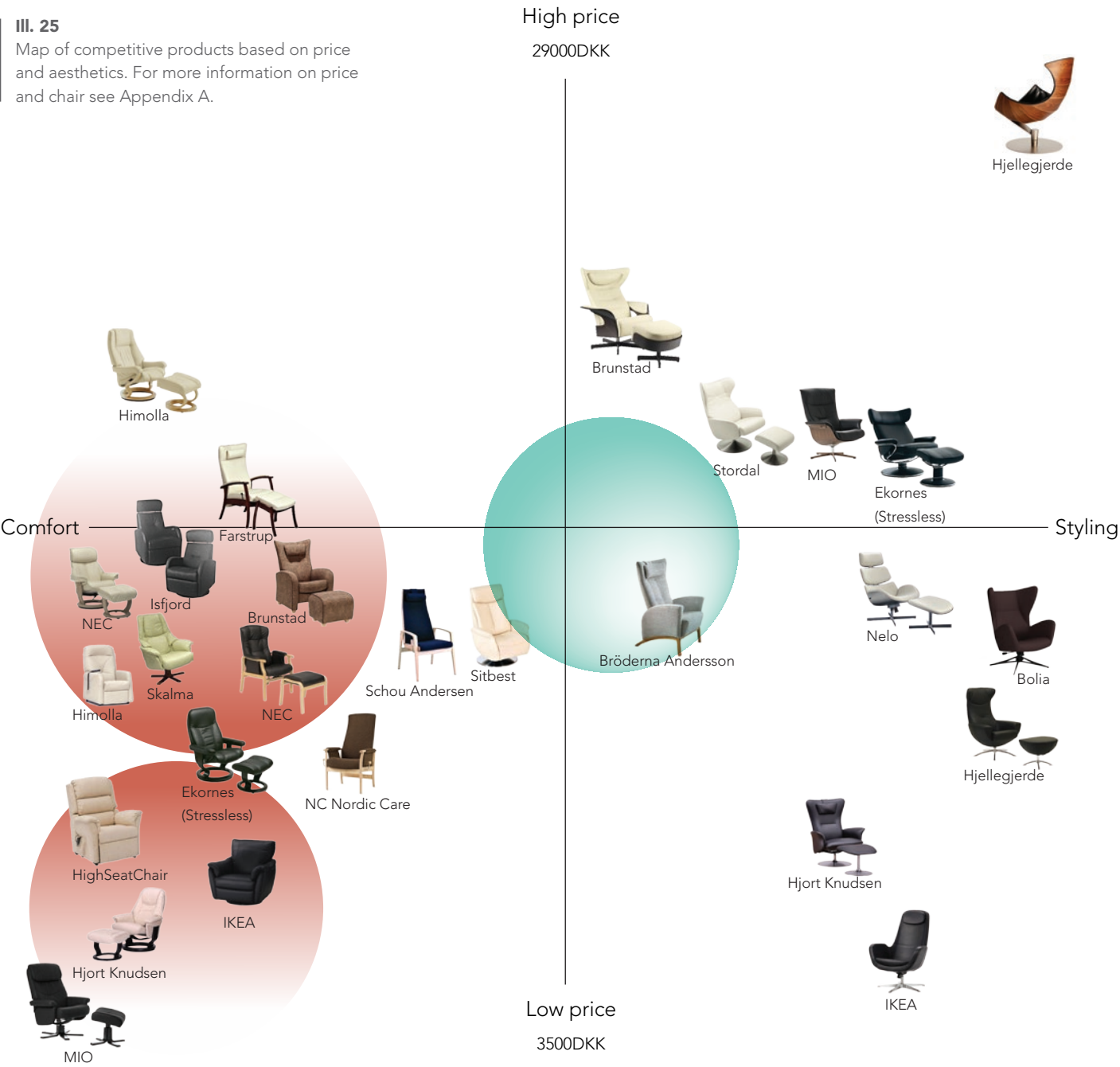
Price and aesthetics

The map below illustrates recliner furniture from the primary, secondary and indirect competitors. The products illustrated in the map below has been experienced at Stockholm Furniture Fair and online, to get an understanding of which products each company currently focus on.

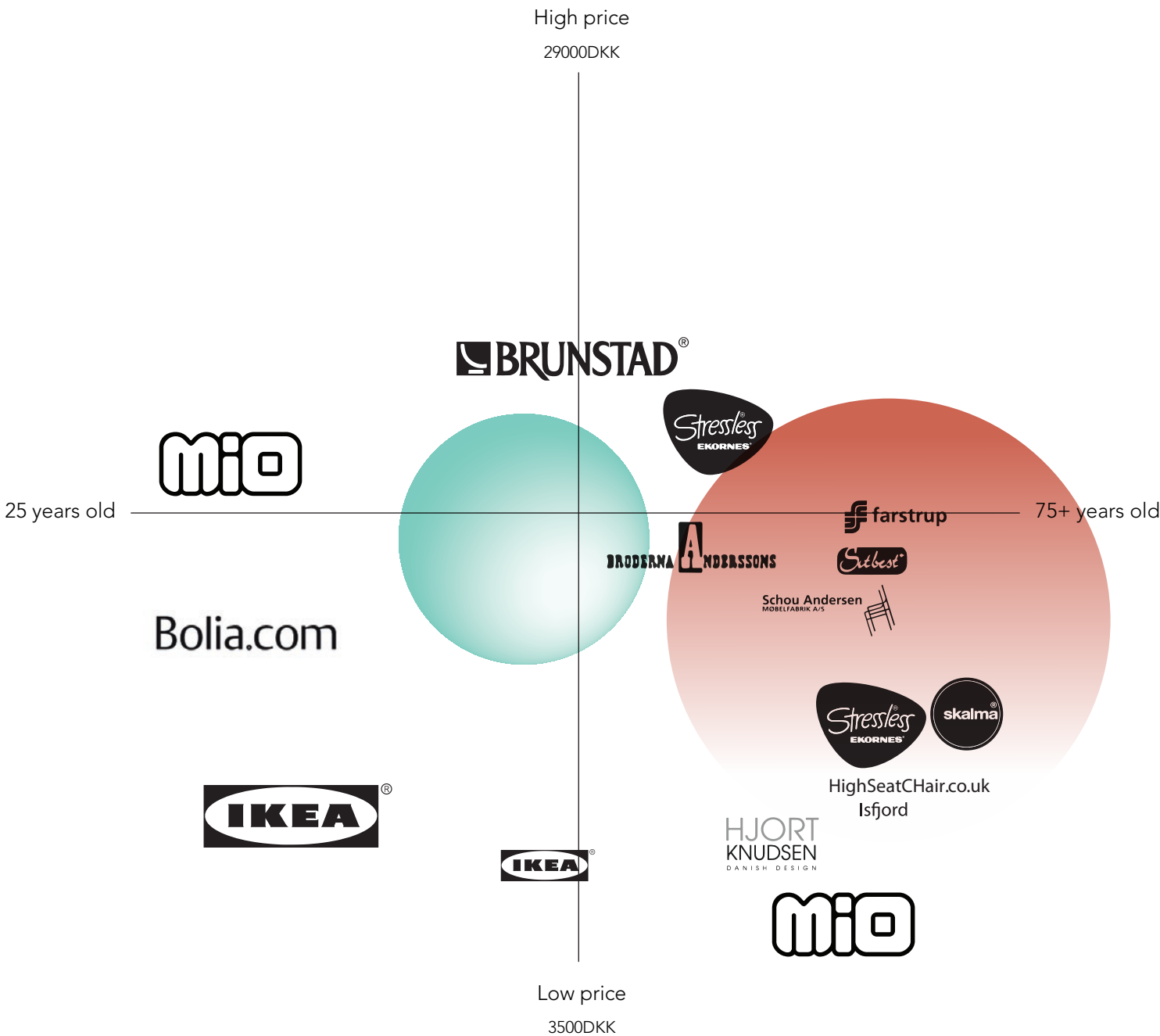
The vertical axis is cost price (Retail). This is chosen as a parameter as the products differ greatly in cost. The horizontal axis is the design aesthetics, where each product is mapped whether the product has a comfortable or a styled aesthetic.

Recliners that have comfortable aesthetic with a low to medium retail price are highly featured on the market. This is where Nordic Easy Chair is placed (Red circles).

Chairs with a styled aesthetics are mostly represented with a medium retail price. The research did not find any recliners with a high price and focusing on function. This is interpreted as there is not a market for a high cost chair that has an aesthetic based on comfort. Another area that is less competitive is a medium to lower price area where there is the same level of styling and comfort.







### Ill. 26

Map of competitive brands based on price and target group. For more information on companies see Appendix A.

## Price and age group

Ill. 26 shows the competitive companies mapped in a diagram with price level on the vertical axis and their primarily age segment on the horizontal axis. It is made from research at the Stockholm Furniture Fair 2013 and online. It shows a high concentration of the primary and secondary companies targeting 65+ and with a low to medium price. It also shows that both of Nordic Easy Chairs ranges; “Balance” and “Tradition” is situated in this area. If targeting another age group Nordic Easy Chair there will be different competitors but not within the recliner industry.

## Conclusion

The majority of Nordic Easy Chairs primary competitors (Ekornes, Farstrup, Hjord Knudsen and Hjellegjerde) targets the same age segment, but differ in the retail price and quality.

The first competitor map (Ill. 25) shows that the most of the companies are focusing on recliners that have design aesthetic that exudes comfort. An area in this map, where it has less competition, is where comfort and styling are evenly focused in the recliner and with a medium price.

The second map is made to clarify which segments, that are highly represented in the recliner chair industry. The map is based on the design team’s definition of the products and information given by Nordic Easy Chair.



## New segment

Visiting Stockholm Furniture Fair 2013 and mapping competitors on price/design aesthetics, show that the majority of the recliner chairs have a design aesthetic that focus on comfort. Through mapping the design team found that there is less competition for a recline chair that has an even mix of comfort and styling.

In the second mapping the three types of competitors are mapped focusing on which age segment that their recline chairs appeal to. From these findings the design team choose a direction, that is a product for a younger segment as Nordic Easy Chair suggested in the initial meetings. (Page 12).

The product will have a cost price of mid to mid-high range as this is where Nordic Easy Chair is currently situated.

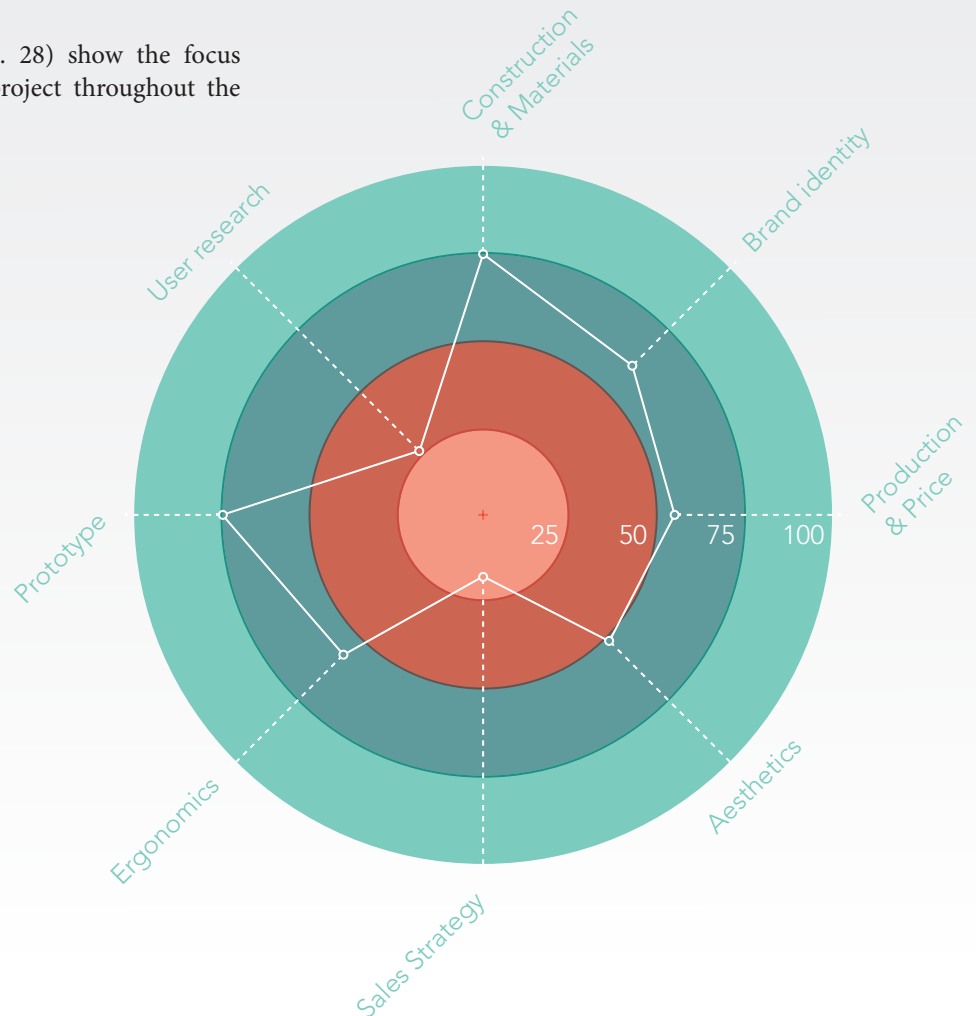
The new segment is “The free seniors” (Page 22, Ill. 22). This segment is characterized by that the children have moved away from home and their disposable amount becomes higher. According to Jesper Bo Jensen, the free seniors in 2030 have a better health, and they keep themselves occupied when leaving the job market. They are independent and are more active. This new age segment starts at approximately 55 years of age and lasts up to approximately 80 years of age. [Jensen, 2001, 28-30].

Choosing a segment ages 55+ is based on the competitor maps and future research. The new segment is still able bodied up until the last few years of their lives, which means that the market potential is high while there is less competition among other recline chair manufacturers.

# OBJECTIVE

The expected outcome of the project is to design a product that Nordic Easy Chair will be able to incorporate in their product portfolio. The product is directed towards the new segment, and the design and functionality needs to address this age group.

The Key Performance Indicator (Ill. 28) show the focus placed on different aspects of the project throughout the project period.



III. 28  
Key Performance Indicator

## Scope

The following subjects will be developed in a limited degree:

### Brand and sales strategy

This project will present these on a lower level of development that is used to illustrate the opportunities in the product and project.

### Durability calculation

As an engineering study the project will be worked on with a level of realism both in terms of durability and production of components. However only selected areas will be verified.

### Sustainability

Nordic Easy Chair do not market themselves with a green profile and the project will thereby not include a sustainable aspect.

### Production and price

Cost of production and retail price will be discussed during the drafting phases. Product maturing and quality control will not be included.

### Market analysis and segment

The market will be limited to Denmark and the private sales market. The design process focus on one segment but it is possible to expand to a younger or older segment if research proves this a better business opportunity.

## Reflection

Nordic Easy Chair enters this collaboration as a realistic project, which is also how the design team approaches this task. The initial meetings at their head office in Aars gave the design team a pre-understanding of how their company operates and at the same time they introduced four possible directions that the project may pursue.

Stockholm Furniture Fair 2013 was placed in the initial phase of the project, and this event gave the design team, in a fast and effective way, information on the market of recline furniture. Interviews with sales personnel and testing of furniture allowed the design team to obtain a shared catalogue of references on recline furniture that is useful in the concept development phase.

During the visit to Stockholm Furniture Fair 2013 the design team noticed a lack of recline furniture, that had a current appeal for a younger segment. The direction for the project is one of the directions that Nordic Easy Chair provided, and mapping the aesthetic/cost and segment/cost supported this decision. Another direction could have been chosen if a different exhibition was visited, that focused on i.e. health care.


*Align* provided a direction early in the process, that allowed the design team to quickly move into *Researching & Analyzing* and *Concept & Strategy*.





# *Researching & Analysing*





## Introduction

Based on the problem area and the theme for this Master thesis, the research and analysis will focus on how the new concept and strategy for Nordic Easy Chair can be approached. The research is divided into field research and desk research. A questionnaire to consumers in different stores and on the Internet was handed out to understand the parameters of buying seating furniture. Furthermore an interview with a sales people at Brdr. Sørensen and Idemøbler - Max Jessen were conducted to get an insight into the consumers' purchasing habits. A focus group was established to understand their needs in the recliner and which activities that was done in their sitting furniture.

Past, current and future trends have been researched to find tendencies that appeal to the segment. Ergonomics and comfort are also analysed to create a recliner that suit most. Established theories have been examined and ergonomics have been tried out on classic and current sitting furniture. A 1:1 mock-up model is build to test the focus group. An interview with a physiotherapist have been held to understand which body areas and changed that are important for support and to verify some of the conclusions of the ergonomic research.



# COLLECTION OF DATA

The collection of data can be divided into the following two categories.

## Field research

The field research has been used to understand the needs of the new segment in terms of functions, activities and comfort. Furthermore sales people at two different furniture stores have been interviewed to understand the sales parameters in the furniture market. The design team has visited an upholsterer to get a pre-understanding of the composition of upholstered chairs. Later in the process an associate professor in physiotherapy is interviewed to verify ergonomic theories and experiments.

When the design team were researching in the field, ethnographic field research methods were used in order to collect the expected data. [Method report p. 13]

The field research data that have been collected can be divided into two types of collection: Quantitative and qualitative (Ill. 33). The quantitative methods that have been used are two sets of questionnaires. The design team have measured chairs in order to understand the dimensions and angles of the chairs, that were found comfortable. The qualitative data is collected from interviews and meetings with the focus group.

## Desk research

The desk research is divided into internal and external data. The internal data is given by Nordic Easy Chair and has been presented in *Align*. Cases has been made on existing products or companies, which had a functionality or strategy that could be used in the project.

The external data is chosen to either create a pre-understanding on a given topic or to verify some of the field research the design team made. Furthermore the external data have regularly been updated on the basis of the output from the field research.

### *Chairs*

The beginning of the *Researching & Analysing* consists of research that creates a pre-understanding of the symbolic value through the history of chairs and upholstered chairs. This is used so the design team achieves a mutual point of reference.

### *Trends*

“PEJ-gruppen”, Stockholm Furniture Fair 2013 and MIX trend magazine were used as external data to get a feeling of future trends. In the magazine “Tid og tendenser” by “PEJ-gruppen” articles were used to map consumer patterns and verify strategic moves. The furniture trends were observed at Stockholm Furniture Fair 2013 and later research in the trends magazine “MIX”.

### *Ergonomics*

Comfort and ergonomics are found to be important in the recliner. Nordic Easy Chair has success with the comfort in their products, and the design team research this area to understand if there are areas that can be improved. The comfort and ergonomic research has both been explored through field and desk research.

The *Researching & Analysing* will result in a problem statement and needs and wishes that comes from Nordic Easy Chair, the approached segment and furniture market.

## Data collection



## Type of collection

Quantitative data

## Collection method

Questionnaire:

- Consumer
- Focus group

Measurement of chairs  
Comfort upholstery chairs

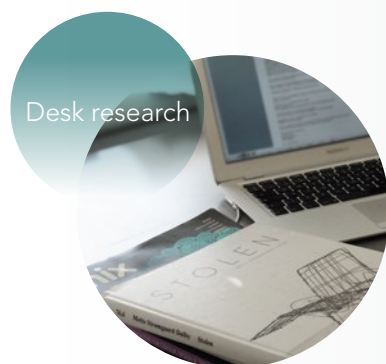
Qualitative data

Interview:

- Brd. Sørensen sales person
- Idemøbler sales people
- Focus group interview and workshop
- Associate professor in physiotherapy
- Upholsterer

Meetings with Nordic Easy Chair

## Data



Internal data

Nordic Easy Chair:

- Sale
- Competitors
- Strategy
- Structure of easy chairs

Cases on TrippTrapp chair, Bolia.com and Fritz Hansen

External data

History of chairs  
Peoples design favourites at Trapholt 2007  
Trends in furniture industry  
Tendencies in consumers habits  
Ergonomic theory

# HISTORY OF THE CHAIR

## Introduction

To understand how the chair has evolved through time some chairs, that are representative for a period or a change in style, have been researched. Upholstered lounge-, easy- and recline chairs are categorized based on their use. The first type of a chair, is found in ancient Egypt where archaeological excavation shows, that an object is made as a sitting device. [Payne, 1989, 14]



III. 34.b

### ANCIENT GREECE AND MIDDLE AGES

Through this period the chair was primarily for the wealthy population. In the ancient Greece the couch was the most leading furniture and things that usually were done sitting were now done lying. (III. 34.b) In the middle Ages furniture was a valuable item, which meant that they became build-in objects to protect against thievery or more mobile. The chair exuded power, which can be seen in the king and church's high seat. [Dalby, 2009, 39]



III. 34.a

### THE BEGINNING

One of the first chairs discovered was the foldable chair. This has been a reference for several Danish designers such as Kaare Klint and Mogens Lassen. (III. 34.a which shows a Curule chair from Egypt) The characteristic of the chairs is that they are mobile and easy to fold and carry. [Dalby, 2009, 38]

### RENAISSANCE

The value of the chair for this period was moved from a symbol of power to be a more everyday object with focus on function. Different aesthetics also found its way to the chair and more ornamental chairs were made. Comfort was also prioritised and many upholstery techniques were invented in this period. [Dalby, 2009, 40] (III. 34.c Upholstered chair by John Jellif)



III. 34.c





### BAROQUE, LA RÉGENCE AND ROCOCO

The symbol of power is noticeable in these periods. In the Baroque the size and comfort changed based on the status and very strict symmetry were followed in the ornamentation. The La Régence softer curves were seen in chairs and the Rococo period made up with the symmetrical lines and more artistic chairs were seen. [Dalby, 2009, 41] (Ill. 35.a Spanish baroque chair and ill. 35.b Italian Rococo chair)



III. 35.e  
Safari chair by K. Klint

### EARLY FUNCTIONALISM

In Denmark the functionalism reached a peak in the 50's and 60's. The architects had a vision about creating furniture with a simple and functional aesthetics and instead of just being a sitting object chairs became more ergonomically focused. Kaare Klint, who was one of the first to point out the functionality of the chair, made measurements of the human body ahead of his design process. [Dalby, 2009, 92]



III. 35.f-g  
FDB chairs by B. Mogensen and Ejvind A. Johansson

### FUNCTIONALISM: FDB

"Furniture to the people" was the vision for FDB furniture that were launched in 1942 with Børge Mogensen as leading architect. The furniture used some of the same aesthetic point of view and principles from Scandinavian Design however these furniture could be mass-produced and therefore sold at a cheaper price. FDB's mission was to teach people what the right taste in terms of interiors was. [Dalby, 2009, 99-100]



III. 35.l  
FAUN by Jaime Hayon

III. 35.m  
Nobody by KOMPLOT

### 60'S -90'S

Verner Panton went against the functionalism and experimented with new ways of seating and production methods. His primary material was plastic and a lot of his furniture had an organic idiom. [Dalby, 2009, 97] In the past 30-40 years chairs have been interpreted more conceptually and what the chair can tell the society. For some designers, the seating comfort is less important than the topic and the chair becomes more sculptural. [Dalby, 2009, 105]



III. 35.j  
Verner Panton chair

III. 35.k  
Miniature chairman by Michele De Lucchi



III. 35.c

III. 35.d

### NEU CLASSICISM

Rediscovery of classical ideals from the Roman Empire and later different past styles replace each other as a reaction to the Empire style (Ill. 35.c Neu classicism chair). Luxuriousness and over upholstered furniture were common in the late 19<sup>th</sup> century. (Ill. 35.d late 19<sup>th</sup> century lounge chair with typical tassels.). [Dalby, 2009, 42]

### FUNCTIONALISM: SCANDINAVIAN DESIGN

Danish functionalism can be divided into two categories: Scandinavian design and FDB furniture (Above). First mentioned were furniture designed by well-known architects and made by cabinetmakers, which made them luxurious at that time. The furniture were shown on touring exhibitions in USA and Canada in the 50's and the furniture of i.e. Finn Juhl, Arne Jacobsen, Hans Wegner became icons of Scandinavian Design and the functionalism. [majosim.dk]



III. 35.h-i  
Poet by F. Juhl and Bear chair by H. Wegner

### Conclusion

In the Middle Ages a chair with a high back was a symbol of power and in the functionalism the high back provides a comfort. A chair with high back is no longer seen in a hierarchy context but has a more functional effect as back support. Signal value in chairs and furniture are today based on who the architect is and how exclusively designed the chair is. People still buy old icon furniture, which is also mentioned during the interview with Jan Sørensen of Brdr. Sørensen, because of the story and architect behind the furniture. (P. 45) According to Mette Strømgaard Dalby the purchasing pattern have changed and today it is more about identity of the buyer and experience economy rather than the need of furniture. People mix furniture from different price levels and let story telling influence the emotions. [Dalby, 2009, 121] Today it is unusual for a family to order a complete living room “kit” from a cabinetmaker however this was regularly seen in start of the 20<sup>th</sup> century. [Dalby, 2009, 95] It is more common that people desire a furniture icon and mix it with what they have collected in the making of their homes.

It is also worth mentioning people refer modern design with furniture from the period of Functionalism that were produced over fifty years ago. The timeless pieces are usually the ones that were more significant for the age and even the consumer were in many cases not ready for these daring pieces. [Dalby, 2009, 135 and interview with Jan Sørensen, Brdr. Sørensen p. 45]

### Upholstered chairs

In the “History of chairs” the chairs were designed to fulfil a specific need. The recliners, however, try to combine both the sitting and resting position to fulfil a need for comfort and relaxation. This page will research different types of sitting positions and see what the functions and seating angles are.

### Active vs. Passive

Illustration 37 shows different types of upholstered resting chairs which are inserted on a scale going from passive to active. The design team defines a chair, that is active, to allow the seated occupant to have room for movement and activities, while a passive chair is a rigid chair that may be used for sleeping.

1 The wingback chair is defined as static because it only allows one posture for the user. It is a wing-back armchair where the wings can be used to rest the head while sleeping seated.

2 The Morris chair is an easy chair with a low mechanical reclining function. The relaxed position occurs when the user adjust the angle through a row of pegs in the armrest.

3 Ray and Charles Eames Lounge chair is an easy chair and is partly passive and active with an Ottoman. The chair has focus on the comfort in a relaxed position. The back in an easy chair usually slopes 30° or more from the vertical position, requires a headrest and ottoman. [Tilley, 2002, 44-45]

4 Milo Baughman's recliner is defined as both passive and active as it provides a seating and lying position for the user. It has an integrated leg rest, which means that the user gets support when reclined. This can also be fulfilled with an Ottoman. Reclining chair is defined by its almost lying down position, which is not suitable for many activities. [Tilley, 2002, 44-45]

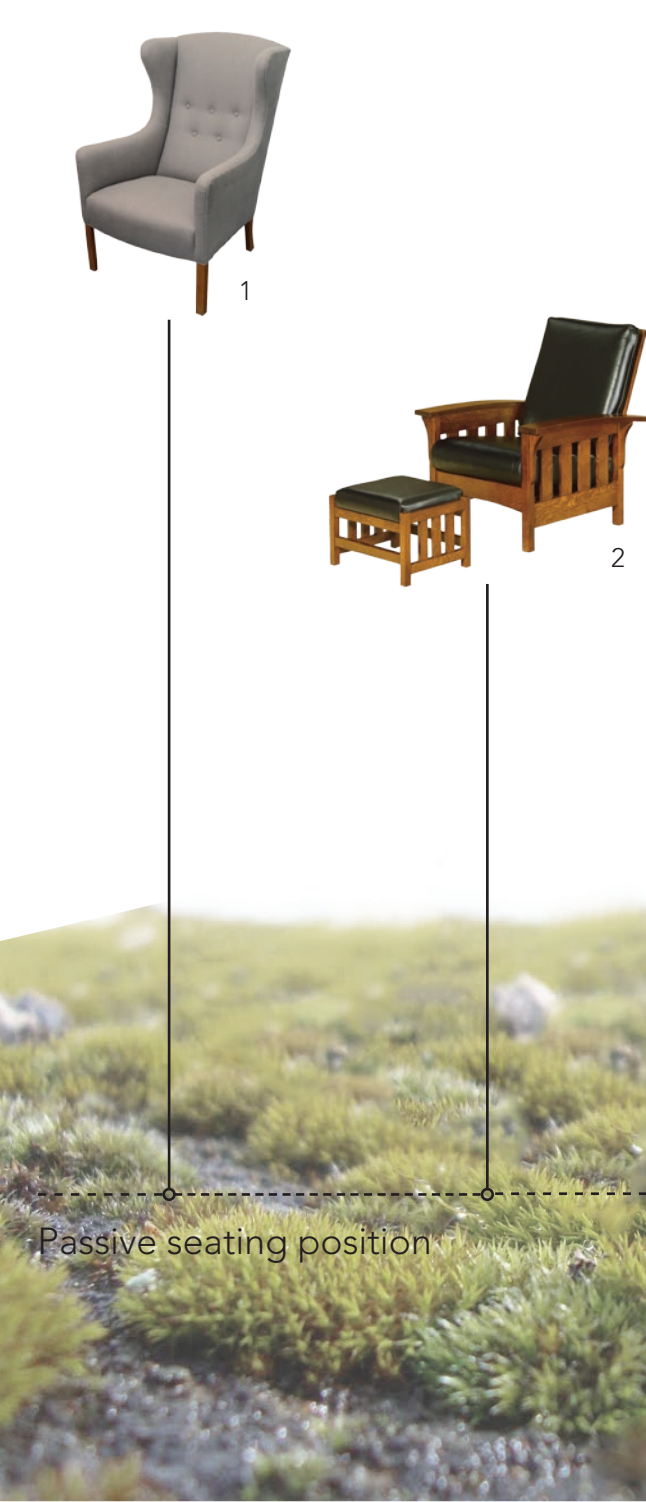
5 The Chaise longue by Le Corbusier, provides a fully reclined position for the user. The user can change the angle slightly by moving the chair from side to side.

6 The lounge chair by Finn Juhl, is defined by the design team as the most active chair. The chair is wide (620mm), which gives the ability to change seating position for the user.

### Conclusion

The Recliners by Nordic Easy Chair are similar to Milo Baughman's chair, as the user will have both seating and lying positions. The differences in a chair that is active and a chair that is passive is explored in the concept development (P. 70).

The chairs by Nordic Easy Chair are seen as “egoist chairs” (P. 16) with only one user in mind. This means that the chairs from Nordic Easy Chair fulfil specific needs chosen by the end-user and does possibly not suit the whole family. All of the chairs shown below can only be purchased in one size, which means that the chair may not be the perfect chair for anyone, but it will suit most.





### III. 37.a-f

- 1 - Wingback chair by Børge Mogensen
- 2 - Morris chair
- 3 - Eames lounge chair
- 4 - Recliner by Milo Baughman
- 5 - Chaise longue by Le Corbusier
- 6 - Pelicane by Finn Juhl



3



5



4



6

Active seating position

# COMFORT IN UPHOLSTERY

## Introduction

Different types of furniture and their upholstery is tested at high end furniture store, Brdr. Sørensen, to examine their level of comfort. [Method report p. 11] The material and the structure of each piece of furniture are described and evaluated.



III. 38.a-d |

## Hard material - No upholstery

### *Chairs*

NAP Chair by Kasper Salto  
CH28 by Hans J. Wegner

### *Materials*

NAP Chair is made of a nylon shell [fritzhansen.com 1] and the CH28 has a 12mm seat and backrest of wood.

Both chairs are made of a single hard material, where the nylon in the NAP Chair provides a slightly flexible seat, while the wooden seat and backrest in CH28 has a harder surface.

### *Purpose of use*

Salto's chair is designed for both Natural, Active and Passive seating (NAP) where it is possible for the user to change seating position. The CH28 chair is an armchair.

### *Evaluation*

Both chairs are hard in their materials, however the shape follows the body and supports the body comfortably that makes up for the fact that it does not have upholstery. The form of the NAP Chair makes it intuitive to shift position in the chair.

## Soft material - No upholstery

### *Chairs*

Pernilla by Bruno Mathsson  
EA124 by Charles and Ray Eames

### *Materials*

The seating area of both chairs are made by a soft material and a frame that holds the soft material. The Pernilla Chair is woven linen fabric (Webbing) that is mounted on a wooden frame. EA124 is a fabric with horizontal stitchings.

Both chairs are made of a simple structure that consists of a frame and a soft material. The materials provide a flexible seat that is determined by how tightly the material is mounted in the frames.

### *Purpose of use*

Both chairs are lounge chairs with a passive seating position. The material itself provides the level of comfort for the user, while it is the frame that defines the curvature that suits the body. The material has a natural flexibility that can provide support for different users. The Eames has a rocking function that cannot be locked in position. Both chairs comes with a separate neck support.

### *Evaluation*

The comfort is defined by the fabric and how it is mounted and both provide comfortable seats. The added neck support is necessary as the fabric and frame does not provide enough support to comfortably support the head. The deep curved seat makes it hard to exit both chairs.



III. 39.a-b



## Hard frame - Cushion

### *Sofa*

Spokeback Sofa by Børge Mogensen

### *Materials*

The sofa consists of a wooden frame. The seating area is supported by webbing and the back is supported by vertical spokes. Both seat and backrest have upholstered loose cushions.

The seat structure is similar to the Pernilla chair - with an added cushion. These cushions are fairly thin but gives a comfortable support for a shorter period of time.

### *Purpose of use*

The sofa provides a flexibility of use as the sides of the sofa can recline and be fixated by the leather strap and transforms the sofa into daybed. The change of function in the furniture means that it needs to comfortably support the body in different positions.

### *Evaluation*

The sofa has a simple structure where the woven seat and cushion gives the seating area a slight spring effect that feels comfortable to use. The spoke back gives a more rigid support for the back. The change of position for the user is supported by the recline function, curved back frame and cushions in back.

## Upholstered frame - Cushion

### *Chair*

Dim Sum by Simon Pengelly

### *Materials*

The structure of the chair is a metal frame where springs provide the support in the seat. The chair is upholstered with PU foam and wadding is placed on top. Recycled PET is used as upholstery. [Montis, 2012]

The chair is supported by the an inner metal frame and springs, while the layers of PU foam provides a softness and comfort to the chair.

### *Purpose of use*

The chair is a soft-seated rocking chair. The chair is upholstered, but selected areas are softer than others to give a better comfort in the seat and head support. The cushions are attached to the upholstery making them non-moveable.

### *Evaluation*

The chair has an open shape that is created with the soft curves and the upholstered exterior. The rocking function provided an feature that encourages the user to movement in the chair in a different way than EA124. The softness of the chair was in selected areas, which was comfortable and displayed comfort aswell.





## Conclusion

NAP and CH28 has a comfort that was determined by the angles or shape of the chairs. The measurements from NAP and CH28 will be used for a template for comfortable sitting, as all members of the design team found these chairs pleasant.

The fabric seat in Pernilla and EA124 gives a softer seat than the two above mentioned chairs, but the user is locked in one position that over time felt passive. The neck rest is added to give a support for the head when reclined. This is a feature that needs to be taken into consideration in the final product, as this support is necessary when reclined.

The rocking feature in both EA124 and Dim Sum is a calming feature that can be researched further. The Dim Sum chair had a simpler and more smooth rocking-feature, as the runners were attached underneath the chair and was intuitive to use. EA124 felt more rigid and was not possible to lock in position, making the recline effect useless.

Changing the form of the Spokeback sofa, by lowering one of the sides, is an interesting feature that allow the user to change seating position from upright to reclined. This low-tech feature is easy to understand and gives a decorative detail.

The upholstery in the Spokeback Sofa is loose cushions, where the level in the Dim Sum is up to three layers of different foam - where selected areas are padded. In the final product, this simple level of upholstery from Spokeback Sofa that provides a soft and pleasant comfort, can be taken into account while considering if specific areas need more attention.

# CASE: TRIPP TRAPP CHAIR

The Tripp Trapp chair is analysed to understand what makes this chair popular after 40 years of being designed. It is chosen as it was designed from user observations, which is an aspect that the design team choose to incorporate in the process by setting up a focus group.

## The chair

The Tripp Trapp® chair is designed by Norwegian industrial designer Peter Opsvik in 1972 for Stokke. The chair is designed to be used by children at a table. It is adjusted in seat and footrest to follow the user from baby to adulthood. Stokke explains that their product development is user-centered and that their goal is to strengthen the relationship between the child and the parents. [Appendix 2. Stokke brochure]

Opsvik found inspiration in his own son, where he found it problematic that the furniture for the child did not suit the user. He explains that the chair should be comfortable and secure while it includes the child by giving it a seat closer to the table. The chair is designed so the user can use legs and arms freely, and according to the manufacturer it fits the posture of all ages. [Appendix 2. Stokke brochure]

Tripp Trapp has a wooden frame and two adjustable plates. The two plates are slid into furrows in the frame to obtain the desired seating height and depth. The second plate is to support the legs of the user. . [Appendix 2. Stokke brochure]

The design of the Tripp Trapp chair is simple and easy to understand and to adjust. The simplicity of the chair is to be taken into the further development of the chair as the design team finds this simplicity appealing.

When Tripp Trapp was introduced it was a new way to see furniture for children and it was designed around the needs of the user and their families. It created a new type of chair. The design team intends to observe the focus group in the design process to make a chair that follows the need of the segment and possibly make a new type of recliner.



### III. 41.a

The Tripp Trapp chair. The back has an ergonomic curve and the plates makes it easy for the user to change the sitting height and depth.

### III. 41.b

The chair suits all ages and accessories can be added so even newborn can use the chair.



# SEGMENT QUESTIONNAIRE

## Introduction

A questionnaire was created to find an indication of which parameters that were important for the consumer when buying seating furniture. The questionnaire were handed out in three different interior stores in Skalborg: Idemøber, Gads møbelcenter and Ulf Bolighus. The questionnaire was also handed out in the provincial town of Arden. 36 people answered the questionnaire. The questionnaire and the total end results can be found in Appendix B.

## Expectation and approach

The questionnaire should give an impression if there was a connection between the trends and the taste of the segment together with the reason of furniture replacement. Also buying criteria of seating furniture were compared to the segments favourite chair to give an idea of what the segment associate with the chosen parameters. The questionnaire was mainly aimed towards people in the age group to collect information about the new segment that the project was intended to aim at. 49% of the respondents were within this segment. [Method report p. 10]

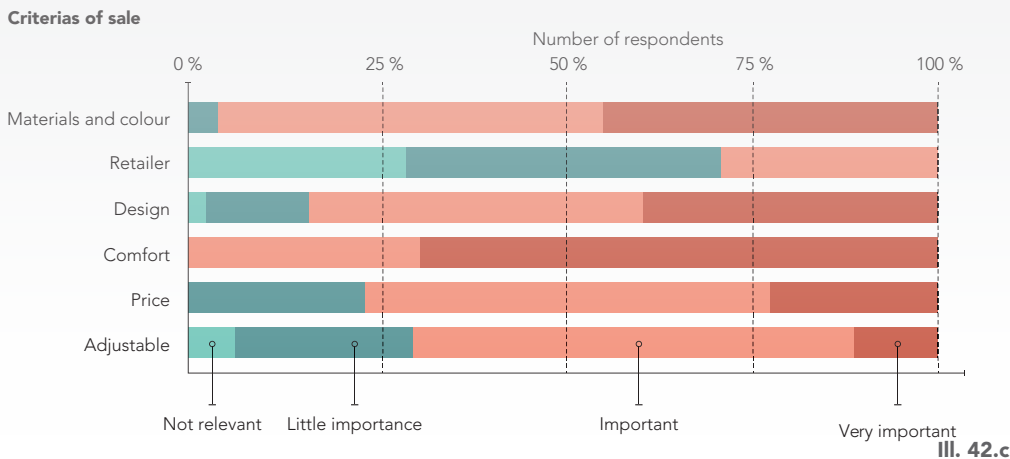
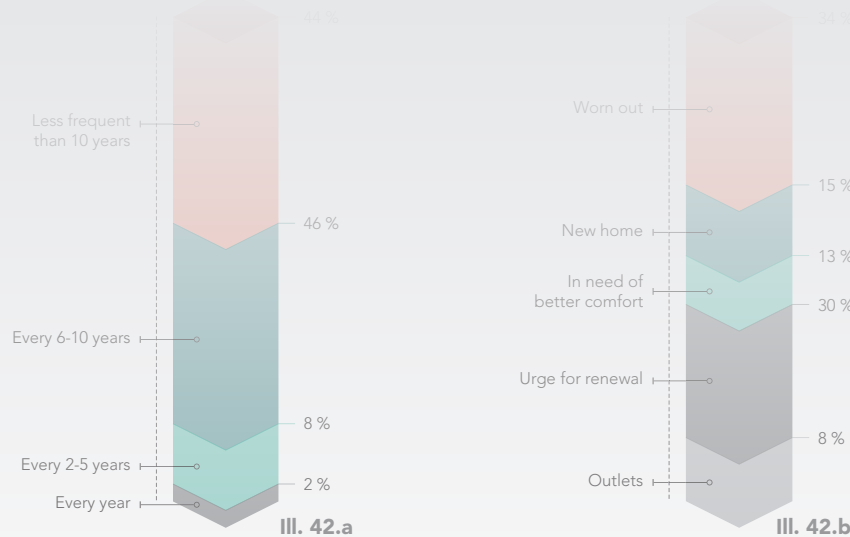
Some specific answers needs to be compared to respondent's other answers in the questionnaire, to get a full understanding. When a customer says that a product is appealing because

it is “designed”, the design team has to understand what “designed” means.

The output of the questionnaire is compared with results from the exhibition “Smagsdommer” at Trapholt 2007, which had more than 12.000 visitors who voted on their design favourites. The exhibition was the foundation of a comparison between the choice of design classics and which values the individual focus on. Each participant answered questions that could disclose their core values and place them in one of the four areas of the Minerva-model: blue, green, purple or pink. [Dalby, 2007, 33]

## Worn out and renewing the home

The illustrations 42.a and 42.b show how often the participants replace their furniture and why this is done. 90% have answered that they change their furniture every 6-10 years or less frequently than 10 years and comparing this with the next question (Reason for replacement) it indicates what the participants expect of their furniture in terms of lifespan. Over 30% have answered that they change their furniture because they are worn out, which either can be an indication



of bad quality or they have had their furniture for a long time. Around 30% have also answered that they buy new furniture because they need renewal in their home.

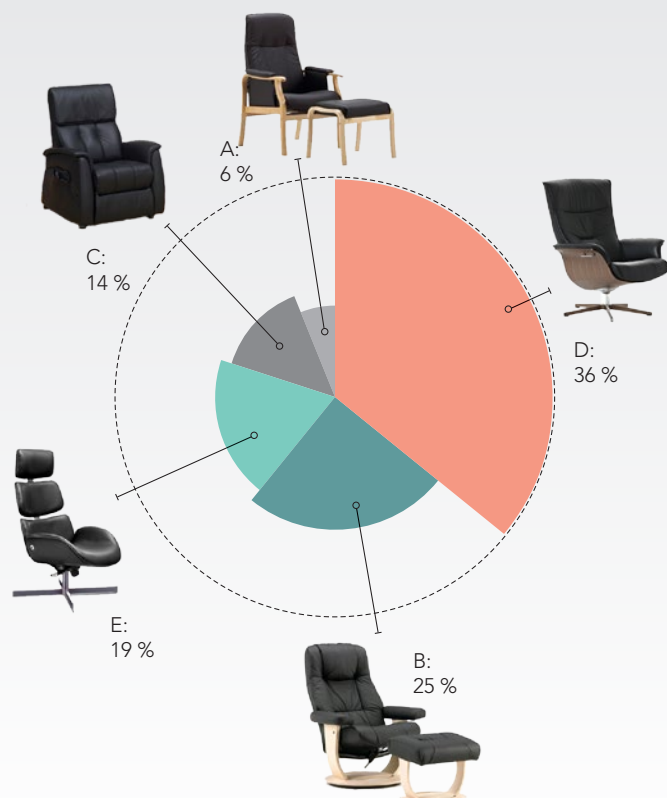
### Buying criteria and lifestyle map

Ill. 42.c shows the result of the different buying criteria and their importance for the customer when buying seating furniture. The primary criteria is comfort and next materials/colours and design. It gives an indication that the costumers are less focused on the price if the right criteria are fulfilled. The respondents think it is less important where they buy their seating furniture and which kind of adjustability the seating furniture can offer.

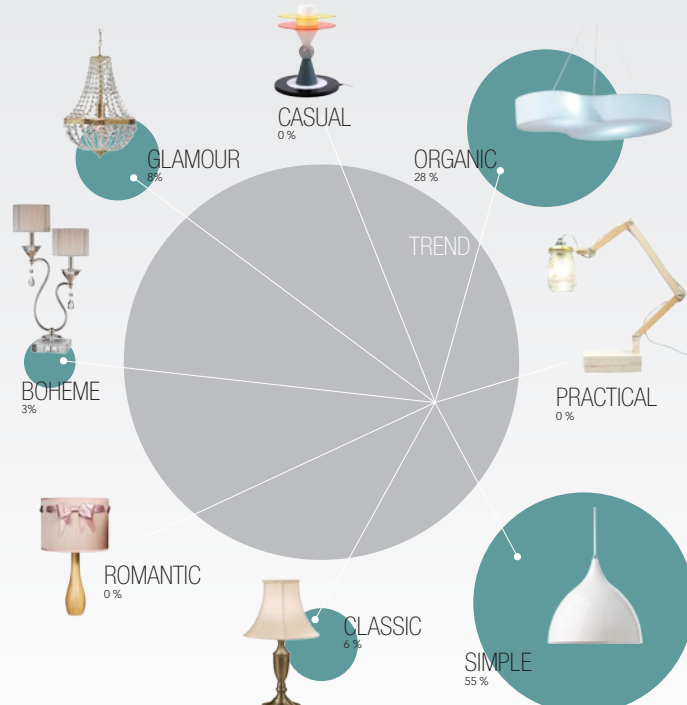
Ill. 43.a shows which recliner the participants preferred when choosing between five recliners. Over 50% chose a chair that focused on the styling of the chair and several that have chosen chair D and E wrote that they were “great design”, “smart”, “simple”, “good-looking”. 25% chose chair B as their favourite and several wrote “comfort” as reason for the choice. [Appendix B for full answers]

There is clear division between comfort and styling. Chair B was chosen based on comfort while chair D and E were chosen because of the styling. However it is not easy to determine comfort based on the look of a chair and the questionnaire shows the importance of first impression and the testing of the chair.

The last question that was given was eight pictures of different lamps. The participants then had to chose, which lamp they found most appealing. Based on the lifestyle map by Henrik Vejlgaard the eight lamps were chosen so they each fit into one of the lifestyle areas. [Appendix D] The design team was then able to indicate which style direction the participants were placed in (Ill. 43.b). 28% and 55% chose the lamps that referred to the organic and simple lifestyle. Compared with the previous question they answered, the aesthetic appealing is a leading criteria with a product like a lamp but with seating furniture the participants would not compromise on comfort versus styling.



Ill. 43.a



Ill. 43.b





## The Smagsdommer exhibition

The taste and values of the segment is combined with the results from the exhibition “Smagsdommer”. Several design classics were divided into 20 stations each with a specific theme, eg. chairs or tables.. At each station the participant was asked a question and this was used to map the participant in Minerva model, while locating their preferences in design. [See Appendix C for the Minerva model]

One station asked "Which chair would you choose for your favourite spot in the living room?" and this station allowed the participants to try the furniture. The four chairs the participants could choose from can be seen in Appendix C and how many votes they each got. The first three chairs are all designed by recognized designers and the last by Stressless (Primary competitor to NEC, p. 24). The Stressless chair was included as it only has comfort as design focus. The interesting observation of the result is when the Minerva-model is combined with it.

Stokke Tok (Ill. 44) received 31,4% of the votes and it was represented by all four segments, Corona chair got 30,6% of the votes mainly from the green segment, which also preferred Kaare Klints Model 4396, which got 15% of the total votes. Stressless got 23,2% of the votes but it was preferred by the purple segment and followed by the pink. [Dalby, 2007, 29]

According to Dalby, the Stressless chair was mainly chosen by the purple segment because it had a great comfort . The green segment chose the chair by Kaare Klint, and Dalby indicates that this could be because of a knowledge of the designer. The Corona chair was chosen mainly by the green segment, which has interest in avant-garde art and culture and can be related in the experimental shape of the chair. It has modern expression, which appeal to the green as well as the blue segment.

Stokke Tok, is presented in walnut and white leather, which was an interior trend in 2007. The chair is a combination and trend appeal and comfort and ergonomic seating. Its exclusive materials combined with styling and comfort, which were found appealing to the blue segment and also the purple, pink and green in the mentioned order. [Dalby 2, 2007, p. 30]

## Conclusion

When comparing the results of the questionnaire and the results of the exhibition there is similarity between the results.

The majority of participants in the questionnaire chose chair D (Ill. 44.a) and noted styling and materials as the reason. The Stokke Tok is also more styled and has more exclusive materials than the competitors. This similarity indicates that people are choosing their chair for their home is more trend-orientated than comfort-orientated.

There were also similarities in the chairs that were chosen based on comfort where Nordic Easy Chairs current chairs would be situated. Combining the different analysis concludes that Nordic Easy Chairs current segment can be placed in the purple and pink areas of the Minerva model. However to approach the trend-orientated segment the new product have to target the blue and green segments.

The question about lamps gives an indication of a design approach that are more simple and organic and the design team therefore chose to approach the right side of the lifestyle map. Further aesthetic development will be based on trend research and less on consumer preferences. This choice is made because aesthetics can be difficult to make concrete and as they are personal and relates to the preferences of a single person.



The background of the page is a photograph of autumn trees with orange and brown leaves in the upper right corner. In the lower part, there is a dark, sloping roof of a building, possibly a house, with some bare branches in the foreground. The overall tone is autumnal and somewhat somber.

## INTERVIEW 1

Jan Sørensen of Brdr. Sørensen

### ***Brdr. Sørensen***

An interview was carried out with Jan Sørensen at Aalborg retailer Brdr. Sørensen. The store carries mid-century design and new award-winning designs from large furniture houses. The interview was carried out to get an understanding of what the customers of quality furniture are requesting and what their triggers in the purchase situation is. The following text is highlights from the interview, that can be found in Appendix E.

### ***Segment***

Jan Sørensen says that their customers are an age group from 20 years of age and upwards. He continues to say that the majority of the revenue is caused by people in the 30s to 50s, but the younger and more design interested customers are also more occurring. He says that the classic Danish furniture has always been popular, and that the company has introduced more contemporary furniture into their collection. The reason, why this is sold is the Danish architects' good balance between functionality and design.

Taking inspiration from the design and functionality in Danish furniture from the 1950's-1960's can provide the design team with an indication of how it was successfully done, and how to do it in 2013.

He says that their customers are often familiar with the design before they purchase a product, but will use Brdr. Sørensen to try the product before purchasing it. Often they have made their mind up before entering the store. This gives an indication on that there is still a need for trying the chair before the purchase.

### ***Trends***

Trends also occur in high-end furniture, where Jan Sørensen mentions the striped Paul Smith fabric, that was used as upholstery on Wegner's chairs. But now they often carry neutral colours both light and dark. Neutral colours or black leather are always popular as he says. Most of the furniture at Brdr. Sørensen are of this colour, and when asked why only their concept store has bright colours, he replies that a trendy shop floor is not suitable, due to the physical limitations of their store. They do however try to change the colours according to trend, but it is done by accessories or art on the walls.

He says that the new products that are becoming more popular are the lesser known classics that are being introduced by the furniture houses. This can indicate that a new design is easily accepted as long as it has the right brand behind it.



# CONSUMER TRENDS 2013-

## Introduction

Consumer trends have been studied to find out how it has developed through the past years and how it will be like in the future. The information has been collected from the Danish PEJ-gruppen and their Trend based magazine “Tid & Tendenser”. The Trends have been chosen based on their relevance for the project and the future development.

## Extrovert to introvert

An article in “Vi elsker vores bolig” in “Tid og Tendenser” #01 2012 by project and consultancy manager, Jakob Søndergaard looks at how the Scandinavian consumer lives and how it has changed the past years. In Scandinavia the home is seen as the centre of life and about 1/3 of the income in Norway, Sweden and Denmark is used on rent, interior, electricity etc. The explanation can be that due to the climate the home is more cultivated compared to other countries. According to Søndergaard the consumer had lived a very extrovert life style regarding the home and bigger and more expensive were keywords for success. [Søndergaard, 2012, 52-56]

Today the Scandinavian consumer has changed to a more introvert lifestyle where keywords such as sustainability, responsibility, ethics, morale and environment have increased in the choice of lifestyle. People focus more on the individual, cosy atmosphere and cocooning (Derived from butterfly's cocoon and the wish of comfort), which is also seen in the interiors and furniture design. The consumer do not see any need to invest in status symbols, because the crisis has changed people's behaviour and it can be interpreted as irresponsible. [Søndergaard, 2012, p. 56] In connection to the introvert lifestyle the trend seems to be more on the individual and giving the home will have more focus on wellness and relaxation.



III. 46.a/47.a  
Functionality is in focus by the consumer and repair is also future trend.



III. 46.b  
Wellness in the home seems to be the future interior trend





## Functionality and thoughtfulness

Due to several years with recession the purchasing habits have change and the consumers are more aware of what they buy and for what purpose. According to design expert, Mads Arlien-Søborg consumers do not need outstanding products with out any content but products that makes everyday more simple.

The consumers are also less tempted to do impulse purchases and use more time on evaluating the products on parameters such as functionality, quality, durability and the need of the product. In 2012 the trend light function started to materialise and with focus on parameters such as function and comfort. Products from the French company Lignet Roset follow this trend where everything beside basic function and soft comfort are omitted (Ill. 47.c). [Arlien-Søborg, 2012, 38-41]

Re-use, Re-pair, Re-cycle also seem to be focus in consumers purchasing habits. If products are damaged, consumers will rather re-pair than buying a new one. The material “Sugru”, which is created based on this life standard, is like modelling wax that can be moulded into any shape or fix any hole and within a couple of hours it gets hard and durable. [Arlien-Søborg, 2012, 41]

## Customer’s experienced advantages when buying online?

48%: I am able to shop, whenever I have the time

38%: It is easy

32%: The products are cheaper

31%: It is easier to compare prices and products

27%: The products are delivered

24%: It is time-saving

20%: You can buy from abroad

12%: There is a bigger and better selection

11%: The product is only available on the Internet

8%: It is less stressful

[Tid og Tendenser #05 2012, p. 90]



## Buying online

Expert in consumer habits and retail, Flemming Birch have looked at the present and future habits. Today sales over the Internet have increased and have become a great competitor to physical stores. According to Flemming birch Big Box retail stores where stores have everything under the same roof are soon to be past and other more convenient shop solutions will take over.

The list on the right shows an analysis from “Dansk e-handel” from 2011 about the Danish consumers where the analysis shows that convenience is one the reasons why more and more people choose the Internet. [Birch, 2012, 90-91]

## Conclusion

The future trends by PEJ-gruppen show that the future costumer seeks functionality, simplicity and convenience both in the products they buy but also how they buy them.

The future costumer also seeks a more introvert feeling in the home where the individual is in centre and words as wellness and relaxation will be a part of the interior styling.



Ill. 47.c

Lignet Roset focus on simplicity and functionality.

## CASE: BOLIA

### Introduction

Bolia is a successful Danish furniture manufacturer that has showrooms in larger cities in Denmark. The purchasing process for the customer is analysed to understand how their alternative showroom concept works.

### The purchase process

The company's concept is a showroom-based store, where it is not possible to receive furniture at the stores. The customer can visit the showrooms, try the furniture and place an order at the showroom with the assistance of sales personnel. The order can also be placed online, if that is preferred.

The customer has two options to receive the products. Either they can be picked up at selected warehouses in Aarhus, Copenhagen or Odense or the customer can choose to have it delivered for a fee. The fee is calculated on the actual cost of delivery, depending on the distance, size of the product and also the manpower needed. According to Bolia, this is done so they do not benefit from the delivery. [bolia.com 1]

What Bolia has done is setting up showrooms at selected larger shopping malls where staff can guide customers and the customers can see and feel the product. Bolia is removing the need for stock, which reduce the expenses of the company. In return the customers receive a product that has not "collected dust in a warehouse" in two to six weeks. [bolia.com 2] Bolia turns the delay in delivery time into a benefit for the customer, while reducing their own costs of stock and storage.

When returning the piece of furniture the customer agrees to a refund of 75% of the cost price, as Bolia explains that they need to find another home for the product. The delivery is done by contacting a customer support line and claiming a refund slip. [bolia.com 3] This means that the customer cannot get a full refund and will have a problematic time returning the product while losing money on the transaction.

### Apps

To help the purchasing process Bolia has developed two apps. These media targets the channels of a younger segment, that is technically literate. The first app is used to see if the furniture suits the user's home. By taking a photo with a smartphone, the app will insert the user's desired product. The other app is to calculate which colours are suitable for the home, and give directions in the choice of materials. [bolia.com 4]

Creating a physical presence in the shopping centres and an active virtual presence allow the customers to base their decisions better on whether or not the products should be bought. Especially the app that allow the customers to see a visualisation of the product in their home, may minimize the need to returns, and both providing a better shopping experience for the consumer, while Bolia reduces the need for relocations of products and complaints.

An alternative sales strategy that is aimed towards the new segment could be considered, instead of using the same channels that are already established.

# FURNITURE TRENDS 2013-

## Introduction

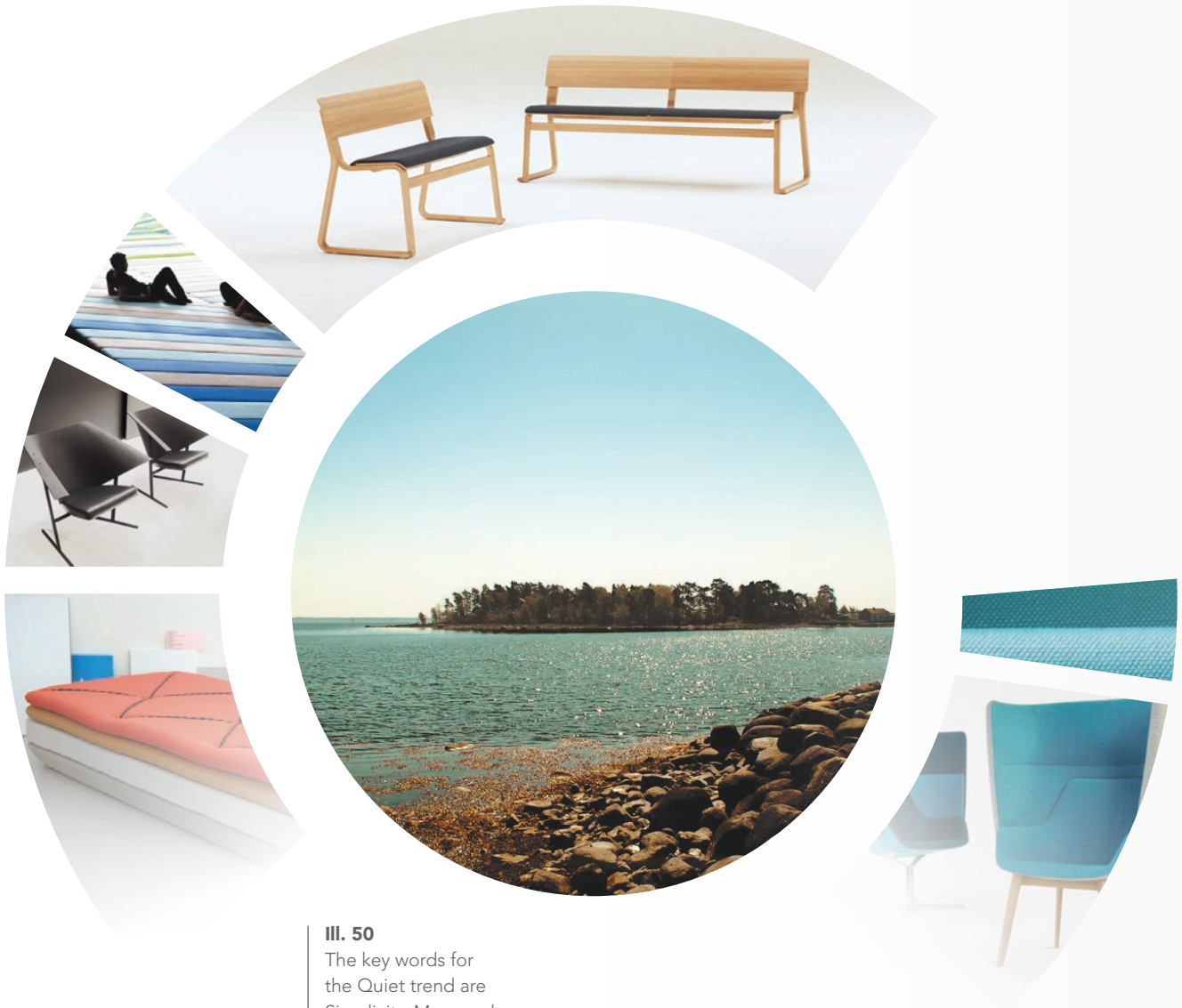
Based on the future trend magazine “Mix”, interior and furniture trends have been researched and three of them have been chosen for the project. The chosen trends have been decided based on what the design team have seen on Stockholm Furniture Fair 2013 and what “Mix” sees as upcoming trends for Autumn winter 2013/14.



## Alpine

The Nordic design culture is still focusing on wood and natural materials however it seems that the trend are moving towards an Alpine feeling. It is similar to the Nordic design culture using light wood types and pastel colour pallettes, however it also brings a roughness to the interiors with contrasting mono-colours and bark left on the wood. Animal and nature are graphical elements on textiles and in design. [Mix Issue 30 Four 2012, 52-59]





### III. 50

The key words for the Quiet trend are Simplicity, Mono-colour and Quietness.

## Quiet design

Simplicity in design has been focus for years however the trend seems to change to interiors and furniture that is not screaming for attention. British designer, Simon Pengally, says that his approach is to let the furniture tell its own story and let the aesthetics come from materials, manufacturing characteristics and the functional requirements.

[Mix Issue 30 Four 2012, 74-76]

At the Stockholm Furniture Fair 2013 the tendencies in the contract market seemed to be Quiet design with mono-colours and less details in upholstery. There was a focus on quite space where the user of the furniture can sit undisturbed.



### III. 51

The key words for the Construction & Structure trend are graphic upholstery, joints and light structure.

## Structure & Construction

At the Stockholm Furniture Fair 2013 constructural details in furnitlre were in focus and special details if upholstery or textiles were shown. Simple furniture had focus on interesting details in the joints and the composition of wood and textiles would create new products. Graphic structure in upholstery and textiles were seen in a lot of products to create depth in the product. Concepts with light construction and more volume at the seat area were also shown by several companies. [Visit to Stockholm Furniture Fair 2013]

# FOCUS GROUP

## Introduction

A focus group of eight people within the age range 50-60 were established because information about seating furniture use and buying criteria were needed to be researched. The seven people were chosen primarily out from their age and how fast the design team could receive response.

The first contact with the focus group was via email with a short questionnaire, concerning their current furniture and how they use them. Identity questions such as age and profession the central three questions were: “What is your most used seating furniture?”, “What kind of activities do you do in this furniture?” And “Why did you buy this furniture?” [The result of the questionnaire can be found in Appendix F]

In this section the result of the questionnaire will be presented. The focus group will also be used in further research and ergonomic testing however the design team chose to select four members of the focus group for the further design process due to their availability in time period. [Method report p. 12] The four selected people were within reach and were able to help the design team with interviews, activity analysing and ergonomic tests.

### Primary sitting furniture

The most used sitting furniture by all of the focus group members were soft-seated resting furniture in the living area. [Appendix F] Half of the focus group members used the sofa the most. The varying activities, which takes place in the living room are for example reading, knitting, watching TV, converse and resting. Most of these activities require movement and room for the body, and the sofa is ideal when changing from an active position to a relaxed, lying down position.

### Activities

Although the focus group spends a lot of time in resting furniture, they do not use all the time on sitting still. Watching television can be defined as a relaxed activity but the focus group tends to make their hobbies and interests in this furniture. Besides hobbies, also the daily routines move over in the resting furniture such as eating or reading mails. One activity that almost all of the focus group members would do in their primary furniture were reading which would require some kind of support under the arms. Besides hobbies, the focus group were also active in their spare time and were running, traveling, walking or sailing. [Appendix F]

### Buying criteria

Comfort was the primary criteria of buying for their chosen seating furniture. The second criteria is the styling of the furniture and if they think it was great-looking. However the criteria was supported by the look of the rest of the living room. Several of the focus group members chose their furniture because it fitted to the rest of the home and interior. The material and quality of the furniture did also have importance for a few of the members, as they were practical oriented in terms of cleaning and wear. [Appendix F]





### III. 53

Mette N, 56. The design team see her as a key person in the focus group. She spends a lot of time on activities and hobbies and value comfort and styling high in seating furniture. Several of her activities such as knitting, sewing and reading is done in her recliner, which require room for movement.

## Conclusion

The recline chair should accommodate the user's activities that are carried out in the sofa, with a need of comfort but at the same time gives space for the personal activities and a ideal seating posture. The purchasing criteria gives information that the focus group are also are similar to the results from the questionnaire, where comfort styling and quality are key factors.



## TESTING THE SORØ CHAIR

Four selected members of the focus group were invited to visit the studio at Aalborg University. This workshop was divided into two parts; first a situated interview [Method report p. 12, Appendix G] where the focus group discussed their furniture choice, preference and cost. The second part is a simulated use, where they were invited to try the Sorø chair so the design team could observe their interaction with a recline chair. From the second part of the meeting the following problematic areas in the use of the chair is observed.

### *Support when seating*

The focus group members supported the weight of their body, by placing their hands on the armrests when entering and exiting the recliner. The armrest is also used when repositioning themselves in the recliner (Pic. 1 & 2).



### *Chair height*

The difference in people's heights allow us to see that shortest member of the focus group hunches when using the armrests, while the tallest member found the back of the chair too short to comfortably use as a neck rest (Pic. 3 & 4).

### *Neck rest and armrest*

The neck rest is not supporting the focus group when reading. The armrest is used in different ways by each member of the focus group when reading a book. When some of the taller members of the focus group reclined in the Sorø chair the neck rest did not support them well, because it was too low (Pic. 5 & 6).

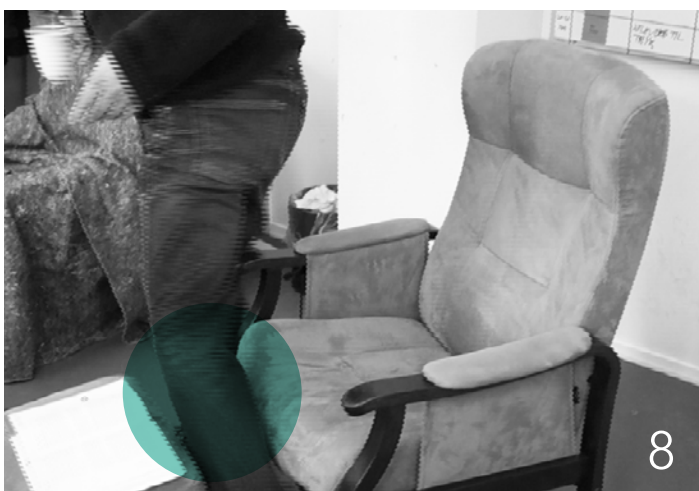
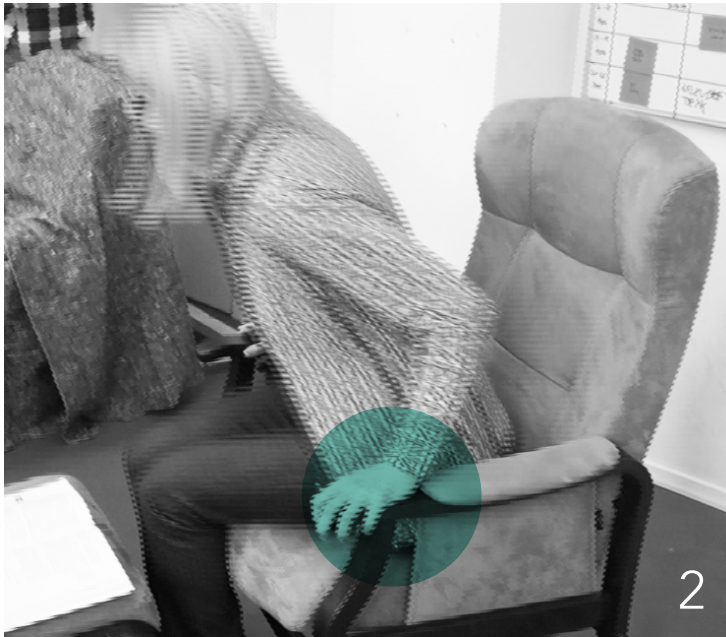
### *Ottoman*

The Ottoman is an obstacle when entering or exiting the recline chair. During entry the focus group members slides in sideways. When exiting the recliner, the focus group members swings out the legs and exit the recliner sideways (Pic. 7 & 8).



## Conclusion





The focus group using the Sorø chair showed ergonomic difficulties when the chair was used by more than one body type. The important areas for a comfortable recliner based on the focus group meeting were the neck rest, armrest and ottoman. These functions were found important both in the need of comfortable seating but also in the activities e.g. reading or knitting. To understand which areas that are crucial for good ergonomics when seating and reclining the following pages will look into theories of ergonomics.



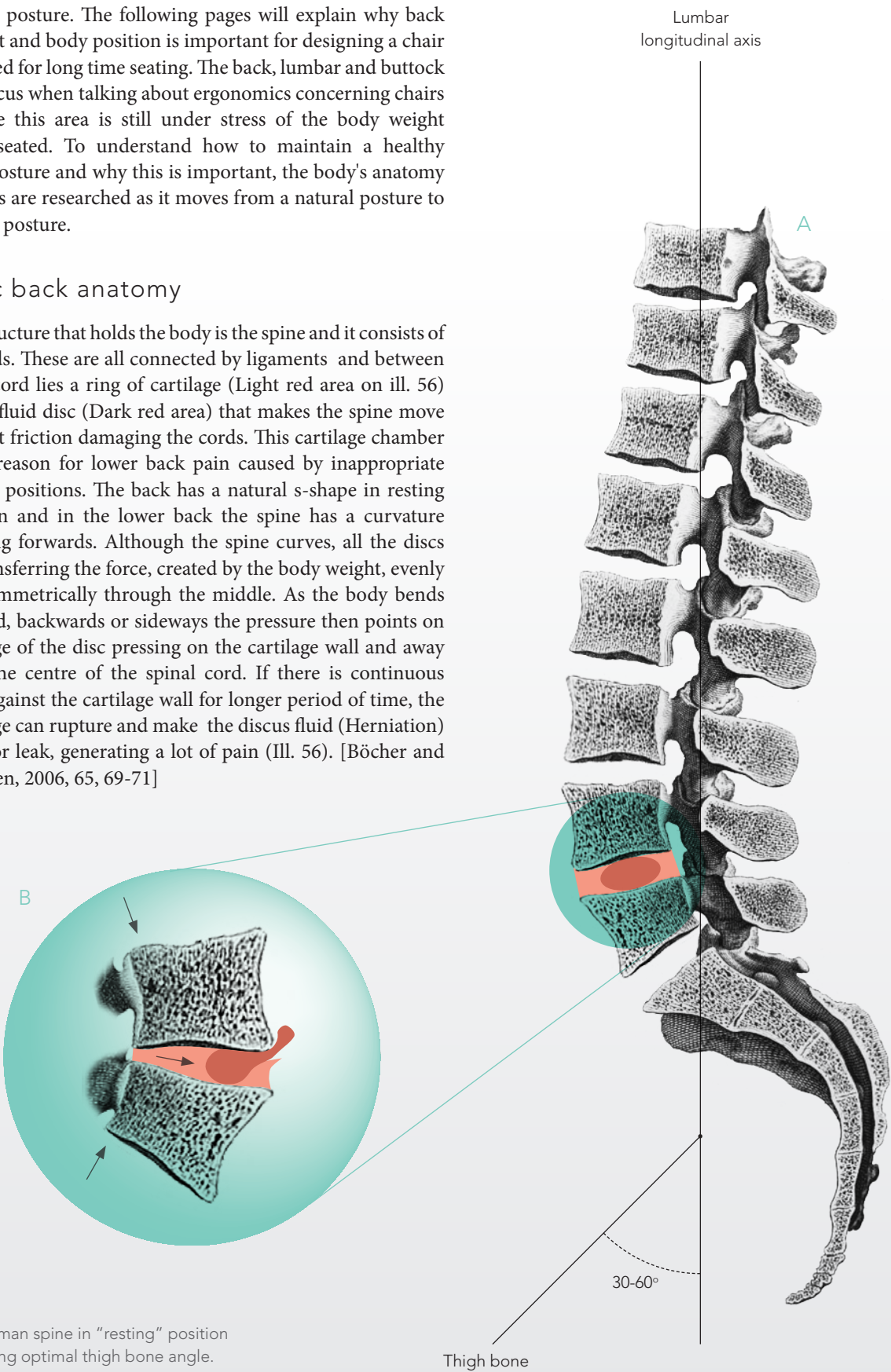
# ERGONOMICS

## Introduction

In order to create a comfortable chair it is important to understand the human body and how to maintain its natural posture. The following pages will explain why back support and body position is important for designing a chair intended for long time seating. The back, lumbar and buttock is in focus when talking about ergonomics concerning chairs because this area is still under stress of the body weight when seated. To understand how to maintain a healthy body posture and why this is important, the body's anatomy changes are researched as it moves from a natural posture to seating posture.

## Basic back anatomy

The structure that holds the body is the spine and it consists of 24 cords. These are all connected by ligaments and between every cord lies a ring of cartilage (Light red area on ill. 56) with a fluid disc (Dark red area) that makes the spine move without friction damaging the cords. This cartilage chamber is the reason for lower back pain caused by inappropriate seating positions. The back has a natural s-shape in resting position and in the lower back the spine has a curvature pointing forwards. Although the spine curves, all the discs are transferring the force, created by the body weight, evenly and symmetrically through the middle. As the body bends forward, backwards or sideways the pressure then points on the edge of the disc pressing on the cartilage wall and away from the centre of the spinal cord. If there is continuous force against the cartilage wall for longer period of time, the cartilage can rupture and make the disc fluid (Herniation) bulge or leak, generating a lot of pain (Ill. 56). [Böcher and Jakobsen, 2006, 65, 69-71]



III. 56

A: Human spine in "resting" position showing optimal thigh bone angle.  
B: Herniation.

Restoring resting position

The focus group interview showed that the members were doing everyday activities or hobbies while seated, and it becomes relevant to explore the human as Homo Sedens (The Seated Man). A. C. Mandal has collected material from several international experts who have researched on the seated anatomy and he describes how the body has a posture where the body is in muscular balance together with an optimal lower back curvature. The “resting” position originates from a person sleeping on the side. It is determined as a 30-60° angel between the thigh bone and the centre of gravity line (lumbar longitudinal axis) where both front and back thigh muscle are relaxed (Ill. 56). At this angle the lumbar remains its natural s-shape. [Mandal, 1983, 21-33] The spinal resting position is also visible when standing in a straight upright position. As mentioned earlier, bending the body forward or backward the shape of the spine will change to one consistent curve putting strain on the back. To be able to hold the resting position in the back when seated in a chair, a lumbar support is necessary to restrain the displaced pressure on the spinal disc created by the upper body.

Design wise, this change of body posture has to be considered in all the functions, the recliner provides to maintain good comfort whenever the user is changing position.

Comfort observation

The anatomy research gives a foundation for body posture but in terms of chairs a lot of measurements is still needed to satisfy a template that can be used in the concept development. To get the measurements right, the design team visited Brdr. Sørensen. [Method report p. 11] Chairs with particular good comfort were noted down and measured. Also chairs with critical comfort elements was noted to avoid the same mistakes in the later concept development.

Four chairs and one sofa were noted as furniture the design team experienced as good comfort. Common for all of the furniture, were the placement and shape of the lumbar support that made the furniture feel comfortable for the whole back. Four of the furniture did also have a wide open curved back that allowed the user to move position sideways without compromising on comfort (Ill. 57).

The result of these observations is measurements representing the average. Furthermore the research is based on subjective estimations of comfort. To verify the measurements for long-term use, further ergonomic research was made on upright seating posture.

Ill. 57  
Chosen furniture from Brdr. Sørensen. Seat height and depth measured in mm.

Furniture	CH28	NAP	Pernilla	Poet	Pelican	Avrage
Seat height	370	460	410	380	320	~ 400
Seat depth	500	400	520	550	480	~ 500
Seat angle	12°	5°	25°	3°	11°	~ 10°
Seat/back angle	100°	90°	104°	97°	98°	~ 100°



CH28



NAP



Pernilla



Poet



Pelican

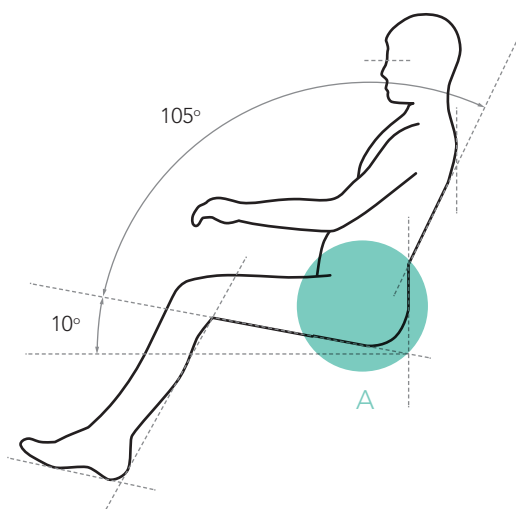
## Upright Seating Position

To validate the reclined resting position and the primary seating posture, a look beyond contemporary chairs is made. It was necessary to find information on seating posture where comfort has especially high importance. A chair where the user has no other option than to be seated, is in wheelchairs. The main issues when talking about wheelchairs and comfort, is the deep tissue injury (DTI) caused by pressure and shear when not seating in a stable position. All though the deep tissue injury and pressure wounds may not be a highly critical situation for a recline chair, it is still relevant in connection to good comfort and not getting sore when sleeping or seating for a longer period. Helle Dreier describes three central factors when achieving good seating comfort: stability, pressure distribution and everyday activity. [Tryksår, 2010, 7-12]

### Stability

When seated it is important that the body is not forced in other directions than straight down. The wrong angles or support can result in the tissue pushed away from the bone structure and the seat bone tipping over causing a shear that can damage the tissue due to the already high pressure on the seat bones (Ill. 58, fig. B). To obtain stability it is important that the body keeps its natural posture. This posture is the same mentioned earlier when in a resting position. It is not the muscles but the spine that is holding most of the upper body weight. This force goes straight down to the seat bones that presses directly on the tissue and skin and not away creating shear (a & b, Ill.58.B). It means that the lumbar support not only keeps a healthy spine curvature but also minimizes shear on the tissue by creating a third support point (c, Ill.58.B). [Tryksår, 2010, 7-12]

The company Sella, who makes measurement tools for optimal seating, has defined this “sound sitting posture” that creates the “maximum of comfort”. [Sella, 2008] As from the earlier theory (P. 57), the angle between the back and the thighs defined the optimal posture but the “sound sitting posture” is also defined by the seat angle and its relationship to the back angle. Sella has defined the seat angle to be 10° and the angle between the seat and the back to be 105° (Ill. 58.A).



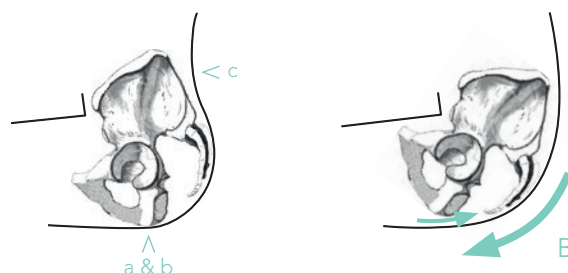
Sella also defines the lumbar support and its connection to these angles. The lumbar support is formed when a vertical line following the lumbar meets the seat and the backrest. [Sella, 2008] The height of the lumbar placement is not defined as it varies with the size of the person sitting in the chair. The position is therefore determined by the furniture observations and is set to 200mm above the seat, bearing in mind that it may have to be adjustable to the individual user (Ill. 59).

### Pressure distribution

The pressure distribution is basically about supporting the body in as many points as possible to make an even load on the body. When seated most of the force is put on the seat bones and some times the tail bone but to minimize the pressure on these specific points it is a good idea to distribute the load around these areas such as thighs, lumbar area and lower back. Distributing the load can be done by transferring the body posture and curves to the seat and backrest. [Tryksår, 2010, 7-12]

### Everyday activity

In terms of activity, Helle Dreier is talking about moving in and out of a wheelchair and sitting in the same point of the wheelchair where comfort is optimal every time. [Tryksår, 2010, 7-12] As the design team is working with another product where the user is able to be active on another level and the recliner should be able to adapt to a broad range of users, this parameter is seen as “making room for body movement”. In other terms – the user should be able to move and still be able to achieve great comfort. This will be tested on a full-scale mock-up model (P. 61)



### Ill. 58

A: Definition of the angles determine a sitting posture.  
B: Optimal three point support and a two point support that creates shear.



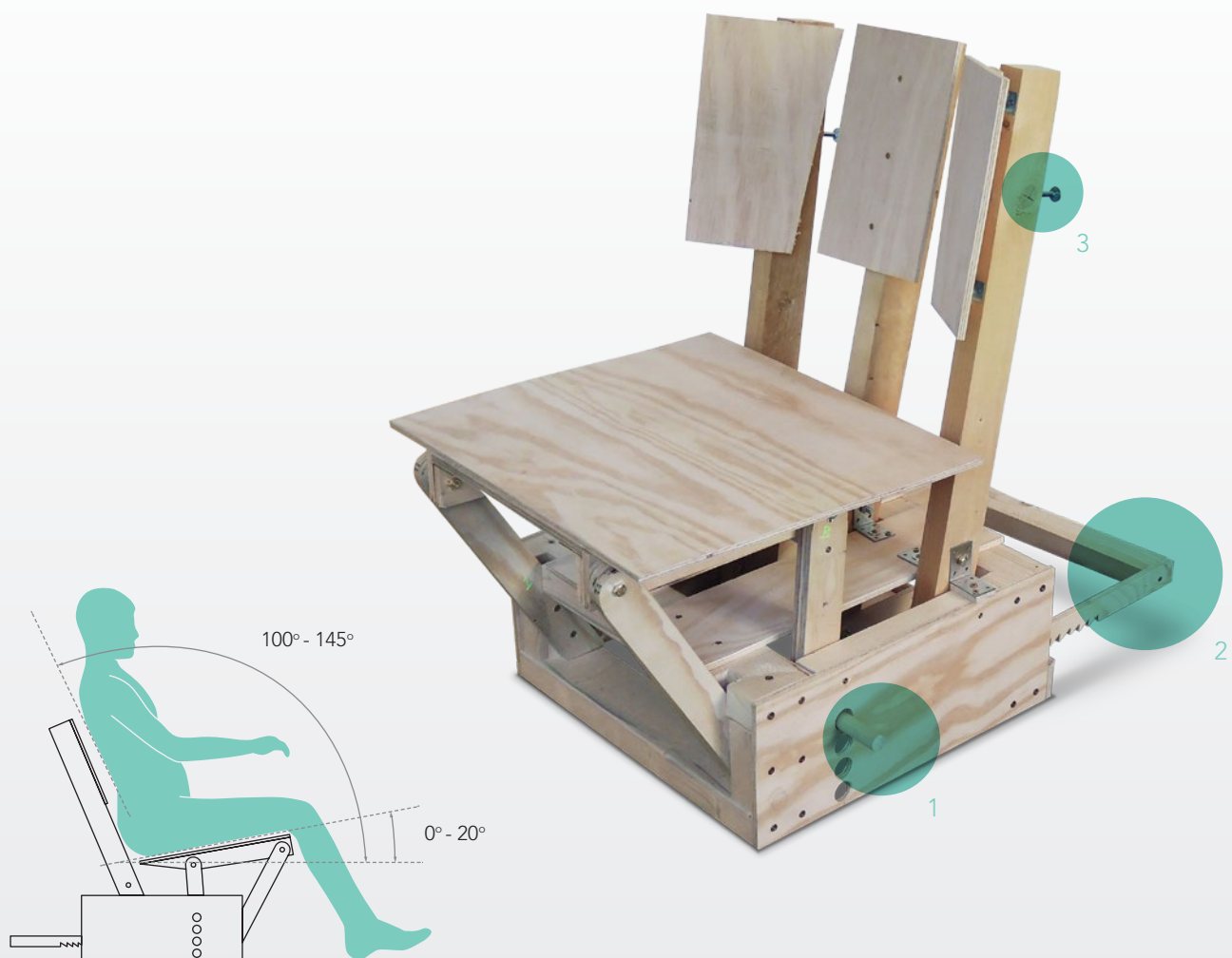


## MOCK UP: PART I

The comfort machine was build to test and verify the theoretical measurements of the right seating positions to achieve active seating. The seat was built on adjustable legs that with a vertical movement allowed the seat to be positioned in different angels. (Ill. 60 1) As it was the hind legs that could be moved up and down the seat height remained the same at 450mm. The backrest consisted of three pieces: The middle piece could move individually and the two outer pieces move together to ensure an even curve. (Ill. 60 2) The back plates on the outer pieces were also able to turn against the middle creating the measurable curve (Ill. 60 3).

Because it is not possible to make an ergonomically correct chair that fits every types of human, the theoretical measurements is tested physically to find the comfortable midway where the majority gets a great experience. Both the design team and the focus group tried the comfort machine to get tests results from a range of body types. The mock-up was adjusted during the tests to compare positions. The angles were also tested for optimal seating position for their activities such as reading and knitting.

The test of seat and back angle can be found in Appendix H.



### Highlights

- 1 - Four step seat angle control.
- 2 - Toothed rack controlling the recline degrees.
- 2 - Bolt adjusting the curvature on the side pieces.

III. 60  
Mock up model.

### Back curvature

As movement in the recliner is a demand observed at the focus group interview it was important to create a curvature in the back that is open enough to make it possible to move around but at the same time making a curvature comfortable for the back. The curvature was tested on the mock-up model.

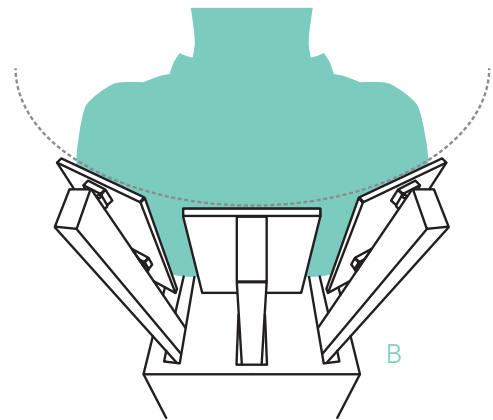
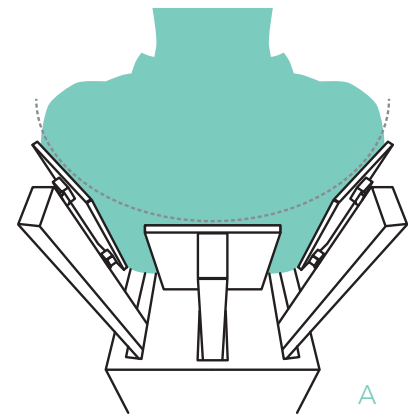
Although the angle plates on the outer pieces made a natural angel from the pressure of the back and shoulders it became closed and the body was not able to move (Ill. 61.). This is an example of when design becomes too ergonomic adapted it minimizes the freedom of movement. If the curvature becomes too wide the chair does not provide an even support on the whole back.

### Seat depth

From the Brdr. Sørensen research the seat depth was set to be 500mm but this depth did not have the same comfortable effect on the comfort machine. During the testing Mette N, from the focus group, mentioned that it was uncomfortable in the hollow of the knee. Which the design team used to re-evaluate the depth of the seat. The chair is without upholstery, which means that the feeling of the sharp wooden edge may increase this feeling. In the future use of the mock-up, it will be inclusive of upholstery, which means that the actual depth of the seat when seated is significant shorter and this feeling is less dominant.

### Conclusion

The goal for the comfort machine was to verify the theory on the focus group and incorporate unknown parameters such as person size and comfort versus activity. In terms of activity the adjustment of the back curvature was an important part of ensuring mobility and comfort. However the machine revealed a critical problem with the seat depth that has to be corrected.



III. 61

A: Closed curvature.

B: Open curvature.



## INTERVIEW II

An interview was carried out with Jette Bangshaab, associate professor at the physiotherapy education at University College Nordjylland. [The complete interview can be found in Appendix I] The interview was held to verify the conclusions the design team made on different ergonomic theory and tests. Furthermore she was interviewed about upholstery and the need of it.

Jette Bangshaab said that it is not possible to create a chair that suit all body types and postures, instead she suggested to follow anthropological measurements to give an indication of the dimensions of the chair. She believes that the chair should give comfort to most users and it must not dictate the posture.

*"You cannot dictate the posture"*

During the interview, Jette Bangshaab highlighted the support of the lumbar as a crucial area, as it is different from person to person. It depends on the individual's size, posture, preference and use of the chair.

The areas that are the pressure point areas for the sitter are seat length and height, as they could cause irritation in the

hollow of the knee. Through testing of the mock-up model on the focus group this was also experienced as a problematic area.

*"It is important not to keep a position for too long, because even if it is a good sitting position, pressure will occur after prolonged sitting."*

According to Jette, the upholstery on back, seat and armrests are important areas, as these provide the pressure points for the user. She suggested researching a material that is not too hard and not too soft for the user, where she suggested memory foam, that changes form by making small movements in the chair and provides a new distribution of the weight. She carried on saying that a "good" sitting position needs to be changed, as prolonged sitting is not beneficial.

Creating a chair that allows for movement either in the upholstery or the form can provide a better sitting for the user. The chair needs a flexible lumbar support that can accommodate the difference in people. Upholstery should be added to armrests, seat and back.

# IDEMØBLER VISIT

## Introduction

A visit to Idemøbler – Max Jessen Terndrup took place, to find out how contemporary design on the recliner market looked like and what costumers are looking for when buying new furniture. The visit had two purposes: The focus group tried out of recliners and questions about Idemøbblers range were answered by sales people Erik and Keld. The visit should give an idea of which kind of functions in a recline chair was found important by the focus group and other customers seen from the salespeople point of view. Shadowing method was used when the focus group tried the recliners. [Method report p. 13] The full interview with the salespeople can be found in Appendix J.



III. 63: Brunstad was chosen as favourite chair because the functions was easy to use and the armrest nestle close up to the body.

## Competitive recliners and focus group

Mette N and Børge N from the focus group tried out different recline chairs. The approach to the chairs was equally to how attractive the chair was to Mette N and Børge N. Mette N always chose to try a chair she felt attractive too because this was an important parameter to her. Afterwards she would try the comfort of the chair and how easy the functions were to use. It was important to Mette N and Børge N that the chair had the right support for legs, head and lower back.

They tried out seven different chairs and the favourite recliner was Amanda with Ottoman from Brunstad. It was wide and the armrest nestle close up to the body and Mette N could almost hide in it. It had a rocking function, which Mette N found relaxing. It also had a small pillow in the lower back to suit the user and a discreet lock on the inside of the armrest is working smoothly. However when the price (20,000DKK) was revealed, Børge N meant that the great comfort and design could not compensate for the high price.

## Electrical functions are for elderly

Mette N also tried out two chairs with electrical seat lift, reclining function and leg rest. She tried a Sorø by Nordic Easy Chair (15,997DKK) with integrated functions. She felt that there were no room for the feet when seating because the leg rest was in the way. Furthermore there was not enough support on the leg when lying down and the electrical help was to slow. She also tried a Comulus by Himolla (7,795DKK) where she felt there was better room for the feet when seating. In general Mette N and Børge N did not like the styling of the recliners for elderly people but they both agreed that they had great comfort.

## Customers want comfort and timeless design

Erik and Keld at Idemøbler – Max Jessen Terndrup were interviewed and they said that the customers at their store always had been quite conservative when buying furniture. The primary parameter when buying a recliner was comfort and price was less important. Comfort was both achieved in the upholstery but also in the different functions the recliners offered. Expensive design classics is not saleable in a store like Idemøbler however they have a lot of furniture that have details and styling approach as furniture from past architects like Le Corbusier and Poul Kjærholm. The customer is style orientated but does not want to pay several of thousands for a piece of furniture.

Erik furthermore told that the majority of customers bought their furniture in black and steel and leather was among the most chosen materials because of their durability. When their customers bought furniture that was intended to last for 10-15 years they tend to be conservative and buy what seems timeless and traditional. According to Erik changeable textiles was a trend that finished several years ago and it was only IKEA who is still doing it and customers associate it with poor quality.

According to Erik the customer habits have changed a lot through the past decades. When he started as a salesman in Vodskov bolighus customers bought and furnished whole rooms at one time but today the trend have changed and furniture is bought occasionally .

## Conclusion

Based on the shadowing method and interview with salespeople at Idemøbler – Max Jessen Terndrup it can be concluded that comfort is an important factor when buying recline furniture both in terms of upholstery and functions. What makes them try the furniture in the store is the styling, where the comfort is what makes them buy the chairs.



# NEEDS AND WISHES

The *Researching & Analysing* have made foundation for needs and wants for the concept. To illustrate these, they have been collected in a diagram, which shows which stakeholders the needs and wishes have been collected from. The diagram have taken inspiration from the House of Quality and the diagram will later be used in the concept development. The importance of the wishes have been given from a factor 1-3, where 3 is most important.

- Consumer
- Nordic Easy Chair
- Furniture market
- Ergonomic research

## Needs

- ● High quality  
*The concept should exude quality in materials and function*
- ● ● Modularity  
*The consumer should be able to fit the chair to their needs*
- ● The concept should not look like an helping aid
- ● Innovative  
*The concept should be innovative for Nordic Easy Chair*
- User interaction  
*The use of functions should be easy readable*
- ● ● Adjustable comfort  
*The chair should approach as many body types as possible*
- ● Room for movement  
*The chair should invite to do different activities*
- ● ● Recline function  
*The chair should have a reclining function*
- Neck support  
*In reclined position a neck support is need for optimal comfort*

## Wishes

- Alpine trend (2)  
*The styling could approach this trend in some levels*
- Structure/Construction trend (2)  
*Details in joints and stitching could approach this trend*
- Quiet design trend (2)  
*Simplicity in the concept*
- ● Price estimate (2)  
*10,000-15,000DKK Sales price*
- Accessories (1)  
*Integrated lightning, table or storage for activities*
- No electricity needed in functions (3)
- ● Swivel function (3)





## REFLECTION

The project mission is to design a recliner for Nordic Easy Chair so they can approach a younger segment and be competitive on a new market but still keep their core values as Nordic, quality, timeless and comfort.

The research of the consumer showed that these core values where also something they went for in a buying situation however styling were also a primary factor. The output of the consumer questionnaire was a styling that was organic and simple oriented. This was also supported by the further research of future trends of the consumer and the furniture market.

The initial research of chairs and their values showed that the height of the back of the chair was an important factor of the experience of the chair. In the different periods the chair was a status symbol and the higher back the more status. A further research and test of different chairs showed that this symbolism is more obliterated today and a lower back gives the user more freedom of movement in the chair. In addition the design team found out that several activities were done in the relaxation furniture by the focus group. Therefore the approach to the functionality of the chair was that it should both invite to different activities as well as relaxation.

The comfort level in the recliner is important because this is a parameter that the costumer would not compromise. The interview with the focus group also showed that in different situations the neck rest, Ottoman and armrest were areas that could increase the comfort level. The focus group consisted of different sizes of people with different needs in the size of the chair. The areas that had the most importance for a good comfort were the placement of the neck rest, depth of the seat and height of the seat.

A further research took place of the ergonomics in the chair. This was both done to create a pre-understanding of the important ergonomics in chairs but also to find out, which optimal measurements of ergonomic sitting positions could be obtained in the chair. The seat depth of the mock-up model was based on the depth from the measurements of Brdr. Sørensen chairs. This were tested to be too deep on the mock-up model without any upholstery. The design team therefore had to keep in mind that the thickness of the upholstery would have an important factor of the mock-up, and further testing were therefore with upholstery.

*Researching & Analysing* gave the design team a more specific design task that were how to combine an active sitting position with a more relaxed reclined position while still approaching a younger segment with comfort and styling. In addition the researching and analysing resulted in a list of needs and wish from the consumer, Nordic Easy Chair, the Furniture market and the ergonomic research that the design team will use as catalyst for the future concept development and drafting.

## **PROBLEM STATEMENT**

How can Nordic Easy Chair, with a strategic change, approach a younger segment while still keeping their initial core values? And how can a recliner where styling and comfort meets reflect this change?



## Introduction

The *Researching & Analysing* gave the design team needs and wishes to work with in the concept development. The concept development has been based on the active and passive chair, activities done in the chair by the focus group and trends. The process of the concept development was done by sketching and scale model making to get a feeling of the proportions of the concepts. Methods used can be found in the Method report however one method particularly were found as a great concept development method: 6x6 sketching method.

Function and styling were the primary parameters used in the concept development, however the ergonomic basic position

(P. 59), was used in the sketching process to keep proportion realistic. Three concepts will be introduced, which also were presented to Nordic Easy Chair and at the Status Seminar II and they will be followed by a comparative analysis.

In addition to the concept development, the future strategy for Nordic Easy Chair and the concept will be presented last in the chapter. Strategic methods as Madonna curve and Strategic diamond have been used to compose a strategic move for Nordic Easy Chair where their current core values are kept but they become competitive on another market than their present.



A photograph of a grassy field with scattered white plastic chairs and a large brown circular graphic overlay. The text "Concept & Strategy" is written in a white, bold, serif font across the center of the image.

# ***Concept & Strategy***



## ACTIVE/PASSIVE

### Six concepts

The new segment has an active lifestyle. The seating furniture they are buying can either display this lifestyle or they can use the chair to recover.

Six models were developed to examine what the difference between an active and a passive chair is. Active and passive chairs were researched earlier in the process (P. 37). [Method report p. 14]

The team has defined the passive chair as a seat for the user where there is one position available, that the user is confined to. The user has the option of sleeping in this chair. This is the type of chair that Nordic Easy Chair is currently making.

The active chair provides a flexible seat for the user where they can sit in different positions while it is possible to carry out different activities.

### Passive chair concepts

**P1** This chair is a narrow rocking chair. The narrow seat makes little room for movement in the seat. The chair can be reclined and head- and leg rest can be adjusted to provide a proper support.

**P2** This chair is a lounge chair with an upholstery that slides into the frame of the chair. The upholstery is designed to the individual's wishes, so the desired support for back and seat is achieved.

**P3** This is a recline chair that transforms from an upright seating position to a lying position. The neck rest is hidden behind the back of the chair and becomes usable when the seat slides forward.

### Active chair concepts

**A1** The low chair is a rocking chair where the seat slides in the frame. The upholstery is loose. The rocking function is used to keep the sitter active in the chair. The broad armrest act as a table.

**A2** This chair is a low chair that can be transformed into a two seat bench by rotating the armrests 180° backwards. The bench allows for talking and gives the user a temporary seat.

**A3** The chair is a wider chair with an upholstered back. The user can sit in different positions resting the back on the curved back.

### Conclusion

The six concepts were discussed to find out where each concept had potential and where there were room for improvements. The concepts focus on different aspects of the chair. The rocking function can be seen in both P1 and A1 but they are integrated in different ways making the rocking experience for the user completely different. P3 and A2 have a transformation aspect where the chair visually changes from one type of chair to another. P2 is an upholstery technique and A3 is flexible chair that allows the user to change position.

The purpose of this method was to develop concepts on the two subjects, to get an understanding of what an active and a passive chair could look like. During the evaluation of the concepts it became apparent that the passive chairs provided a static seat and that the chair needed to be transformed from a seated chair into a sleeping position. The active chair was a more playful piece of furniture that had different function or seating positions. All the passive chairs have a high back to provide a neck support for the sitter, while the active chairs are all made as low chairs. This was done unintentionally. Noticeable for all concepts are that they are lacking a leg rest. Even though P1 and P2 were generated on a passive chair they still have an active element as rocking and swivel function.

Creating a recliner where the primary functions are sitting still or sleeping is in contrast with the focus group's current active lifestyle. Instead the concept should encourage and illustrate the user's active lifestyle, while it allows for the user to incorporate their daily life in the chair.

## THE NEW CHAIR

### Definition

The active chair is defined by having flexible seating options, where the user has room and possibility of changing position. It is an open chair to create a social seat in the room, where it is possible to interact with other people. At the same time it can also provide a more private space where it allows the user to rest. The passive element of the chair is a secondary function that is incorporated on the same level as other activities. The resting element does not become a dominating feature on the design of the chair.

The chair should primarily be an active chair that is both comfortable and allows different activities of the users. It is important that the chair reflect the active aspect and allows for a subtle transformation into a passive chair. Nordic Easy Chair's existing product range is reclining chairs and maintaining this element in the new chair, continues to utilize their expertise in this area.





P1



A1



P2



A2



P3



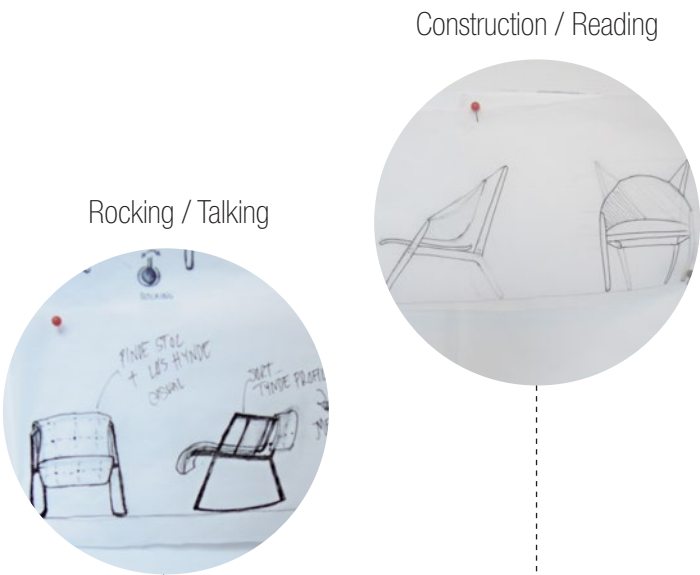
A3

III. 71.a-f  
1:10 scale models

# FUNCTION/STYLING: 6X6

The previous models did not focus on additional function and styling in the chair. The focus group interview and trend research left the design team with parameters that could have influence on the design. These parameters were split up in two categories: The trend research which had influence on the styling and activities the focus group member did in their seating furniture.

The two categories were randomly combined in six-step sketching round. [Method report p. 15] The sketching gave ideas of the connection between activities and design. Every sketch was evaluated and compared to find similarities and clearly differentiated concept directions. The directions that were chosen to follow was based on the modularity in the chair and how the chair invited to active use. All modular, Semi-modular and Integrated were seen as headlines for directions. An additional round of sketching took place and this led to the three concepts on the next pages.



First word is from the trend research and second is activities from the focus group.

As little as possible / Eating



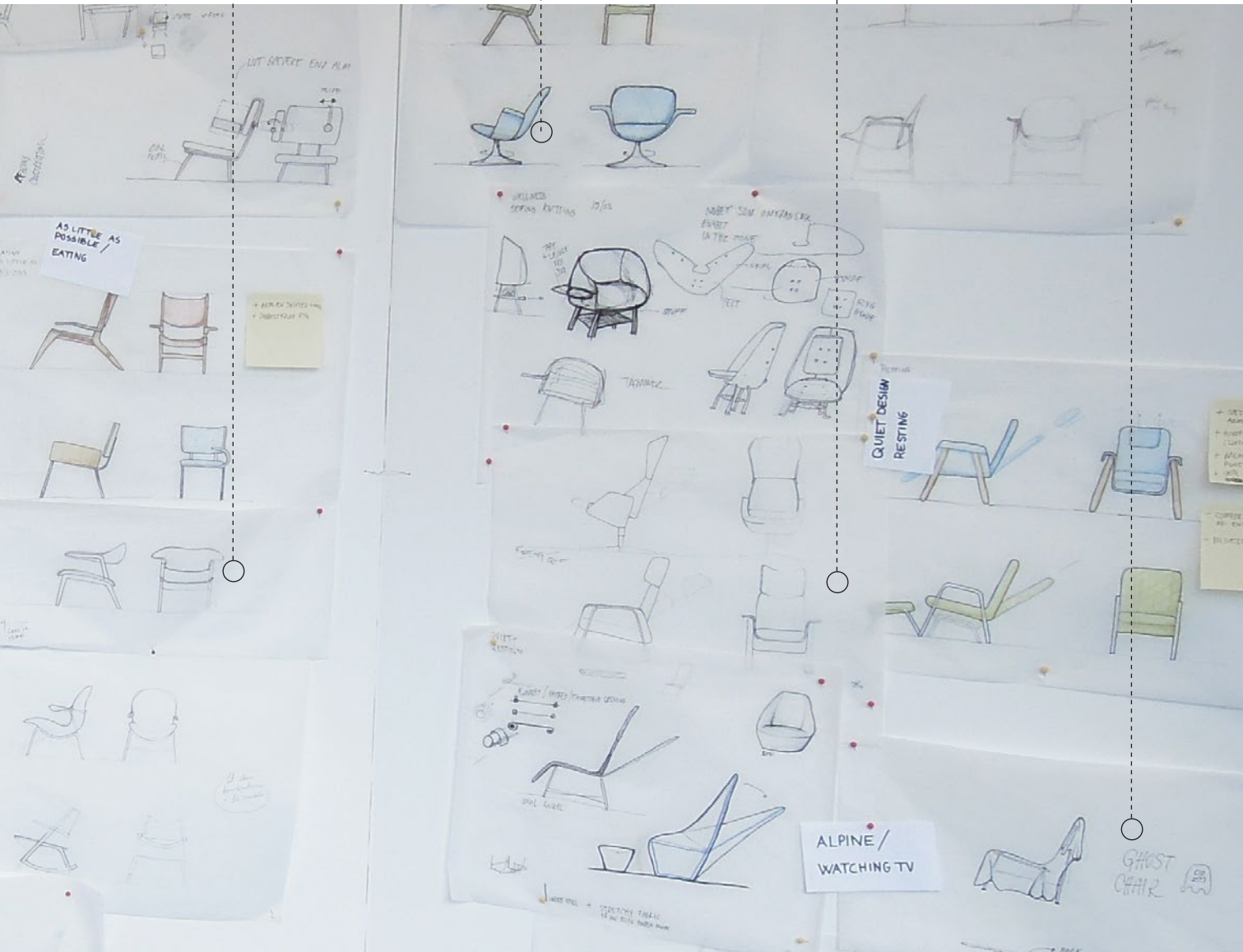
Wellness / Sewing, Knitting



Quiet design / Resting



Alpine / Watching TV





## THREE CONCEPTS

### Condensing the concepts

Several of the sketches contained the same ideas of an open and transformable chair but there was a big difference in the modularity of the concepts. The ideas were therefore condensed to three concepts that had diversity in how the functionality transformed to satisfy the idea of a chair that can adapt to the user's needs.

### Combining the story

When connecting function and styling, a universe began to evolve around the concepts. The idea with a recliner with room for movement and adaptability where equivalent with the philosophy of nature and animals adapting to the surrounding conditions. This philosophy sets the names given to these three concepts, which are derived from different types of birds. The shapes and overall expression determine the type of bird species.

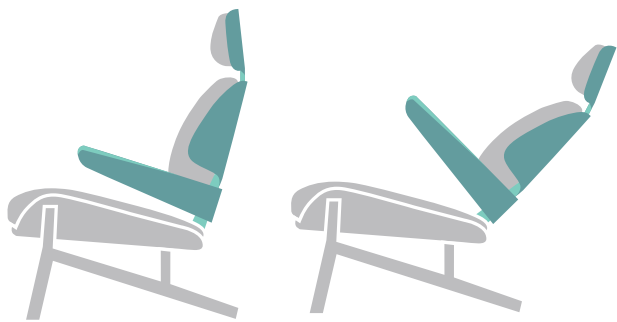
Albatross is one of the world's largest flying birds and it is majestic among sea birds. The calming roaring ocean and the slow movement of this giant bird plays well with a resting chair and the simple curved shells has reference to the slightly curved tip of the albatross beak.

The duck creates references to the hunting society and joyful cartoon characters. Having these references the resting chair becomes more playful but also classy furniture at the same time. Like the albatross, the duck is also a slow mover that floats around the pond in quietness and harmony, which represents the feeling of being relaxed in the chair. The shape has visual references to the bird as the armrest spreads out as wings together with the curved seat representing the chubby but streamlined body of the duck.

Goose is also known as a hunter or farmer's animal. The goose is more classy and elegant than the two other birds, which is also represented in, how the chair is shaped. With sleek legs and neck together with the dynamic curved body the chair obtains a quiet and simple silhouette.

Albatross

This concept was modular and the neck rest, armrest and upholstery are changeable. It gives the customer the possibility to decide the comfort level of the chair in connection to needs on the date of purchase. The intention with the modularity is also to give the user the possibility to increase the comfort level throughout the lifespan of the recliner. The transformation feature functions as an associated service where an installer, provided by Nordic Easy Chair, assembles the additional features at the customer’s home. The basic construction consists of four wooden shells combined with large visible bolts making the elements easy to change. The upholstery is easy fixed on the shells for easy replacement as well.



III. 75.a-c

Albatross is a modular concept where the user can fit it to their needs. The arm-, back- and neck rest reclines.

Pros

- Satisfy specific user-comfort needs.
- Individually defined chair.
- Transformable from light easy chair expression to recliner with heavy expression.
- The wooden construction is a current tendency.

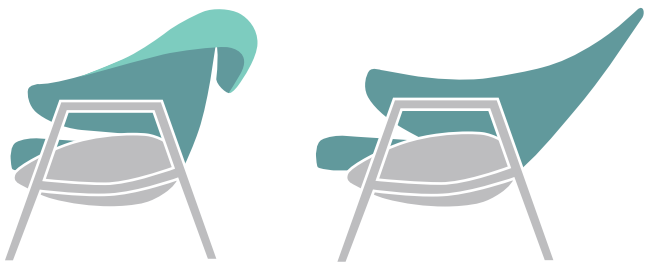
Cons

- The styling is complex and the construction is similar that of an office chair.
- It has strong references to the known design icon: Eames Lounge Chair.
- The large number of wooden shells makes the chair very expensive.
- The Ottoman has to be bought individually.



# Duck

The Duck recliner is two shells made in felt. It is designed with the active and passive chair in mind. The material is important for the function of the chair as the felt forms the collar and creates the functionality. The Duck can transform by flipping the collar and be either a light open chair or a private and closed resting chair. The basic shape is a wide-open curve that allows the user to move around changing seating position. The shell construction are connected through the legs and provides rotational fixation for the back.



## III. 76.a-c

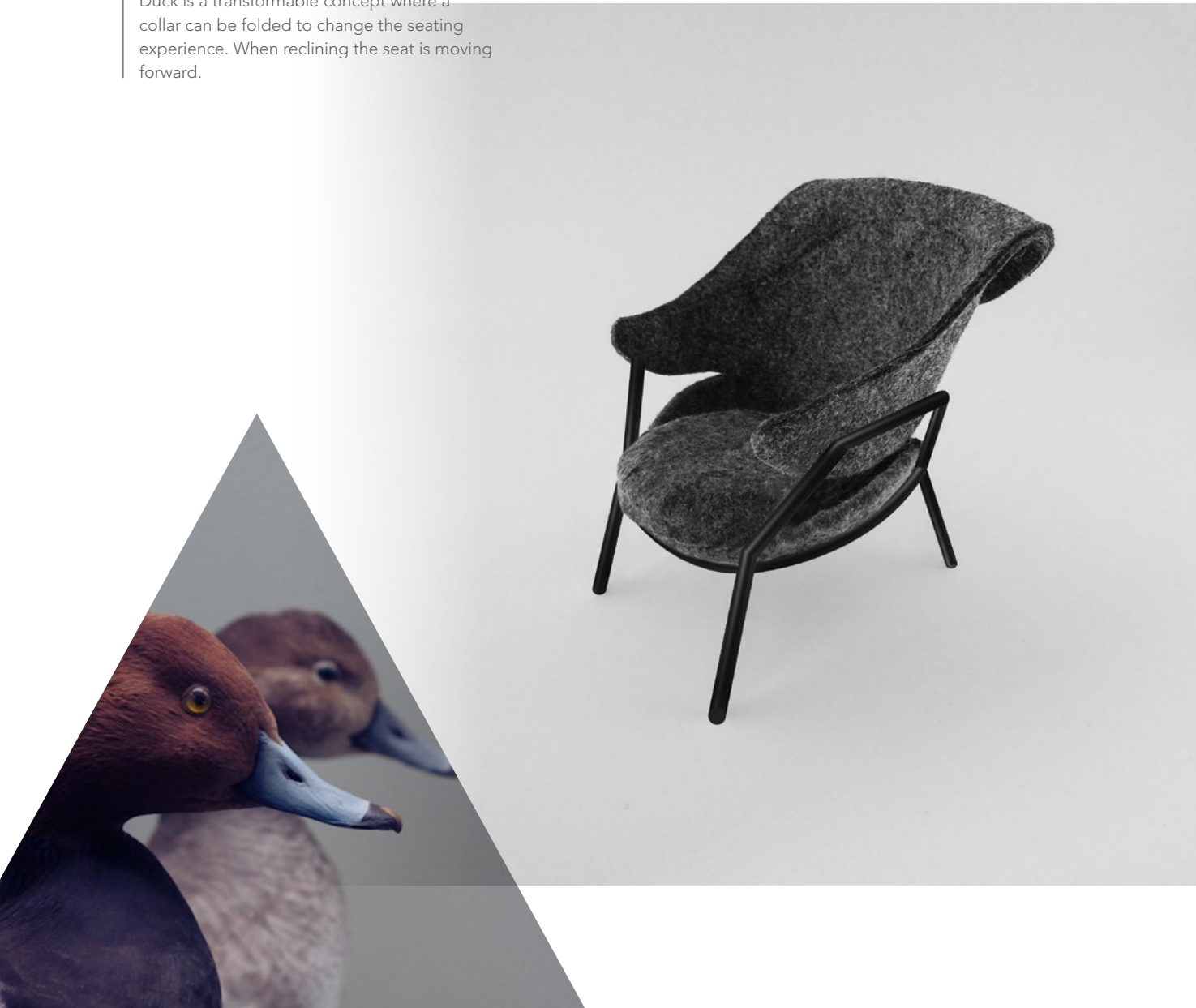
Duck is a transformable concept where a collar can be folded to change the seating experience. When reclining the seat is moving forward.

## Pros

- Great connection between function, aesthetics and material.
- The open arms is welcoming and warm and has certain recognisability.
- The idiom is contemporary and modern, which appeals to a broad segment.
- The open shape invites to changeable seating positions.

## Cons

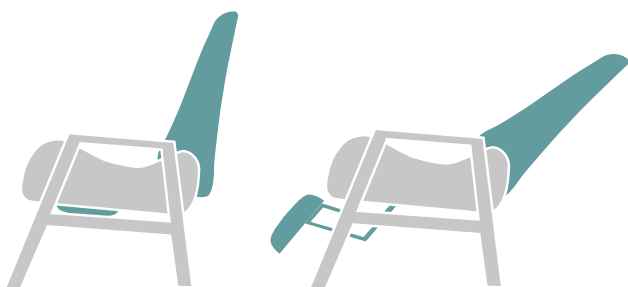
- Felt is not very durable for frictional wear and may not look good after 10 years.
- The transformation is not user friendly as the collar is difficult to operate when seated.
- The Ottoman has to be bought individually.





Goose

The primary feature in this recliner is the integrated leg rest. The chair has a mechanical leg rest that appears from underneath the chair when reclining. As the Duck chair the Goose is a two-shell construction consisting of a seat part and a high back. The whole construction is upholstered except the legs and armrest.



III. 77.a-c

Goose is the integrated concept where a leg rest appears when the user reclines.

Pros

- The recliner express lightness despite it has an integrated leg rest.
- According to Nordic Easy Chair there is a demand on recliners with integrated leg rest.
- The quiet design idiom reflects a contemporary trend direction.

Cons

- The recliner is anonymous in a PR-perspective.
- The leg rest mechanism makes a physically heavier chair.
- The recliner do not invite to different seating positions.



# EVALUATION SCHEME

The three concepts were evaluated based on the needs and wishes diagram that were created from the researching and analysing. Furthermore the concepts were shown at Status seminar II and presented for Nordic Easy Chair. [Method report p. 16] When the concepts were presented for Nordic Easy Chair they found it important that it was a concept with innovative potential. They had seen the Albatross modular chair before and they meant that because all the elements would require expensive production of wood shells it would become an expensive chair. The Goose concept with the integrated leg rest was according to NEC a demand on the Asian market, but the company saw the most potential to carry on with the Duck chair, because it had elements they had not seen before and it could become innovative in their market area.

Both at the presentation with Nordic Easy Chair and Status seminar II [Method report p. 17], the Duck concept received great interest, because of the transformation from a low chair to a recliner. The tall back that the two other concepts have, do not invite to movement in the chair as much as the Duck chair does when the collar is folded down. Another interesting element was the integrated leg rest in the Goose concept however the overall shape and styling of the Duck were most appealing.

Based on the evaluation scheme and comments from Nordic Easy Chair the design team chose to work further with the Duck concept. In the further development it have to be improved in terms of comfort and resting situation. It also have to be more userfriendly in the transformation because the collar at the moment have to be folded when standing behind the chair.

The importance of the wishes have been given from a factor 1-3, where 3 is most important. The needs have been given a factor 3.

- Consumer
- Nordic Easy Chair
- Furniture market
- Ergonomic research

## Needs

- ● High quality  
*The concept should exude quality in materials and function*
- ● Modularity  
*The consumer should be able to fit the chair to their needs*
- ● The concept should not look like an helping aid
- ● Innovative  
*The concept should be innovative for Nordic Easy Chair*
- User interaction  
*The use of functions should be easy readable*
- ● Adjustable comfort  
*The chair should approach as many body types as possible*
- ● Room for movement  
*The chair should invite to do different activities*
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*The chair should have a reclining function*
- Neck support  
*In reclined position a neck support is need for optimal comfort*

## Wishes

- Alpine trend (2)  
*The styling could approach this trend in some levels*
- Structure/Construction trend (2)  
*Details in joints and stitching could approach this trend*
- Quiet design trend (2)  
*Simplicity in the concept*
- ● Price estimate (2)  
*10,000-15,000DKK Sales price*
- Accessories (1)  
*Integrated lightning, table or storage for activities*
- No electricity needed in functions (3)
- ● Swivel function (3)

Total



Albatross



Duck



Goose

2	3	3
5	3	3
3	5	4
2	4	3
4	4	4
5	4	4
3	5	3
5	5	5
5	3	5
1	3	2
3	4	4
2	3	3
-	-	-
1	1	1
5	5	5
1	1	1
133	147	137



# LOOKING FORWARD

## Introduction

In 2011 Nordic Easy Chair had a deficit of 6.49 mil. DKK, but in 2012 the company had a profit for the first time in 5 years. This is done by a turnaround of the company, where new products have been launched and were well-received by their customers. The current strategy from Nordic Easy Chair is based on two areas; The first is to be more present on their existing markets and launch new products, and the second is to expand to new markets. [wood-supply.dk]

The new product is part of this two-sided strategy, where it will be introduced nationally to target a new recliner segment. In the following chapter it is discussed how Nordic Easy Chair can add this product while building on their own brand.

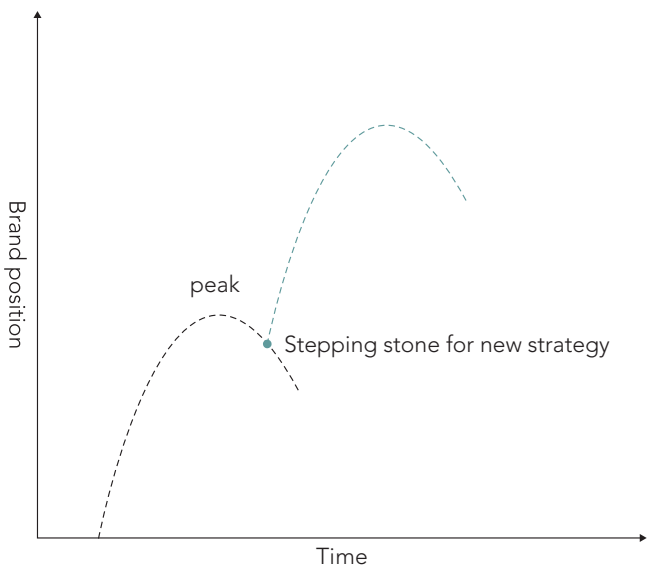
## Madonna curve

In an article by Jacob Rosenkrands from 2004 it is put forward by the communication company Bruce Mau Design (BMD) how Denmark can rediscover their international design success. Bruce Mau says Denmark is a too perfect nation that relies on past successes and where people fight against changes, however this can be the start of failure. BMD consider the reproduction of several design classics from architects such as Arne Jacobsen and Hans Wegner as an obstacle for future development in Denmark. [Rosenkrands, 2004]

Eight years later in the future tendency magazine “Tid og Tendenser”, Mads Arlien-Søborg says that the tendency is still the same. According to Søborg is today’s Danish design missing a common design movement, which they had fifty years ago where there was a common design vision about design for the people. [Alien-Søborg, 2013]

The previous observation by BMD and Søborg can also be found in Nordic Easy Chairs past and present strategy. They are trusting their strategy on products that have not change function and styling in the past four years. Looking at the whole recliner market where Nordic Easy Chair is situated there seem to be no front runners. Nordic Easy Chair follow the changes, when the competitors launch new features, or there is a optimization of technical features such as materials and construction. However according to BMD a strategic change does not have to change the whole company profile if the company have a healthy economy.

BMD uses a strategic tool to illustrate how a company can use their current key values towards an innovative process. It is called the “Madonna-curve” after the Pop star that has reinvented herself several times over the past 26 years. [Rosenkrands, 2004] Ill. 80 shows a rising curve with a peak an then it decreases. In the “Madonna-curve” a company will reinvent their strategy when they are on the top before becoming too mainstream. According to BMD the history and tradition of the company have to be in balance with future strategy otherwise the company will loose connection to the present.



**III. 80**  
The Madonna curve above is a strategic move for companies with a healthy economy that wants to change strategy.

# CASE: THE REPUBLIC OF FRITZ HANSEN

An example of a company that has reinvented themselves is Fritz Hansen. The company was established in 1873 by cabinet maker, Fritz Hansen. The company is known for producing the iconic furniture of i.e. Arne Jacobsen and Poul Kjærholm. In the noughties Fritz Hansen reinvented themselves. They shifted their focus from contract furniture in canteens and waiting areas, and changed the name to The Republic of Fritz Hansen. This was to mark the start of a new strategy, where the furniture becomes an essential part of their customer's image. At the same time they asked several new designers to interpret the design philosophy of Fritz Hansen. This resulted in a new series of furniture by Kasper Salto and Pelikan Design. [fritzhansen.com 2]

Fritz Hansen found a way to add to their current classic collection by inviting new designers to join their company. The two directions - the classic furniture and the new furniture - are joined under the unified name "The Republic of Fritz Hansen". The new direction will gain some of the values of the classic furniture by association, and add new products to the collection, while it is part of the new strategy of "The Republic of Fritz Hansen".

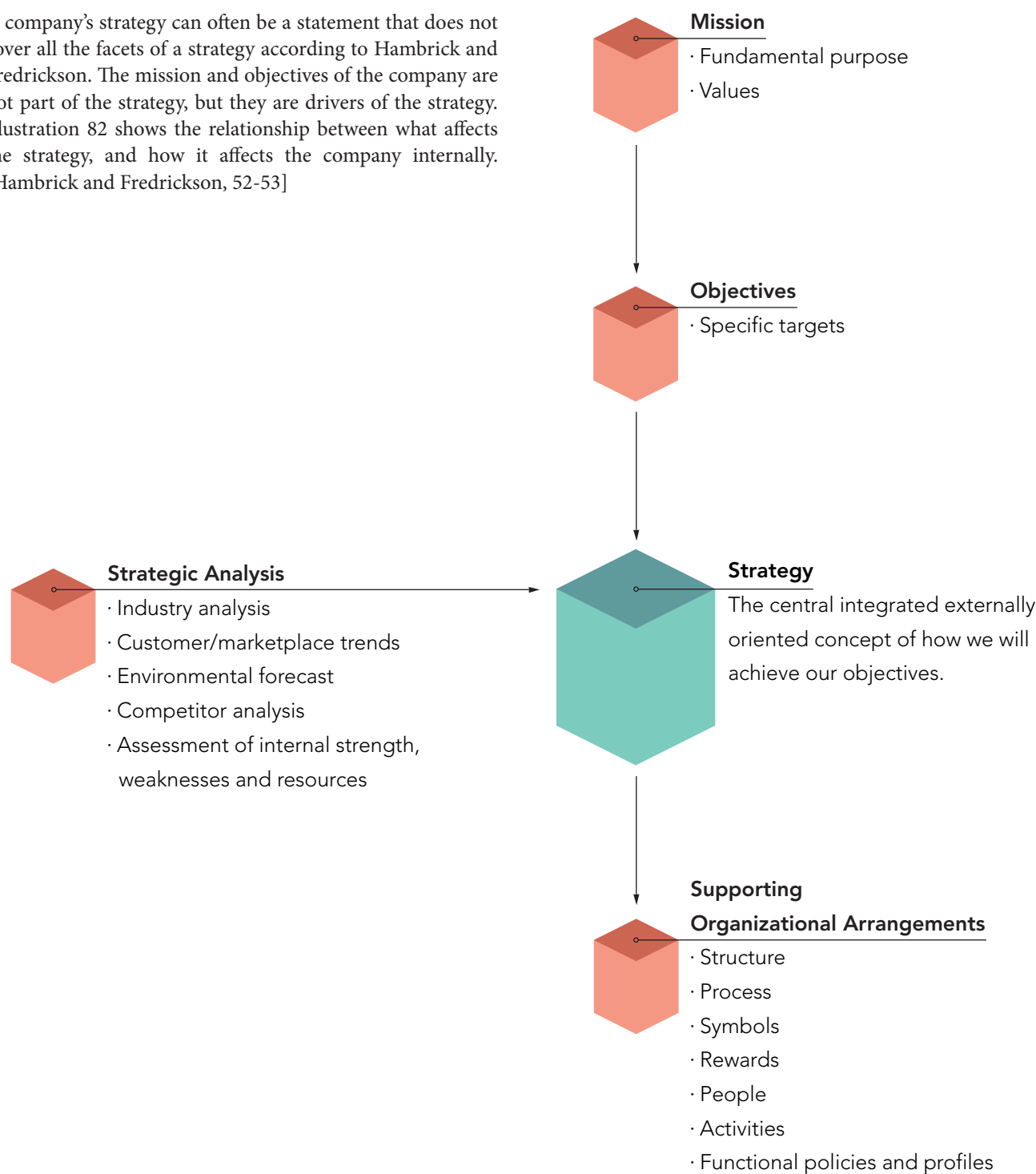
When Nordic Easy Chair invited the design team to add a new product to their existing line of furniture, they did a similar strategic move as Fritz Hansen. The Duck Chair is incorporated in the overall brand, but it is the beginning of a sub-division of a new type of recline chairs.



III. 81  
The image shows the Swan Chair by Arne Jacobsen and the Favn sofa by Jaime Hayon (2011). These two represents the classic direction and the new direction of Republic of Fritz Hansen.

# FUTURE STRATEGY

A company’s strategy can often be a statement that does not cover all the facets of a strategy according to Hambrick and Fredrickson. The mission and objectives of the company are not part of the strategy, but they are drivers of the strategy. Illustration 82 shows the relationship between what affects the strategy, and how it affects the company internally. [Hambrick and Fredrickson, 52-53]



III. 82  
"Putting strategy in its place" by Hambrick and Fredrickson.



# THE STRATEGY DIAMOND

The strategy is defined by five areas: The Arena, the Vehicle, the Differentiators, the Staging and the Economic Logic. These five arenas needs to be defined before a strategy can be established. The strategy must include all five and be a unified whole. [Method report p. 18]

The strategy will be regarding the new strategy for Nordic Easy Chair when the Duck Chair is included in their product portfolio. The existing mission and objective from Nordic Easy Chair are maintained, and the strategy will be based on this information, that has been given during meetings at Nordic Easy Chair. An analysis of their current strategy can be found in *Align*.

### Arena

The arena is where the business will be active. It needs to be specific arenas and identify market segments, geographical areas, and also value adding stages. The emphasis on each arena should also be mentioned, to locate which are the primary areas and which are less important.

The arena that Nordic Easy Chair will be present in, is large chains of contemporary furniture houses such as Bolia, BoConcept primarily on the Scandinavian market. Their products will target a segment that seek both comfort and design in recline chairs. Nordic Easy chair will still manufacture recliners but add a focus on recliner chairs for a different and younger segment.

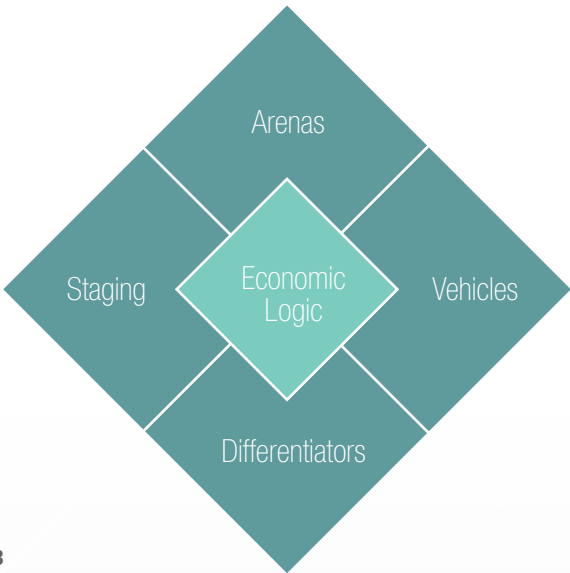
### Vehicles

The vehicles define how to get to these arenas. By entering a new arena there is a uncertainty that needs to be considered. The vehicles used for this arena are a joint venture with a large Scandinavian furniture house, such as Bolia.

By joining collaboration with such a warehouse Nordic Easy Chair can contribute with both product design and as a sub-supplier. Bolia in return will provide a well-known brand and existing customer base, while obtaining an addition to their current product portfolio.

### Differentiators

The strategy is also defined by how they will win the position on the market and how it will differentiate it self from the existing competition. This differentiation can be a combination of several factors that creates a coverage of a market that has not prior been targeted. According to Hambrick and Fredrickson the company should not offer a coverage on a broad variety of superiority, instead they should choose few directions where this business is able to brand themselves.



### III. 83

Strategy diamond  
[Hambrick and Fredrickson, 53-57]

The design team has found a less competitive area in the market for recline chairs for 55+ segment in a medium range of cost. At the same time there is a lack in the market for recliner chairs that combines styling with the comfort of the recliner chair. The product will be marketed on the styling, that nods towards the Danish design classics, while it distances itself from the current recliner market.

### Staging

This part of the strategy diamond illustrates the steps that this strategy is carried out in.

The first step for Nordic Easy Chair is to establish the collaboration with a large furniture warehouse. The product will be tested in selected warehouses. Step two is to expand the product to the Scandinavian market. Step three will be adding new products to the product line to start a whole series of design oriented recliner furniture.

### Economic Logic

This part of the diamond covers the economic profits that the strategy has. According to Hambrick and Fredrickson this can be done by offering a hard-to-match product. By offering a product that differentiates on a level that the customers are willing to pay the correct price for and can maintain a healthy economic logic.

The cost of the chair is expected at a mid range where there are found less competitors. Bolia already have a healthy customer base, and by adding this product it will obtain exposure, while it receives the stamp of quality that a large furniture warehouse has.

[Hambrick and Fredrickson, 53-57]

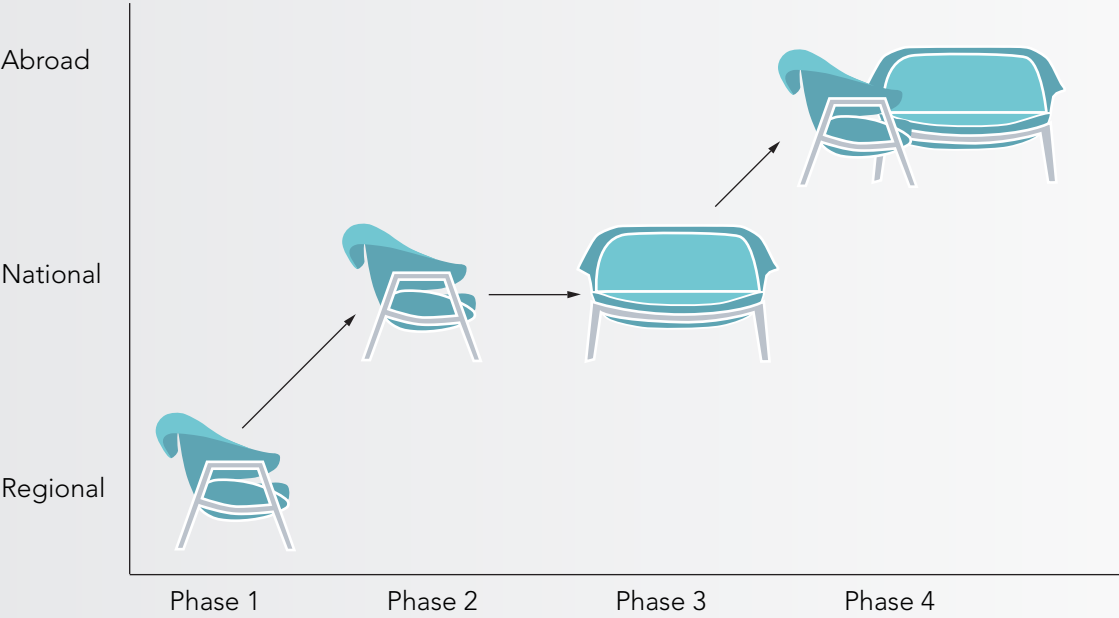
# FINAL STRATEGY

The final strategy for Nordic Easy Chair and the Duck concept is to join a collaboration with Bolia. The Duck concept will be placed in a shop-in-shop environment where Nordic Easy Chair’s name and product will be present. Creating a new platform for a new product and a new segment is a high-risk operation, which will have a difficult start up phase. The co-branding will provide Bolia with a product that they do not have in their existing portfolio, while for Nordic Easy Chair it will give an access to potential customers. The concept will suit Bolia’s profile better than Nordic Easy Chair’s existing retailers.

The strategic staging is divided into phases to test the market and develop suitable products for the collaboration. The product is launched in a single store to test the interest in the product, while the production phase is being fine adjusted (Phase 1 on Ill. 84.a). There is a low volume demand from a single store. The second phase of the strategy is to roll out nationally to the remaining Bolia stores. Third step is to develop a range of furniture for the Bolia and Nordic Easy Chair co-branding. These can include a sofa, a different type of recline chair or a third product that will suit this collaboration that utilizes the competences of Nordic Easy Chair while it suits the Bolia showroom.

Teaming up with Bolia will be beneficial as Bolia is expanding to other countries than the Northern European market. [business.dk] Entering new markets with Bolia will spread the awareness of the Nordic Easy Chair brand, so their current line of recliner chairs for an elderly segment reaches a new arena with an added exposure to their brand.

For Nordic Easy Chair this collaboration will be the start of a new sub-brand, similar to the creation of the Balance series in 2007 (P. 13) that was later merged to form Nordic Easy Chair A/S.



III. 84

The strategic staging for the collaboration between Bolia and Nordic Easy Chair.

# REFLECTION

The part of the concept development phase that is shown in the process report is only a small part of the actual concept development. The design team used a lot of time collecting information in the *Researching and Analysing phase* and parallel to this, the design team sketched and modelled on different concepts. However the design team later found a relevant topic for the concept development, which were the active vs. passive chair. This approach combined the relaxation position and active position, which were found from the focus group questionnaire where the design team saw a tendency of many activities in the seating furniture.

The chosen Duck concept had elements that the design team have not seen in a recline chair before and combining the active seating position and relaxation position in both function and styling were seen as an primary parameter for the chosen concept. The Goose concept with the integrated legrest had some functional features that the design team will take further into account when developing on the product concept.


The strategy chosen for the new concept is based on Nordic Easy Chair's wish to approach a younger segment. Bolia has great commercial appeal to a segment that is style conscious. Because the sales strategy has not been detailed this will figure on a concept level. However the intention of creating a Nordic Easy Chair shop-in-shop area in Bolia's showroom is something that Nordic Easy Chair is already familiar within the current sales channels. At one of the first meetings Nordic Easy Chair expressed that they were interested in an online sales channel for the new concept. The design team saw this as a great change to do something different for Nordic Easy Chair. However this strategy would change Nordic Easy Chair from being a "Business-to-Business" to "Business-to-Consumer", which would demand internal reorganization, Costumer Service and most important a Showroom to try out the furniture, which the focus group saw as an important factor in the buying situation. [Appendix G] Bolia would provide Nordic Easy Chair with all these channels and furthermore Bolia commercial brand would make it easier for Nordic Easy Chair to approach the new segment.

III. 85

The strategic staging for the collaboration between Bolia and Nordic Easy Chair.







## Introduction

The product development of the Duck concept will be presented in the first part of *Drafting*. The product development is divided into the process of finding functional principles for the reclining mechanism and the flexibility of the collar and form development of seat and the base.

The product development will result in a product scope, which will present the areas of the chair that either will be fully detailed, outer detailed or kept on a conceptual level. Last in the drafting chapter the detailing of the chair will be presented. The upholstery, construction, materials and production will be explained as well as FSA tests, FEM analysis, interface and price estimation.



A photograph of a tree trunk with a large, semi-transparent teal circle overlaid on it. The word "Drafting" is written in a white, italicized serif font across the center of the circle. Below the circle, a stack of fabric samples in teal, yellow, and purple is visible, along with a white drafting tool (a T-square or similar) leaning against the tree. The background shows the rough bark of the tree and some green foliage.

# *Drafting*

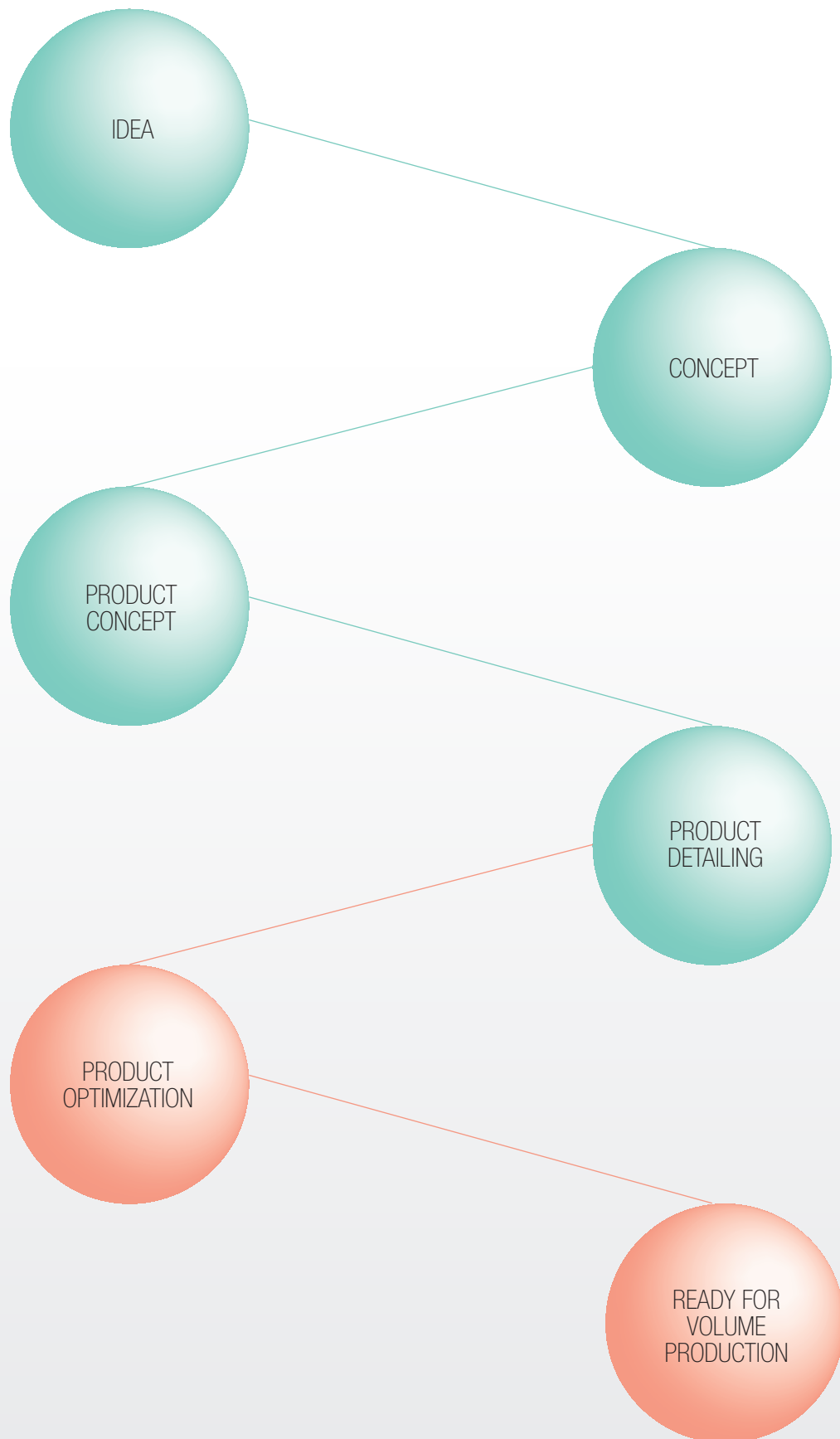


## LEVEL OF SOLUTION

As mentioned in the introduction, the drafting chapter it will focus on the Duck concept. The expected level of solution of the Duck concept is shown in the diagram to the right. The product will be detailed however due to the time period the design team will renounce some detailing of the product, the product optimization and ready for volume production.

In addition the brand, that the Duck concept will be a part of, will not be detailed because the design team have chosen to focus on the detailing of the Duck concept, and which materials and production methods will do to make the product achievable. Furthermore additional accessories to the Duck concept will not be visualized as well, but have been a part of the concept development. The design team have chosen to name the product "Duck chair" which will be used in *Drafting*.





### III 89

The diagram shows the different stages of the concept and product development from getting the idea until ready for volume production.

# SECOND MOCK UP

## Building the model

The first mock up model was used to test the seat and back angles. To get an understanding of the seating comfort in a curved chair an attachment to the existing model is build. This is attached to the front of the three back paddles. At the focus group interview it was found that the seat length of 500mm is too deep and needed upholstery, and by mounting the attachment it in front of the back paddles the seat depth will be reduced to 450mm.

The overall measurements are made from a 1:10 scale drawing where the back curvature is divided into horizontal bands where the curvature is approximated. The bands are covered by cardboard and foam to give a soft back.

The model is used to test if the curved back provides a back where the user can sit in multiple directions. It is also used to see if the width of the chair, and height and width of the armrest provide a comfortable placement.

Upholstery is added to give it a softer seat however for this mock up the foam that are used have been different types that the design team were in reach of. Illustration 90 shows the measurements of the chair.

## Results

The armrests are extended to the edge of the seat, which felt too long. During the testing of the Sorø chair it was found that the focus group members naturally rest their hands on the edge of the armrest (P. 54-55), which should be possible in the Duck chair too. 50mm were removed, so they are long enough to provide a support for the lower arm and has a length where the sitter is able to hold the edge of the armrest. This also provides a more open front, that makes it easier to get into the chair. The arm rests measure 300mm (Ill. 90).

The inside length between the armrests (Ill. 90) will be made wider than the in the mock up model to suit larger people and also to encourage that the sitter uses the Duck chair for different seating positions.

The angle of the armrest in the mock up model are straight forward, where a wider spread armrest will give a more embracing expression, while it will provide more space for movement.

The height of the armrests is heightened with a upholstery material (Ill. 90) as the wooden extension was too low to comfortably use it.

The extension to the mock-up gives a possibility to test out the concept while lengths and depths are adjusted to give a better seat.

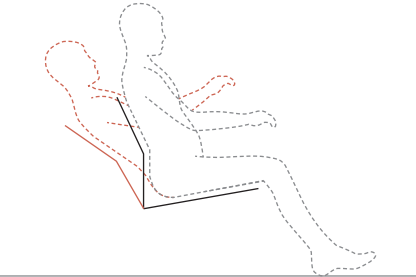
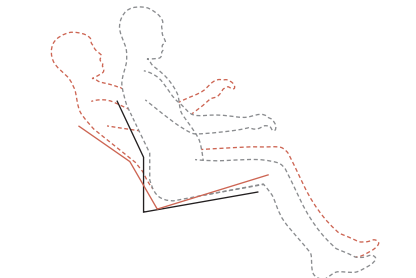
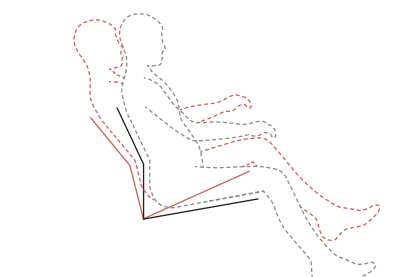


III. 90  
The mock-up model with the curved back.

# RECLINE PRINCIPLES

## Three principles

In the testing of chairs at Stockholm Furniture Fair 2013 and Brdr. Sørensen the design team found that there are three general reclining principles in a chair.

Recline principle 1	Movement	Chair	Pros	Cons
	The seat stays in position while the back reclines.	Chairs from Nordic Easy Chair's Balance series.	The sitter keeps contact with the floor when reclining.	The lumbar support moves unparallelled to the movement of they body and is positioned too high when reclined.
Recline principle 2	Movement	Chair	Pros	Cons
	The seat moves forward and slightly upwards when the back reclines.	Chairs from Nordic Easy Chair's Tradition series.	-	The lumbar support moves unparallelled as in option one.  The sitter looses contact with the ground.
Recline principle 3	Movement	Chair	Pros	Cons
	The seat and back angle is fixated and it is the entire seat that reclines.	The Egg Chair by Arne Jacobsen	The lumbar support is maintained.  Can provide a rocking function.	Lacks a resting position when tilted backwards.  Legs require a leg rest when tilted backwards.

## Conclusion

Nordic Easy Chair offers recliners with the first and second principle. During a meeting with Nordic Easy Chair they explained that option two is being phased out, because there is little demand for a chair with this functionality. Nordic Easy Chair explained that this seating is problematic with especially smaller people as they find it uncomfortable in the hollow of the knee. During the testing of furniture the design team found it problematic that the sitter looses contact with the ground in the chair in the second option, as it closes the bloodflow to the legs. Option three did not give a resting position and is not a reclining function suited for the Duck chair. On the basis of this, option one is selected as the reclining feature in the product.



# RECLINE FUNCTION

Nordic Easy Chair’s chairs recline in three different ways. The first is only by kinetics where the sitter uses their bodyweight to both recline and get up in seating position again. Friction is what makes tighten the movement. The second is where a gas spring makes a smooth movement by compressing gas. It also pushes the seat back up. This is usually controlled by a handle. The third option is by electricity, where it powers an engine so the user do not have to use any bodyweight. The three principles are compared below using comparative analysis to find the principle most suitable for the Duck chair.

	Kinetics	Gas spring	Electricity
Pros	<ul style="list-style-type: none"><li>. Small mechanical components</li><li>. A cheap solution</li></ul>	<ul style="list-style-type: none"><li>. Even movement when reclining</li><li>. Does not loose efficiency over time.</li><li>. Small mechanical components</li><li>. Less straining for the body than kinetics.</li><li>. A demand for this solution</li></ul>	<ul style="list-style-type: none"><li>. It is a helping device for people with needs.</li></ul>
Cons	<ul style="list-style-type: none"><li>. Difficult to use the function.</li><li>. Being phased-out at NEC.</li><li>. Not an even movement, which removes the feeling of quality.</li></ul>	<ul style="list-style-type: none"><li>. An inelegant component that needs to be hidden away.</li></ul>	<ul style="list-style-type: none"><li>. It looks and feels like a helping device.</li><li>. Targets the elderly or handicapped.</li><li>. A slow movement in the chair.</li><li>. An expensive solution (+ 5,000 DKK).</li><li>. An electrical cord needs to be plugged in when in use or charging.</li></ul>

## Conclusion

The kinetics is being phased out by Nordic Easy Chair, as there is little demand for it. The electricity solution is a solution that will suit a different segment than the one that is approached. The gas spring is chosen as it provides a reliable solution with a feel of quality.

# OTTOMAN VS. INTEGRATED LEG REST

The design of the recliner has so far not determined whether it should have an ottoman, like the majority of Nordic Easy Chair’s recliners, or if it should have an integrated leg rest like the LUX models found in Nordic Easy Chair’s product portfolio.

During the focus group's testing of the Sorø chair the Ottoman became an obstacle when entering and exiting the chair (P. 54-55), which is not desired. The integrated leg rest cannot make the recliner seem heavy in order to achieve the wished light expression of the concept. Integrated recliners often have a vertical leg rest (P. 15 (Ill. 15.f), P. 17 (17.e) and P. 20 (20.c)), which will not suit the transformation concept of the chair. The integrated leg rest from the Goose concept (P. 77) has the benefit that the leg rest is hidden underneath the seat when not in use. This leg rest does a 90° movement when it reclines. Almost the same transformation is found

in the transformation of the collar. Giving the leg rest this feature will suit the concept and make it correspond the transformation of the collar.

The Duck chair is intended to be the start of a new brand for Nordic Easy Chair, which both the ottoman version and the integrated leg rest version can be part of. The design team believes that the two versions of the recliner should have the same expression and not be significantly different. By integrating the footrest underneath the shell it requires room for mechanical parts, where an ottoman version does not have the same need. As the chairs need the same expression, the overall design is defined by the need for room underneath the seat.

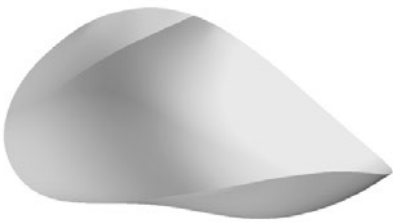
The focus group research and the intention for the strategy for the brand means that the integrated leg rest is chosen.

# SEAT AND BACK FORM

The upper body form of the Duck chair has a double curved surface both in the seat and back. The design team wanted to approach a more organic shaped style but still with a simple expression. The overall form of the upper body is divided into two parts: a seat and a back shell. The seat shell should contain the mechanism for the reclining system and leg rest. The back shell should be able to recline from 105° to 135° and contain the armrest. Furthermore the collar will be attached to the back shell. The form development of the seat and back were done in the 3D program Rhino with the plugin T-Splines as it allows the design team to make quick changes to the double curved surfaces. [Method report p. 19]

## Seat shell

The initial concept of the seat was a half spherical shell. This were made because the Duck concept had a overall spherical form, which did not make room for the recline and integrated leg rest mechanism. The development of the seat shell led to a half-drop shape which provided space for both the legrest on the outside and the mechanism on the inside, while still keeping the idiom of the Duck concept (Ill. 93.a).



Ill. 93.a

The final seat shell have a drop-shaped curvature to achieve a light and organic expression.

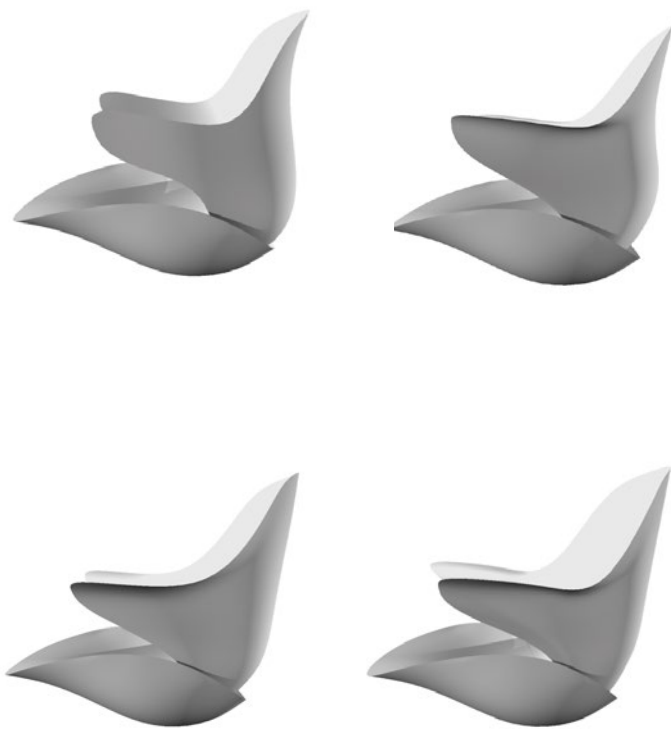
## Back shell

The back shell is developed so it fits inside the seat shell. This is chosen because the armrest is integrated into the back shell and the distance cannot be too wide. Other recliners will usually have the armrest in the seat and only have the backrest reclining. At the focus group meeting (P. 54-55) the design team found it important that the forearm is supported while reading as this was tested in the Sorø chair. The armrest is therefore integrated in the back and follows the forearm while reclining.

The back of the back shell were first intended to make a slope so it followed the curvature of the human spinal. (Ill. 93.b-d) However the change of the seat shell also meant that the back curvature had to be changed in order to create a more quiet expression (Ill. 93.d). The collar, that is the primary element of the Duck concept, will be attached to the top of the back shell, which would entail a more direct line from bottom to top of the back seat. The curvature of the human spinal were thought as an ergonomic position however this would only be experienced by a limited of people, as Jette Bangshaab explains. The design team therefore choose to work with a back cushion that improved the comfort level of the back and lumbar area.

## Armrest

The armrests were connected to the back near the lumbar area. The first concepts of the armrest (Ill. 93.b) had a thin surface for the forearm and hands. However the focus group interview showed that a wide armrest that the user could lay the forearm on, would increase the comfort experience. This was also verified by Jette Bangshaab. [Interview II, p. 62] The focus group used the armrest as a position for the forearm and as a helping aid when exiting the chair. Due to the last function it is important that the armrests have strength, and are able to take the force applied to the material. The construction has to fulfil this need.



Ill. 93.b-e

Above illustrations show the development of the back shell and armrest. The development focused both on the functional and aesthetically parameters.

# DEVELOPMENT OF THE COLLAR

The collar intended for the final Duck concept is a folding collar that the user unfolds when standing behind the chair. This collar is made of a single material, and the design team believed that it was possible using a thick felt material. This concept requires the user to exit the chair, move behind the back and unfold the collar when it is in reclining position. Changing the position from seating to reclining becomes a complicated process, where the user will need to have decided before seating if they want to use the reclining function. The following criteria are established:

The collar can be adjusted while sitting. It is simple, convenient and intuitive.

The principle from the original concept is tested. The material needs to provide the structural support when folded up and maintain the form when unfolded. The material and the form is self-bearing and needs to provide a supporting neck rest for the user.

### Felt

A felt collar is tested on the mock up model (Ill. 94.a). A 3mm felt is attached to the model to test if a single material can provide enough stiffness to support the head. When tested it became apparent that a single layer of felt was not sturdy enough, and it unfolded by the weight of the sitter's head. The felt, however, gave a fold in the collar that was coherent with the desired effect.



### Sandwich construction: Viledon

A sandwich construction is created first in smaller scale models by sewing cardboard and fabric together to examine if this can provide a strong enough construction for the collar.

This was tested on the mock up with an iron-on support, Viledon, on textile, to test if it gave a structural support but it gave as little support as the felt (Ill. 94.b).



### Sandwich construction: Foam

A cold foam was used as part of a sandwich construction, to see if a less flexible material was possible to support the weight of the sitter's head. This is tested in the mock-up model where the sandwich construction consists of textile and 50mm 38kg/m<sup>3</sup> foam (Ill. 94.c). This solution proved better than the felt and Viledon fabric, however it was not enough to provide a comfortable support and the head was barely supported.



Ill. 94.a-c

The collar is tested on the mock-up model with three different materials.



Evaluation

Unfolding the collar was thought as being a simple movement, however during the testing of the models, it became apparent that the sitter needs to reach far back to get a grip of the collar. This gives an ergonomic difficult movement, so the interaction with collar needs to be moved to another place.

During the testing and modelling of collars, it became apparent that the other challenging area is not finding a material combination that creates this support. The challenge is to find a solution that can provide a strong support, when folded up and still give enough flexibility to unfold it. It is the line of rotation that is the weakest area that has to have both stiffness and softness.

Folding neck rest

The folding neck rest is a long cushion that hangs over the backrest of the chair. The cushion can be folded and attached to itself with buttons. Multiple buttons allows for different lengths of neck rest to accommodate the different heights of users (Ill. 95.a).

This solution is simple and still gives an illusion of a collar. This principle means that the neck rest must be approximately 600mm long when unfolded which is longer than the seat of the chair. This makes the cushion seem separated from the chair and creates an undesired feature. When testing a similar system on the mock-up model it was difficult to reach and handle.

Rail system

An alternative is to insert a rail system in the back of the chair to control a linear movement of the textile. The user grips the rail from the back of the chair and adjust it after the needed support. The rail can be adjusted after the height of the sitter. The solution maintains the collar from the initial concept, while it gives a stable support for the head. The grip is placed behind the sitter, which can provide a unpleasant ergonomic twist of the torso when adjusting it (Ill. 95.b).

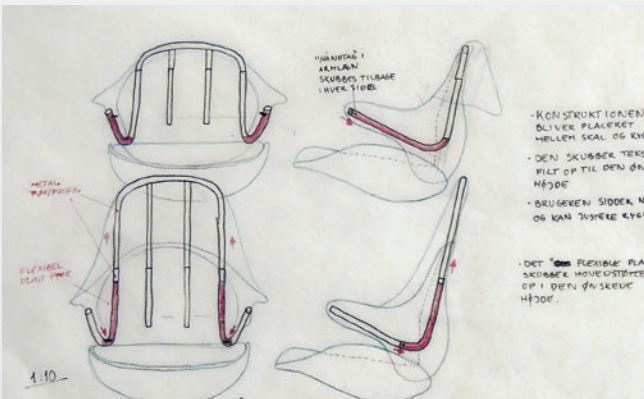
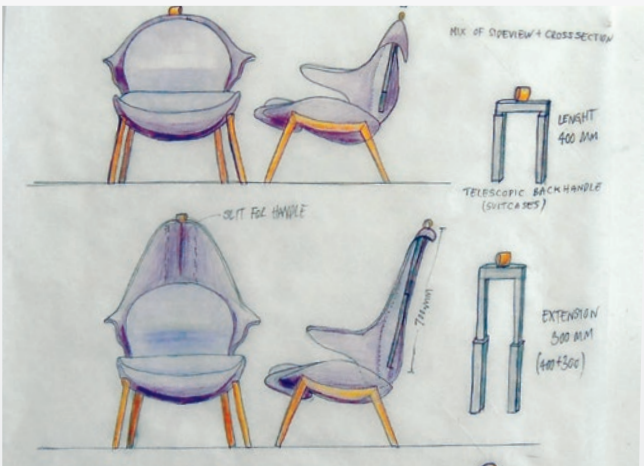
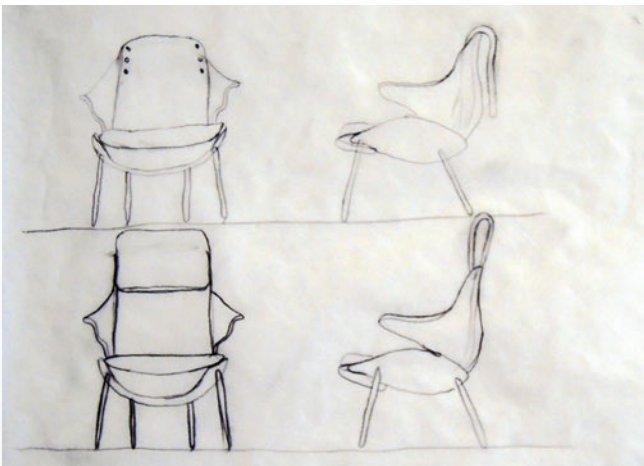
A similar system is created where the handle is positioned in the armrests and an internal system moves a flexible material that pushes the neck support up. This system transferred a horizontal movement from the user into a vertical movement of the neck support (Ill. 95.c).

Choice of system

It is decided to use the rail system that is adjusted in the collar. This provides an intuitive system where the transformation from folded to unfolded is adjusted by the sitter while sitting in the chair. The system is more technically complex than the folding collars that provided the support by the material, however this system is chosen because it will provide the support and adjustability that the user's need when sitting and lying in the chair.

Alternatives

Deadlines are approaching and a collar combination that provides a functional solution has not been found. The previous models require extensive testing of the materials to create a form that provides a acceptable support. Alternatives are discussed to find a functional solution. The alternatives has to maintain the concept of a transformation from a low to a high chair.



Ill. 95.a-c  
Sketches that illustrate alternative solutions.

# THE BASE

## Criteria

Until now the focus of the development on the chair has primarily been on the seat and back (Upper body) of the chair. A base will be designed to suit the overall concept. The base from the Duck concept (P. 76) is attached to the armrests, which gives a restricted expression. Instead the frame should not support the arms that instead should be self-bearing.

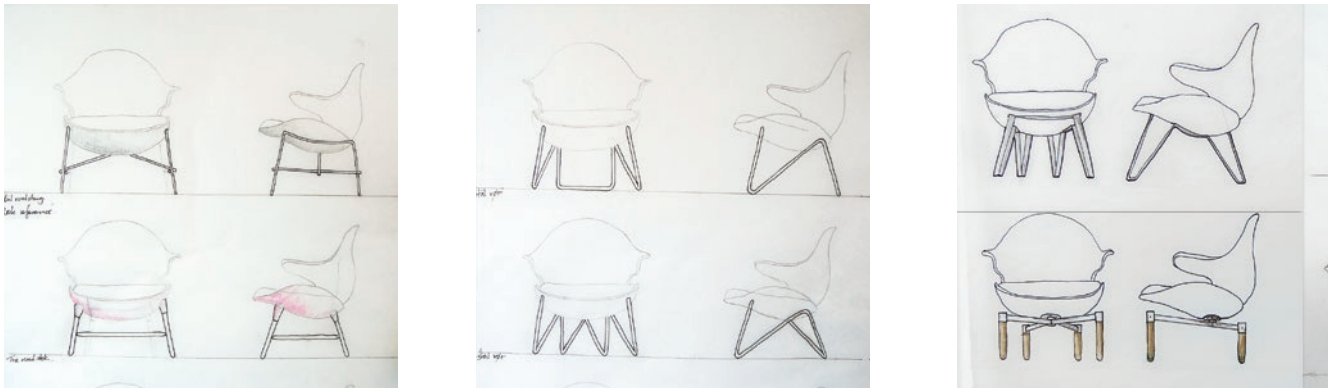
The following criteria has been established for the frame. It needs to suit the chair and relate to the trend research. In “Structure and construction” (P. 51) it is found that a light frame should contrast the heavy seat and back, while keeping the overall base simple. The integrated leg rest folds underneath the seat, which means that there can be no obstructing elements in the leg rest’s path.

## Sketching

A joined sketching session were carried out where the design team sketched in a 1:10 scale. A selection of the sketches can be seen in ill. 96.a. During the sketching session a variety of books were researched for inspiration, which caused a general sense of reference to the classic, modern furniture from the 50’s and 60’s. The nod to this furniture ties in well with the upper body as there are elements in that also has the same references.

From the sketches, four were selected as being relevant to carry into 3D modelling. They were selected on the basis on which suited the chair the most. When carried into 3D it became apparent that the base’s touch-points to the floor needed to be wider apart to create a stable chair, that also looked trustworthy when it was reclined.

Ill. 96.a  
A selection of sketches for the base of the chair.



Ill. 96.b-g  
3D sketches. Four selected bases from the sketching session and two swivel bases.



## Four models

Ill. 97.a: The design takes inspiration from duck legs. The upholstery is extended down the four wooden legs. The legs are mounted individually in the base.

Ill. 97.b: The expression is angular to contrast the curves in the upper body. The wooden legs are mounted on the side of the base.

Ill. 97.c: The base is made from steel rods that are joined in a disc underneath the seat. The legs carry the frame and creates a light floating expression.

Ill. 97.d: The frame is a more graphic expression where it is mounted on each side of the shell and also underneath it.

## Swivel base

Nordic Easy Chair have swivel bases on some of their existing range of furniture. At a meeting Nordic Easy Chair expressed an interest in a swivel base for the original Duck concept. At this stage a meeting is due where they are presented to the progress of the chair. [Method report p. 16] Two swivel bases are designed for this meeting. (Ill 97.e-f).

The swivel bases and the four legged models give two different expressions. The four legged versions are mounted relatively high up on the sides of the upper body to gain a width to the legs. This gave a sharp contrast to the upper body but was pulling the chair down. Due to the length and thickness of the legs, the base seems unstable.

Four legged bases are suited to the individual and are not height adjustable. This will go against the desire of creating a chair that suits most people in a household. The swivel base has the benefit of providing a rotation and a movement in the chair, while it can incorporate a height adjustment feature that allow for one base to suit the height differences among people.

The design team saw the duck concept as having four legs, however the swivel base provided ergonomic benefits for the user, while it provided a simple, light and classic element to the chair. The four-star base (Ill. 97.f) is the chosen base.





# PRODUCT SCOPE

Because the Duck chair is a comprehensive concept with several elements, the design team needed to make a scope of the product due to the time period. Furthermore the design team did not have the chance to build a 1:1 prototype before hand-in of the project reports. The primary elements of the Duck chair that the design team found important were the comfort level, the mechanical mechanism and the collar system. Ill. 99 shows the level of detail of each of the areas in the chair. The division is in three levels: Concept, outer detailed and fully detailed.

## Concept

### ***Leg rest***

The leg rest will only be detailed on a conceptual level. The choice of upholstery will be defined based on the collar sandwich construction and the form will be incorporated to the overall styling. Due to the time period, the design team do not have time to test the comfort level of the leg rest and it is therefore chosen based on trying existing recliners with integrated leg rest.

## Outer detailed

### ***Armrest***

The armrest is a part of the back shell, which will be detailed with choice of material and production method. Furthermore the length, width and height have been tested.

### ***Neck rest***

The neck rest will be detailed with choice of material and functional elements. In addition the shape of the neck rest will be incorporated in the back shell.

### ***Back cushion***

The back cushion will be detailed with focus of the lumbar support.

## Fully detailed

### ***Collar***

The collar is the primary element of the transformation concept. In order to make this area functional this will be fully detailed. Construction elements and materials will be chosen.

### ***Reclining and inner construction***

In order to make sure the recline and leg rest mechanism can be inside the seat shell this is fully detailed. Material and production methods will be chosen and FEM analysis will be made on chosen components.

### ***Base***

The base is fully detailed with choice of material, production method and construction.

### ***Seat cushion***

The seat cushion will be fully detailed and in order to find the right foam combination, the comfort level is tested in a FSA analysis.

## In addition

### ***Styling***

The styling of the Duck chair will be detailed with in choice of textile, stitching and colour.

### ***Price***

A price estimate of the product will be given based on collected prices from different suppliers.



| III. 99

## CHOICE OF BASE

The chosen concept for the base was a swivel base, which adds adjustable comfort in the Duck chair. In addition a centre-oriented base had the advantage compared with legs that it is easier to integrate height adjustment. In Nordic Easy Chair's recliners there are no height adjustment that the user can do while seated. At the focus group interview (Appendix XX) the difference in body types indicated the need of different heights in the chair and the design team therefore chose to incorporate this function in the base.

### Manual adjustment

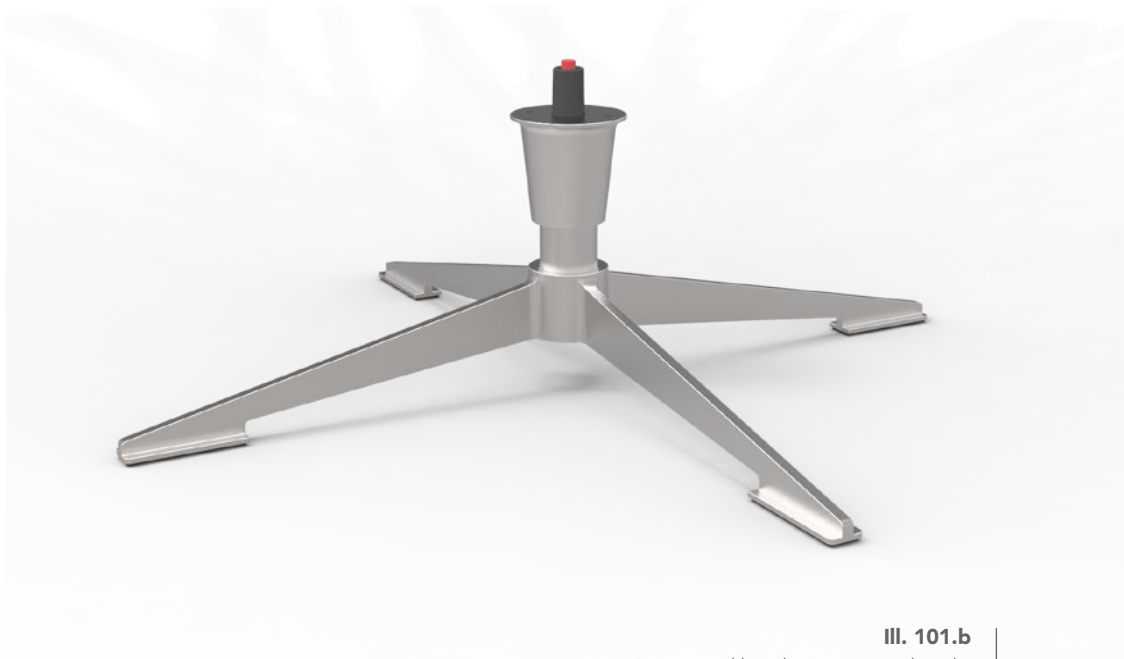
The first principle for the height adjustment allows a light upper base construction (Ill. 101.a). It is a system that has to be adjusted outside the chair and with an Allen key. The shape of the base is simple and the centre is raised to give a light expression. However the ergonomic problem with getting out of the chair to adjust the height, which for elderly people can be a problem, the design team decided to incorporate a gas spring that could be adjusted while seated.

### Gas spring system

To find a system that is able to adjust the height while seated the design team looked at office chairs. The system often requires that the user removes their body weight from the seat, while the height is being adjusted upwards, however this was not seen as a problem because the height adjustment would only appear while being in a seating position and not reclined. This system requires a gas spring and based on the ergonomic theories and the New Balance series by Nordic Easy Chair the height adjustment has to be able to raise the height from 420mm to 500mm. This would ensure that the concept approach more people than if the height is only one. Because the gas spring has to run 80mm the design of the base has to be rethought. The centre is lowered in order to make space for the total length of the gas spring.

The final base for the Duck chair is shown on illustration 101.b. The approach for the design of the base was visual stability and lightness. The conical shape at the top and the end of legs have reference to the feet of a duck.





# NECK REST

## The height of the neck rest

The back of the chair has a height of 500mm, which corresponds to the height of the chairs from the visit to Brdr. Sørensen. The height was then tested in the mock up model (P. 60) where the height felt appropriate.

The slide system for the collar (P. 95) is tested in a 1:2.5 scale model to see if it will be possible to use a slide system for the neck rest. The model showed that it is possible, but in order to handle it, the textile will need to be sliced open to be used (Ill. 102.a). In the model a strap is attached to the slides, making this the element, that the user pulls when adjusting the neck rest.

## Testing of the strap

The strap is tested in the mock up model to find out if it is possible to reach the strap when it is placed behind the back. The result were that with a back shell height of 500mm, most people found it difficult to reach. The height of the Duck chair is re-evaluated, and the height is increased to 600mm in the model. This made no significant changes to the perception of the low chair.

The new height and a strap were tested on people with a range of different heights. The results were, that it is possible for all to reach. The length of the strap adds extra length and helps shorten the reach for the sitter (Ill. 102.b-c).



**Ill. 102.a**  
1:2.5 model with potential slide system. Notice the gap that is need for moving the system manually.

## Height of collar

As the height of the back is enlarged with 100mm, the collar can be shortened with 100mm too. This means that the collar has a maximum height of 200mm, which will limit the visual effect of the entire chair. It is decided to keep the collar's initial length of 300mm, to keep the same expression. The shape of the collar is a narrowing rounded form (Ill. 102.a), which is not perceived as intrusive with a total back height of 900mm.

### Ill. 102.b-c

Test of strap with back height of 600mm.  
A height 1900mm  
B height 1720mm



### Testing of the neck rest

The slide system is added to the back of the mock up model, where a plate is mounted between the slides (Ill. 103.d). Different sizes and types of upholstery were tested to find a suitable size that supported the neck. A 40mm 38 kg/m<sup>3</sup> foam was chosen as the neck rest.

The design team discussed if the sitter should use the neck support to adjust the slides instead of the strap, however this means that the neck support will be unnecessary complicated. At the same time it means that the reach will be longer without the strap.

### Shape of the neck rest

The neck rest is modelled in a 3D program to see how it suits the rest of the chair. Different variations of the neck rest is modelled (Ill. 103.a-c).

The first is reminiscent of a car seat, which is a reference that is undesired and the shape is not coherent with the rest of the chair. The second neck rest is modelled to followed the top of the back, however it creates some sharp corners where the neck rest meet the back cushion. The third has a soft curved shape that follows the contours of the back shell, while it breaks the curved top of the back cushion. The third neck rest is chosen because it is most coherent with the overall idiom of the Duck chair.

When the neck rest is extended it will create a gap between the two cushions. Testing this principle in the mock up proved that this did not provide a unpleasant feeling of being unsupported.



**Ill. 103.a-c**  
Different models of  
the neck rest.



**Ill. 103.d**  
100mm of back height  
added to the mock up. The  
slide system was also tested.



# SHELL

## Introduction

The inner construction of the existing Nordic Easy Chair furniture consists of cold cure foam with an inner steel frame (P. 19). The shells in the Duck chair can be manufactured in different ways that will create a different expression in the chair and has an impact on cost of the chair and also the assembly methods.

Three manufacturers are contacted to obtain estimations on cost for each shell. [Appendix XX] The 3D drawings of the seat and back shells are sent to Schultz Seating System, a cold cure foam manufacturer, Danhill Plast A/S, a rotation moulding manufacturer, and Midform A/S who makes 3D formed plywood. They all received a 3D model that had a thickness of 10mm. Each sub-supplier has been presented to the project and the collaboration partner (NEC) by phone.

## Manufacturing method

### *Cold cure foam moulding*

A steel frame is put into a form. The form is injected with two liquids under high pressure. These two liquids react and form the Liquid Polyurethane Resin (PUR). This material expands during the reaction (Ill 105.a). The composition of the two liquids determines the density of the seat to provide a foam that is either flexible or rigid. [Thompson, 52-53]

Creating the structure of the Duck chair using a cold cure moulding method has the benefits that the seat becomes upholstered, and that the chair can easily obtain the curves that is required in the form. Group Sales Manager, Gregers Lohmann from Schultz Seating System, stats that the metal tubes of the frame should have a diameter of 22mm to achieve an acceptable strength. The base and mechanical elements of the back and seat will be mounted on the metal frame inside the PUR foam. Nordic Easy Chair is already using this method and have a close relationship with the supplier.

Using this method means that the chair will have a thick shell that has included upholstery. The cushions do not require additional padding and will be thin elements in the chair. This gives a different expression than the original concept.

### *Rotation moulded*

Polymer is injected into a hollow form where the form is rotated at approx. 250° C. The form is in motion for 30-90 minutes and is ejected from the form. Rotation moulding creates a hollow form with a constant wall thickness and a good surface finish. [Thompson, 30-31]

The rotation moulded frame has the benefit of having a thinner shell than the cold cure foamed frame (Ill. 105.b). The fixation points for the mechanical elements and frame can be incorporated into the form to limit the parts needed in the product. Through the dialogue with CEO, Peder Madsen from Danhill Plast A/S, he advised that a minimum volume of 15litres were required in such a form and that the thickness of the element should be at least 25mm, where the armrests and the edges may be a little less. This thinner shell is more similar to the original concept, however it lacks the upholstery on the shell, which will add additional thickness to both sides of the shell.

### *3D forming of plywood*

Each layer of plywood is cut to give the layer a flexibility in more than one direction. These layers are glued together in the form and the cuts in the layers of plywood makes it possible for the plywood to obtain curved three-dimensional forms (Ill. 105.c). [Lefteri, 67-68]

The wooden shell is by Production Manager, Ole Salomosen from Midform A/S, estimated to require a thickness of 12-13mm, which is less than the two other manufacturing methods. The wood will, like the rotation moulded shell, require upholstery to the shell to give it a soft comfort. The wood construction gives more freedom for construction elements to be attached.

### III. 105.a

Cross section of the chair with an cold cure foam moulded frame. The shell will be a upholstered solid with steel rods providing a structural support. The shells will be thick and the cushions will not require much upholstery to provide a comfortable seat.



### III. 105.b

Cross section of the chair with rotation moulded frame. The shell will afterwards be upholstered. The material provides the structural support, while the cushions provides the comfortable seat.



### III. 105.c

Cross section of the chair with plywood. The shell will be a thin element where the upholstery is added afterwards. The material provides the structural support, while the cushions provides the comfortable seat.



## Cost of shells

The three manufacturers gave an estimation of the expected costs of tools and unit price. A unit is defined by a back and seat shell combination. Each manufacturer was asked to give the cost for 100units and for 1000units. The quotes they returned were of different units, which are re-calculated by the design team to give comparable prices. [Appendix Q]

The manufacturers' cost of unit and tools are qualified estimates. The final form needs to be optimized according to the manufacturing method that is chosen. The manufacturing method is chosen from the criteria of cost, assembly options, and the impact the manufacturing has on the form.

	Cost: Tools *	Cost: Unit **	100Units	1000Units	10,000Units
Cold cure foam Schultz Seating System	70,000DKK	525DKK	1225DKK	591,5DKK	531,65DKK
Rotation moulding Danhill Plast A/S	180,000DKK	355DKK	2155DKK	470DKK	308DKK
3D formed plywood Midform A/S	120,000DKK	260DKK	1460DKK	380DKK	272DKK

\* The combined cost of the tools for the back and the seat

\*\* The highest cost of the seat and back combination from the offers

## Conclusion

Manufacturing the Duck chair in a cold cure form moulding will mean that the shell will get a thickness that is not desired in the form. It will change the look of the chair where the seat and back are padded, while the cushions are thin and merely decorative. Due to the volume required in the rotation moulding the shell will have a thickness that Danhill Plast A/S estimates is 25mm, while it still requires upholstery on the shell. An estimated guess is that the shell will be 45mm thick with padding and fabric. The cushions will have the needed upholstery to provide a comfortable seat. Midform is able to provide a shell that is 12-13mm thick that will give an even thinner shell.

Attaching the frame and mechanical elements from neck and leg rest to the cold cure foam is only possible in the steel frame. During the process the cold cured foam 3D model has been detailed, to use as a foundation of the mechanical parts of the leg rest. Attaching the leg frame to the cold cured foam frame can become problematic as it will need to pass a thick layer of foam that encircles the steel frame.

The wooden shell is chosen as the shell as it is the thinner and cheaper solution. What needs to be taken into consideration is that upholstery and gluing is added afterwards and will result in a higher cost.



# UPHOLSTERY

## Introduction

The upholstery in the Duck chair can be divided in three parts; the seat shell, the back shell and the cushions (Seat, back and neck). Every part needs to satisfy a comfort and contribute to the overall aesthetics. The following detailing will be based on the theory of ergonomics and the knowledge gathered on upholstery methods.

## Foam

The finish on the 3D formed plywood shells is rough according to Ole Salomonsen, Midform A/S, and will need to be upholstered with foam before attaching textile to the surface. The upholstering on the shells is thin, while it is soft enough to lean against. The Womb chair by Eero Saarinen is thinly upholstered on a fibreglass shell but still gives soft upholstery on the overall shell (Ill. 107.a). This chair's upholstery is used for inspiration to the upholstery of the shells. The three-dimensional form plywood shells will be covered with a 10mm (38kg/m<sup>3</sup>) cold foam.

The mounting of the layers of foam have been discussed with upholsterer, Jette Andersen, from A-Polstring. She explains that the foam will be glued to the shells using a Sabaspray 2201 (An upholstery glue). The glue is spread in a thin layer with a spray gun. The foam is cut in a pointed edge from the inside, and is folded around corners to avoid any noticeable edges when touching the edges (Ill. 107.b). The glue dries in a few minutes and during this time the upholsterer can remove and re-attach pieces of foam.

The foam is cut by the supplier to suit the form. Jette Andersen says, that these edges will not be visible if done in a professional manner. A thin layer of wadding was thought to place on top of the foam to even out the surface, however Jette advise against this. She explains that the curved surfaces will require glue between the fabric and foam/wadding, and the wadding means that it will be impossible to control.

### *The back shell*

The foam is attached to the back shell after the slides and mechanical components are mounted. This is done to make the mechanics less noticeable.

### *The seat shell*

The seat shell is divided into two pieces; The shell and the sitting plate.

The shell is upholstered with foam from the outside and in. It is folded around the edges as on ill. 107.b. The edges are glued and stabled, to avoid any movement of the foam over time. The hole in the bottom also has foam folded around its edges, to give it a soft and even surface.

The sitting plate is upholstered, pulling the foam to the bottom side of the plate and then upholstered with textile.

### *The textile for the back shell*

The textile is cut and sewn by Nordic Easy Chair's existing supplier. The collar and shell cover consists of several pieces of textile that are sewn together. There is an opening on the front side and bottom edge of the shell making it possible to attach the cover to the shell. Jette Andersen explained that the curve of the form will make glue unnecessary on the back side of the shell. Glue is needed under the armrests and on the inside curvature of the shell.

### *The textile for the seat shell*

The textile is attached to the outside of the shell with staples on the inside of the shell. These staples will be hidden by the seat plate. The front has a gap where there's a hole cut out, where the textile will cover the gap between the flanges.

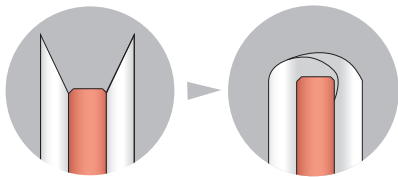
### *The cushions*

The cushions are cut from blocks of foam by the supplier. The covers are sewn by Nordic Easy Chair's current supplier. Both items are shipped to Nordic Easy Chair to be mounted.



**Ill 107.a**

The Womb Chair by Eero Saarinen without textile. The chair is covered on the inside by a thin layer of cold foam.



**Ill 107.b**

The illustration shows how to upholster around an edge without leaving a seam of glue.

## Seat cushion

In the research it was found that most of the bodyweight goes through the seat bones when seated (P. 58). The most exposed area of the buttocks when seated is at the two points around the seat bones and if this stress is not distributed to the rest of the buttocks and thighs the user will experience pain in this area (Ill. 108.a A).

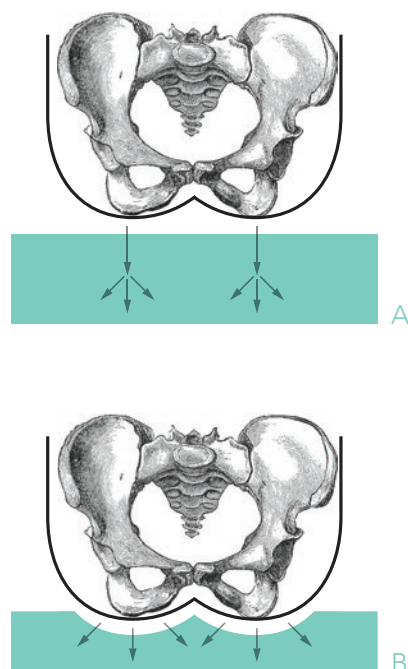
There is two ways to deal with this issue when creating a seating cushion. Carefully selecting the right foam is crucial when distributing the stress as foams can be found in several of different densities and thickness. The easy way of ensuring an even stress distribution is to make the foam as thick as possible but for a design as Duck chair where the goal is to make a more light expression and where there have to be room for mechanical components under the seat, the cushion cannot be too thick. [Tryksår, 2010, 10]

Another way of distributing the stress is to preform the foam to make it support around the curved shape of the buttocks and thighs. This way the stress is not only distributed vertically through small areas of the buttocks but is transferred through a larger surface area of the buttocks. Unfortunately a body shape cushion contrary with two important visions to the Duck. The body-formed cushion makes the chair static but the Duck should not only be designed for only one particular user or seating position. Also the cushion gives the chair a highly ergonomic expression that makes an undesired relation to helping equipment (Ill. 108.a B). [Tryksår, 2010, 10]

## Force Sensitive Application

To find the best-suited upholstery for the seat cushion, different foam combinations were tested with a Force Sensitive Application mat on two of the focus group members and one member of the design team. A Force Sensitive Application mat is able to calculate the sitting load on the buttocks and how it differentiates from person to person and material to material. [Method report p. 20] The different foams that were tested were cold foam, polyether foam, Viscous elasticity foam (Memory foam) and ZenXit (A material provided by Gabriel). [Appendix K] The materials came in different sizes and densities and were both tested individually and in combinations. The total results of the Force Sensitive Application test can be found in Appendix L.

The result of the tests showed that combining different density of cold foam gave the best result in general. The pressure on

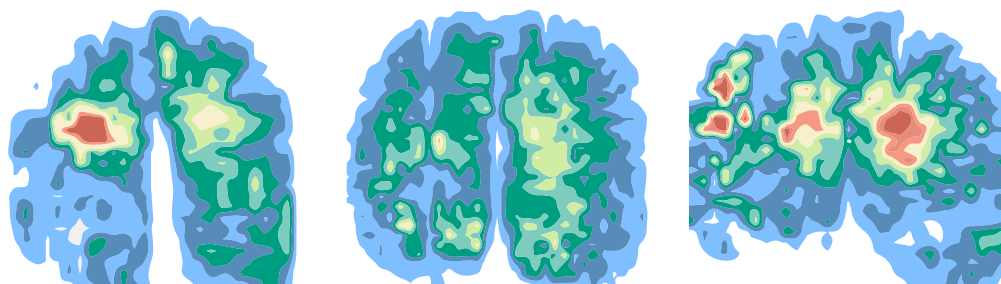


**Ill. 108.a**  
A: Non flexible seat.  
B: Curvature fitted seat.

the seat bones was significantly reduced when combining 20mm (50kg/m<sup>3</sup>) cold foam on top of 50mm (38kg/m<sup>3</sup>) cold foam or 50mm (38kg/m<sup>3</sup>) cold foam and 55mm (32kg/m<sup>3</sup>) cold foam together. [Appendix L] These combinations showed a better equalization of the pressure compared with some of the other results. The tests where the upholstery had switch places did not show significant changes in the pressure load.

The chosen combination for the seat cushion is 20mm (50kg/m<sup>3</sup>) cold foam on top of 50mm (38kg/m<sup>3</sup>) cold foam. (Ill. 108.b) This is due to the significant reduction of thickness compared with the other two, while it still has a great equalization of the pressure on all of the test people. The thickness of the different densities of cold foam can be varied in the final seat cushion so both comfort and thickness can be decreased or increased.

The textile that will be on the final product will also have an effect on the pressure load because the textile will increase the stiffness of the seat cushion. The chosen textile for the chair will be explained later in *Drafting*.

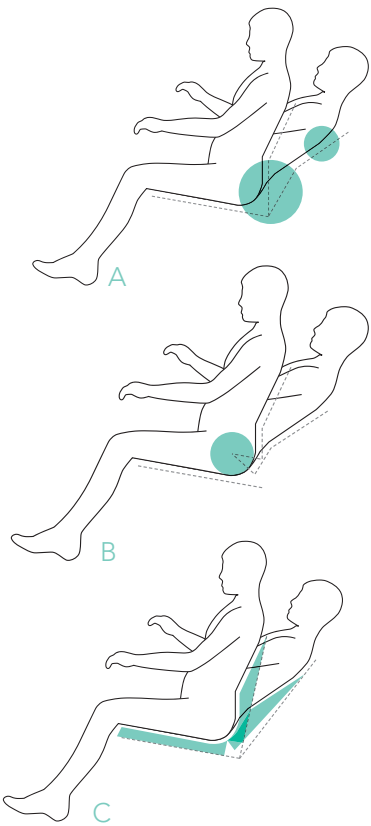


**Ill. 108.b**  
FSA test of 50kg/m<sup>3</sup>Cold foam (20mm) on top of 38kg/m<sup>3</sup> Cold foam (50mm). The more red the pressure is loaded on the buttocks. Test people are from left: Ditte, Mette N and Børge N.

## Back support

A problem with many recliners is that the rotational point when reclining is far from the actual rotational point in the hip. This means that reclining creates a shear between the back and back rest and the lower back support is placed higher than intended (Ill. 109.a A). The I-Sit chair by Magnus Olesen A/S (P. 130) has solved this problem by moving the reclining rotational point to both sides of the hip, which means that the rotation lies in the same axis as the hip (Ill. 109.a B). Unfortunately this makes the chair look heavier around this point, which is not acceptable for the Duck chair that should look lighter. Therefore the design team decided to move the backrest rotational point closer to the hip by separating the back cushion from the shell and attaching it to the seat cushion, creating a new rotational point just behind the buttocks. This way the shear is happening between the shell and the cushion and not the body (Ill. 109.a C).

The right lumbar support is important for several places on the body (P. 56). There is a clear guide of the shape of this support but the challenge is to make a back cushion that can adapt to different body heights. Several adjustable back supports exist on the market. Common for all of them, is that they are all quite elaborate to adjust and only few are height adjustable. The goal is to create a cushion that is easy to adjust or self-adjustable.



**Ill. 109.a**

- A: Rotational point far from the hip.
- B: Rotational point near the hip.
- C: Cushion follows the back.

## Shape of the back support

The first principle is an empty cushion bag attached to the seat cushion and when purchasing the chair, the customer can choose between different lower back supports that all fit in the same bag (Ill. 109.b). The seat becomes slightly deeper when choosing a higher cushion but it would be tall people that would choose the higher lumbar support. The problem with an individually chosen lower back support is the same as the ergonomically shaped seat cushion – it only fits a small range of users. Other materials have therefore been researched that are able to adapt to different body shapes. Cold foam is not able to move around behind the textile but the insulation material, polystyrene beads (Krøyer beads), is able to move around but is still soft and shock absorbing. These beads are already known from beanbag chairs.

The lumbar support in the back cushion is therefore designed so it fits with an average body size. The cushion contains four chambers divided by flexible walls. Each filled with polystyrene beads and when the body leans against the cushion the beads can travel up or down to an area where more filling is necessary. When the user is exiting the chair the beads are pressed back to their original place by the flexible walls (Ill. 111).

**Ill. 109.b**

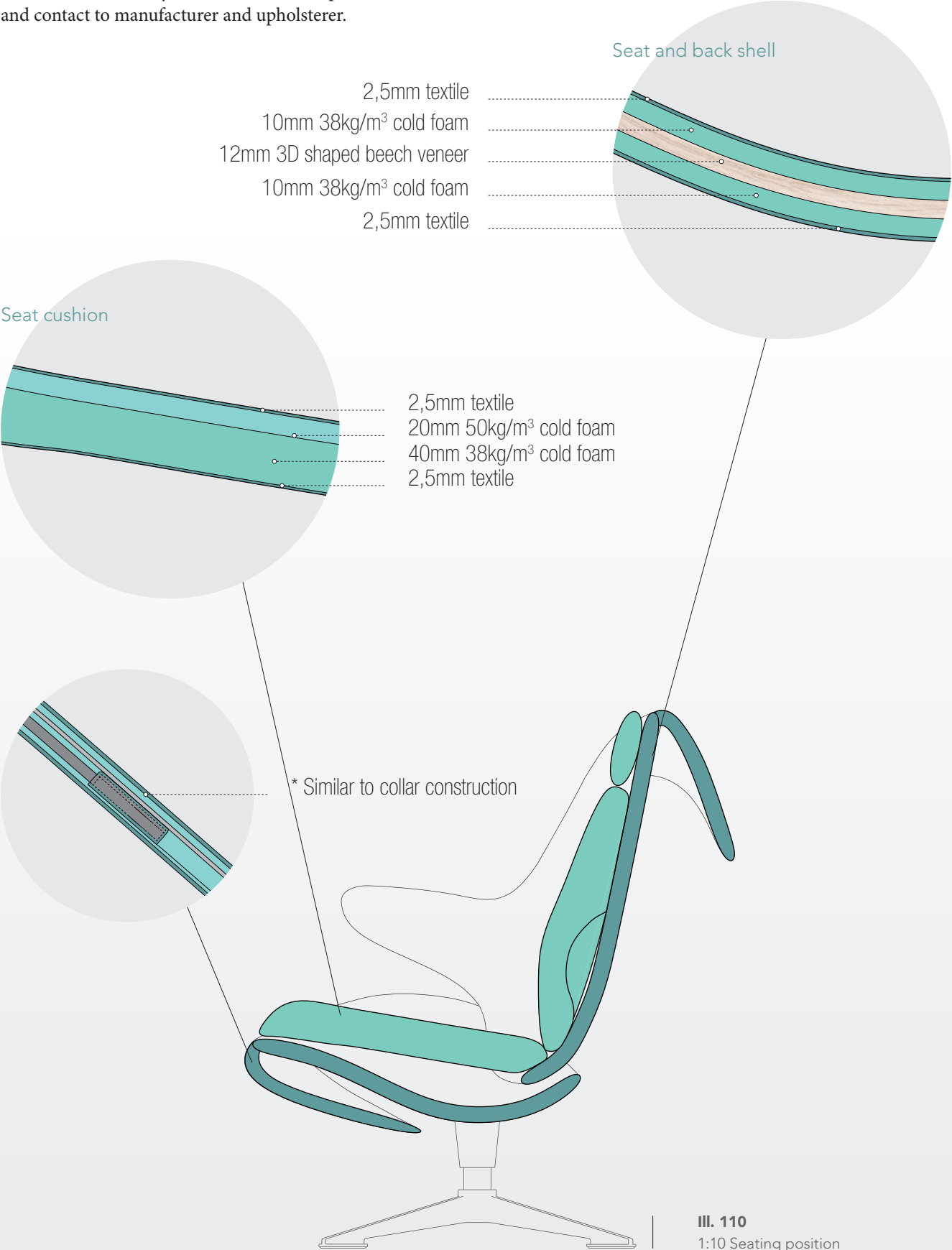
A flexible lumbar support has to be designed for several body types. The illustration shows three different sizes.

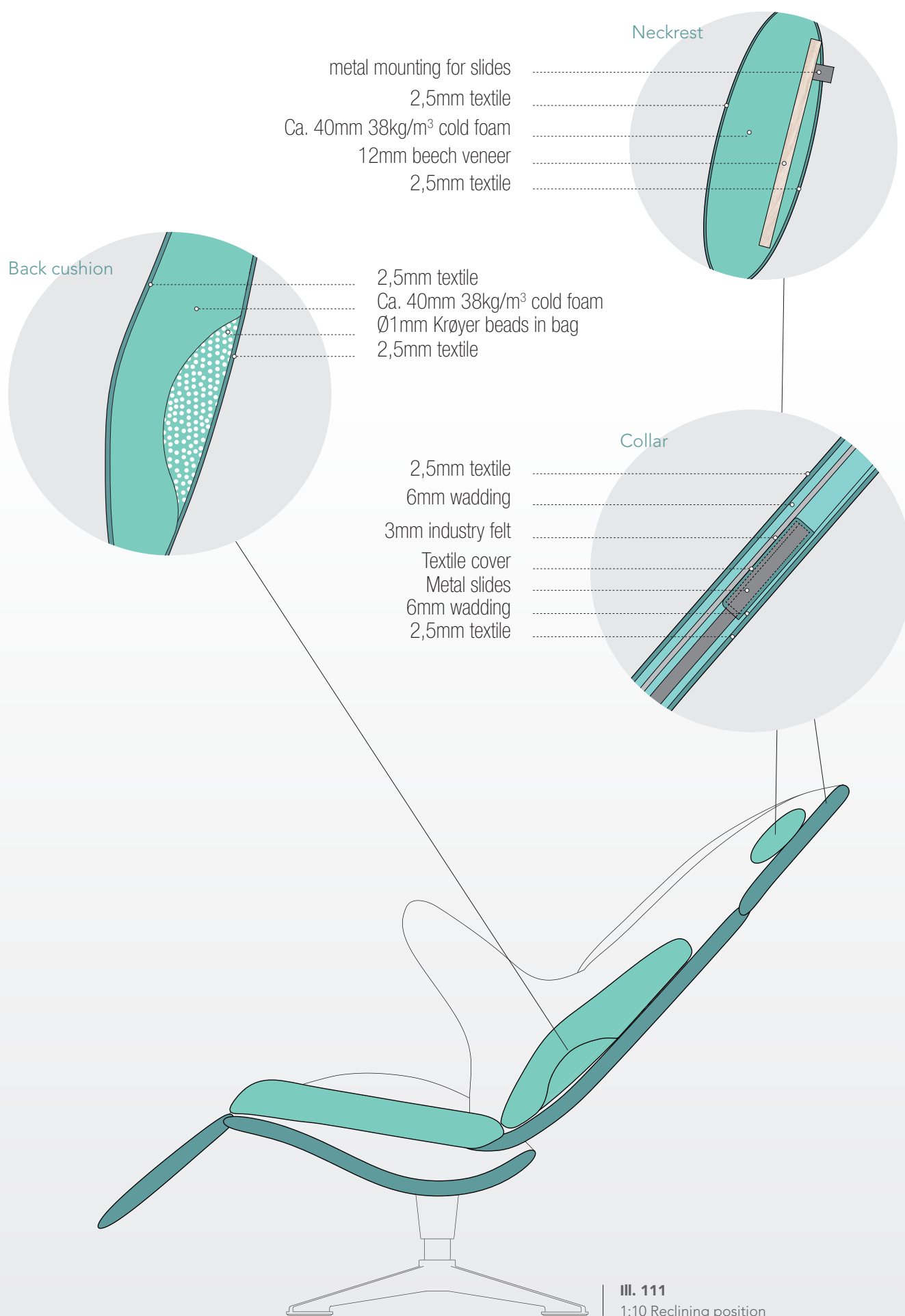




# Upholstery construction

To visualize the different layers of the upholstery, a cross section of the shells, neck rest, seat and back cushion, collar and leg rest have been made. The cross sections are not in scale. The different layer sizes are based on previous research and contact to manufacturer and upholsterer.





# TEXTILE AND COLOUR

## Gabriel

Gabriel is a leading textile manufacturer for the furniture industry. It is founded in 1851 and has head office in Aalborg. They manufacture textile for both contract and home furnishing. Their textiles ranges from synthetic to wool, and from felt to mesh. [gabriel.dk 2] Gabriel was chosen because they are a leading company on the textile market.

### Meeting 1

A meeting was arranged with Simon Sønderby Nielsen from Gabriels' DesignMaster department to discuss the textile for the Duck chair. The Duck chair has a curved form, where the design team believes that a textile with less visible woven lines is preferred, since the lines can disrupt the curved forms on the chair. In this meeting the grading system from the textile is discussed, and established that the fabrics that the design team had chosen all met the criteria for domestic use. [Appendix M for a specification of the fabric grading system]

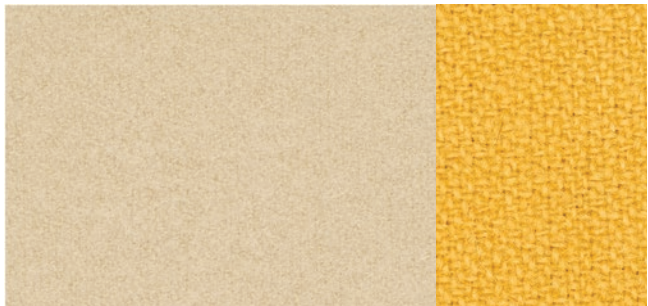
At the meeting the design team had the opportunity to feel the tactility of the fabrics. Three of their upholstery fabrics are chosen as possible textiles for the chair. These are Byron, a woven fabric with a smooth surface. Novo 2, a woven wool with a slight texture and Europost 2, a woven textile that has a felted appearance. The prices for each fabric type are obtained according to the purchase prices for Nordic Easy Chair A/S.

### Meeting 2

A second meeting was arranged the following week to choose the colours for the Duck chair. The colours were chosen with inspiration in the trend research where the hues of alpine and mono-colours are chosen from the quiet design. The recliner has a differentiation in colour in the shell and cushions, to emphasize the difference in these elements. At the second meeting at Gabriel the textile samples from all three types were handled to find four colour scales. The colour scale is illustrated below.

The yellow and grey are more subtle and similar hues where the different textures in the textiles create another dimension to the combination. The teal and red combinations are more bold and the same type of textile is chosen for both seat and shell.

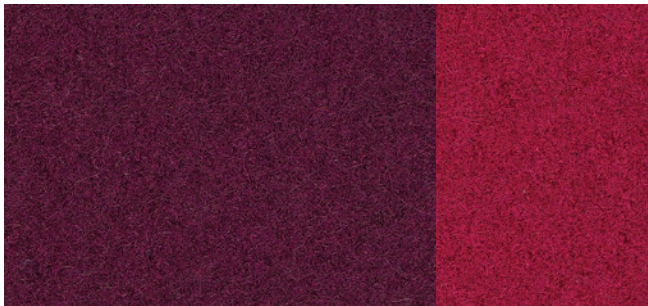
Soft yellow



Europost 61107

Novo 62019

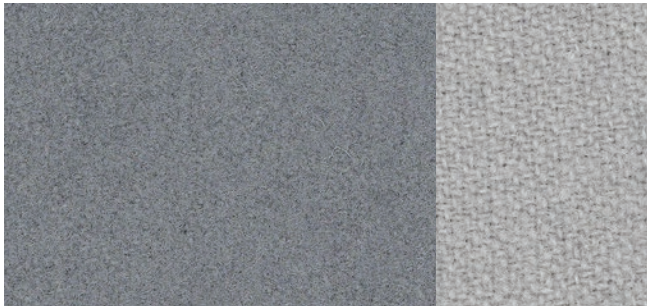
Warm bordeaux



Europost 64045

Europost 64035

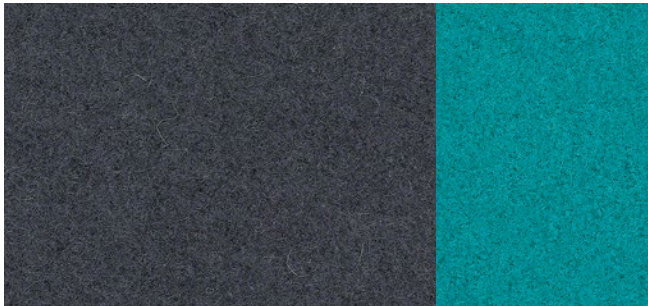
Neutral grey



Europost 66056

Novo 200

Bright teal



Europost 60017

Europost 67016

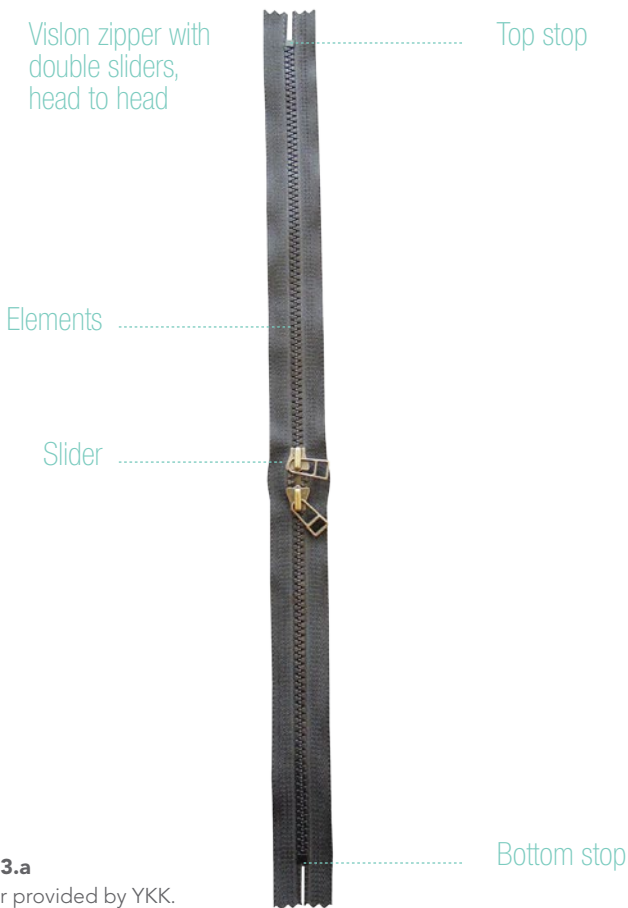
**III. 112.a-d**  
The colour scale chosen for the recliner. The colour on the left is the colour intended for the shell, while the colour on the right is for the cushions.



# ZIPPER

To avoid a gap in the sandwich construction in the collar different solutions have been researched. The gap is created to move the neck rest up and down and allow the collar to unfold. The gap is approximately 300mm long and if the gap is not closed, it will open while the collar is folded down on the back of the chair, which results in an undesired appearance that exposes the mechanical components. Different solutions for closing the gap are considered, such as magnet ribbons or zipper.

To close the gap completely the zipper is chosen because it would close the gap completely. YKK Danmark A/S was contacted to find a suitable zipper solution for the gap. They advised the design team to use a Vislon zipper with double sliders arranged in head to head relation. (Ill. 113.b) Because the zipper would not be influenced by any horizontal pull, YKK Danmark A/S suggested a zipper with a 4mm width. Furthermore different sliders could be attached based on the function needed. The design team chose to use a DADHR slider with auto lock as shown on the picture. The leather strap would be able to be mounted on the sliders and the neck rest will cover the gap that the two sliders are creating in the elements of the zipper.



Ill. 113.a  
Zipper provided by YKK.

# STITCHINGS

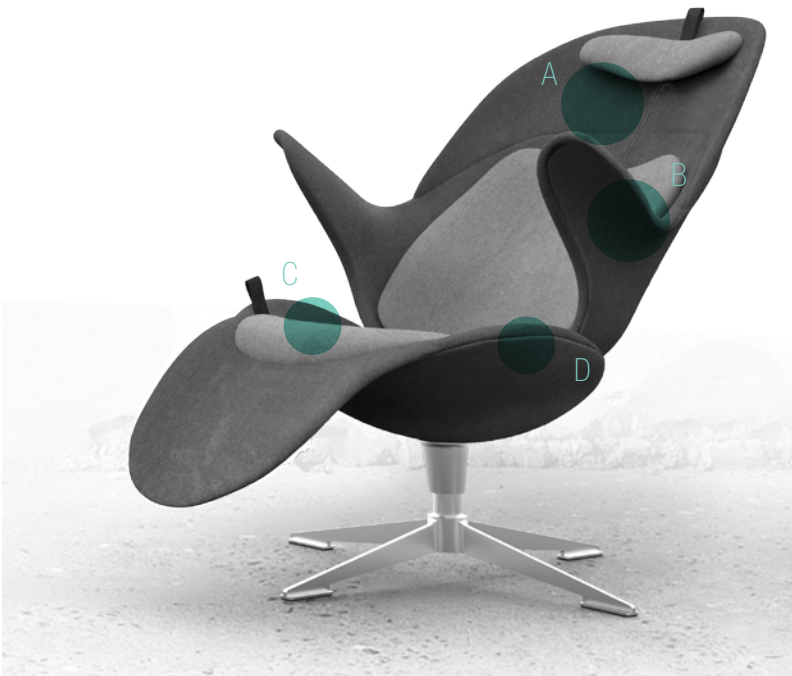
The following stitchings have been chosen for the product. An overview of the most common stitchings can be found in Appendix N.

A: A zipper boxing seam is used to cover the zipper in the collar. This seam is carried down the middle of the back. This will divide the textile in two, and will be beneficial in the mounting of textile in the shell upholstery process.

B: The stitchings along the edge of the back shell is made to control the fold of the collar. The stitching also separates the upholstered shell part from the loose collar.

C: The stitchings on the pillows are plain stitchings. They are placed on the back side of the cushions to make them more discreet. Instead it is the organic curves of the chair that dominates the expression.

D: The stitchings on the shells are placed just behind of the edge curves. The stitchings are “plain stitchings”, to underline the edges without emphasizing it as it can be seen in the “Oculus Chair” by Wegner. (P. 130) The stitchings are placed behind the curves to allow a slight movement in the textile, that was less tolerated if it was directly on the edge of the curves of the armrest.



Ill. 113.b  
Stitchings on the final product.

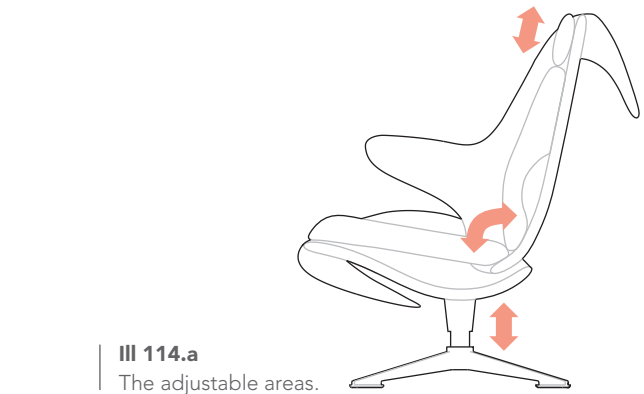
# HANDLES

The Duck chair can be adjusted in three areas, the seat height, the recline function and the neck rest (Ill 114.a). The seat height and recline function both relates to gas springs that are mounted in the base or the seat shell. The neck rest is adjusted in the back shell.

The user must be able to adjust these features while sitting, which means that they must be in reaching distance when seated and reclined. It is decided to keep the handles simple so they do not interfere with the overall design of the chair. At the same time the handles cannot be too invisible as they need to be easy to locate. There must be a coherence between the handles in the chair.

## One or two handles in the seat

In the seat there are two adjustment features, where one provides a rotational movement (Recline) and the other provides a vertical movement (Height adjustment). It is decided to join these two handles in to one, as two separate handles can create a confusion. A quality leather strap is chosen as the handle, as it provides a reference to craftsmanship. The user interacts with the handle on a daily basis and it must be a reliable handle. The strap will work well in the seat as in the neck rest.



Ill 114.a  
The adjustable areas.

Three concepts are made on a handle for the seat that can both provide an adjustment feature for the height adjustment and the recline function. (Ill 114.b-d) All three handles have a noose on the top of the handle. This is given to illustrate a vertical movement, where the upwards pull of the handle correlates to the movement of the height adjustable base. The rotational movement will slide from side to side and it is decided to place it on the right side of the chair next to the seat cushion.



Ill 114.b: Handle one  
A sheet of metal is inserted between a folded leather strap.



Ill 114.c: Handle two  
The leather is folded around itself and a metal plate is the end profile.



Ill 114.d: Handle three  
Leather is folded around the a round metal profile.

## Conclusion

During testing on the mock up model the first concept will be more suited for pressing down on the broad side of the strap as opposed to pulling the handle in the horizontal movement. It seems fragile and does not prove a good grip. The second handle has a metal plate that the user can press down on with i.e. A thumb. It was believed that this provided a better control, but when the thumb is pressed down on the strap, the hand's grip is much bigger and the plate has no functional value. If this handle should be suitable for a hand it must be much larger, which will not suit the chair. The third handle has a metal profile inserted between the leather straps. The round profile provides a grip for the user and there is a sense of control in it.

# INTERACTION

## Colour

The Duck chair has two colours on the cushions and shells, and a third colour is added to the handles to signal to the user that something happens in this area. The solid leather strap had a different tactility and is more sturdy than the textile used for upholstery, which indicates to the user that this is an area that can be operated. The two handles are discussed as being the interface of the Duck chair.

## Interface

In the article by Wensveenm, Djajadiningrat and Overbeeke (2004) an interface can be seen as feed-forward (FF) or feedback (FB), where they signal the actions or future actions of a product. The FB is the information that is given during the use of the product, or immediately after, where the FF gives an indication to the user how the product is to be used. FF and FB are divided into three types; Functional, Argumented and Inherent. Functional is the information generated by the product itself. Argumented is an indication of the action in the product in the product. Inherent is the overall experience of the product that related to the perception of the action. [Wensveenm, Djajadiningrat and Overbeeke, 2004]

This method is used to describe the interface of the chair.

### ***The seat handle***

The noose on the end of the handle is pointed upwards. The noose itself signals that it is to be pulled by hand, and relates to the motoric skills. This gives it an inherent feed-forward. There is an instant functional feedback when the sitter uses the function, as the gas spring is immediately released. This is also a inherent feedback as the movement is felt by the sitter. The vertical direction of the pull corresponds to the vertical movement of the chair.

Reclining the Duck chair is controlled by the same handle. The indication of the metal rod inside the handle give it a stiffness and references a joystick, that shows the user that force may be applied to it. The handle is pushed forward to release the gas spring, which will mean a backwards movement, when the sitter applies force to the back. When returning to an upright sitting position, the handle is also pushed forward, which corresponds to the direction of the chair. This handle also provides a instant functional and inherent feedback.

### ***The neck rest***

The neck rest is manually adjusted from the back and has a similar handle to the seat handle. The neck rest is moved in connection with a zipper, where its linear movement provides a familiar reference. There is a audible inherent feedback in the sound of the zipper, while there is an instant functional feedback in the direct combination between the force applied and the movement of the neck rest.





# CONSTRUCTION

The following pages covers the constructional elements of the Duck chair. To explain the connection between the construction elements, the chair is divided in four assemblies: Back, seat, base and the mechanical part. Few elements have been chosen not to be detailed due to time constrains. (Product scope p. 98) These elements are explained through principle illustrations. The construction contains elements that could be critical in terms of stability or durability. These have been tested through a build-in finite element method program in SolidWorks for validating (Method report p. 21).



**III. 117**  
The inner construction of the Duck chair.

Back Part

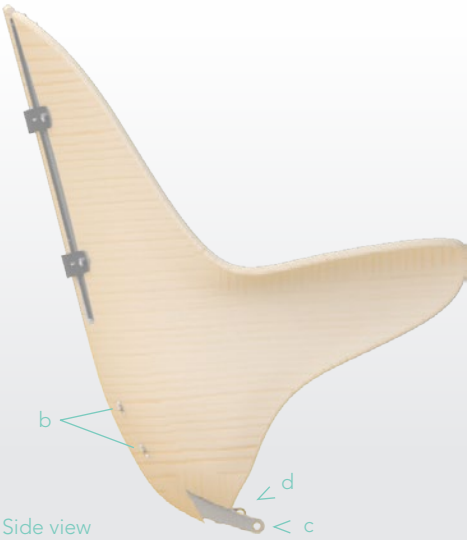
Assembly

The main supporting element of the back is the three-dimensional formed plywood shell made in one piece. Down the back, two gaps are made to make space for the headrest slides. The slides are bolted through the shell four places and fixed with tee nuts (Ill. 118.c a). In the bottom of the shell to make space for the joint that connects the back assembly to the rest of the chair. The joint is mounted similar as the slides by four bolts and tee nuts (Ill. 118.c b). The joint has three mounting points (Ill. 118.c c & d). The two outer points provides the backs rotational ability and the movement of the leg rest (Ill. 118.c c). The middle mounting point connects the back to the gas cylinder locking and releasing the recline function (Ill. 118.c d).

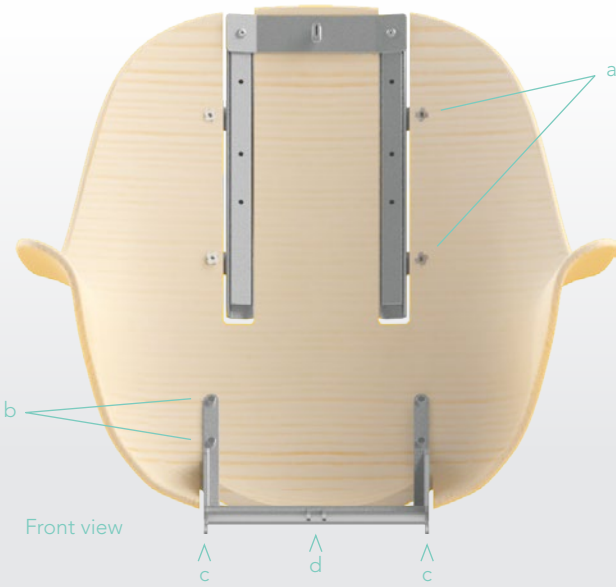
Headrest mechanism

The system consist of five parts fixed together with rivets (Ill. 118.b 1). The sliding parts are standard drawer sliders with a length that satisfy the adjustability together with load carrying capacity of 40kg each. [klee.dk] As the sliders should take as little space as possible they are turned 90° for what is the normal position for receiving load. Klee explained, that from this position the slider capacity decreases by 25% and can take a load of 30kg each (Ill. 118.a). The sliders are mounted on two braces that are bolted to the plywood shell and fixed with tee nuts (Ill 118.b 2). The fifth piece is the top plate that provides the mounting for the head cushion through the collar fabric (Ill. 118.b 3).

Ill. 118.c  
Side, front, back and top view  
showing the constructional  
elements of the back assembly.



Ill. 118.b  
1: Rivet assembly.  
2: Tee nut and bolt fixation to back  
wood shell.  
3: Head cushion mounting point.



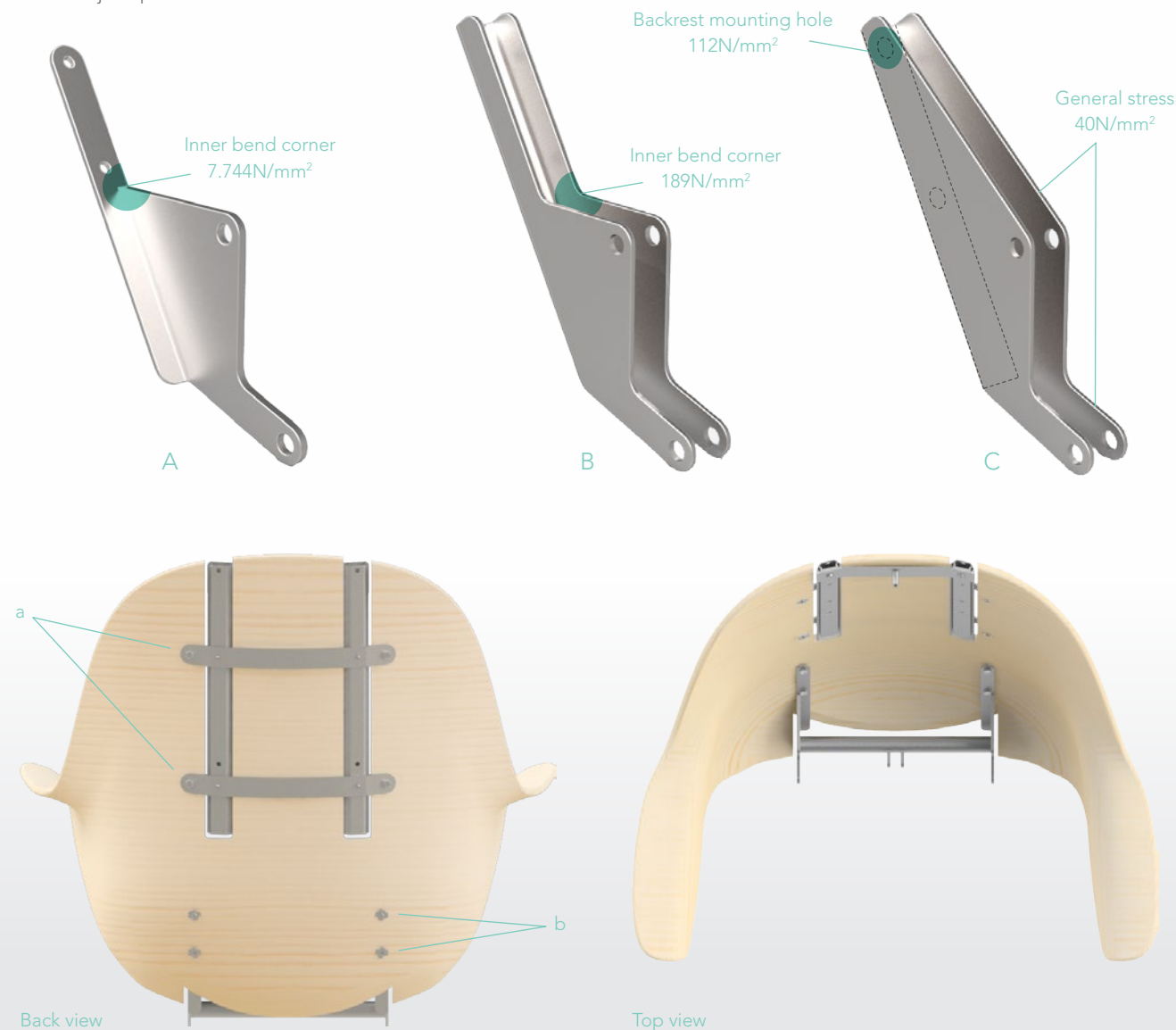


**FEM Analysis - back to seat fixture**

An area of the backrest that could be critical in terms of durability is the joint connections. These joints pieces should be able to withstand both the weight of the back assembly and the weight of the upper body of the user together with unknown factors. The upper body comprises around 63% of the body weight, which means that the upper body of a person that weighs 120kg is around 76kg. According to SolidWorks mass properties the back assembly weighs around 6kg, which give a total of 82kg and distributed on two joints it gives 41kg per joint piece. The weight is distributing mostly from the upper back to the top backrest and is therefore placed on the top 100mm of a back shell representative. [Appendix O] To make a more realistic result the force is transferred from the back shell to the joint piece through washers for a local distribution.

Based on information from local metal construction company (Scaniro) the mechanical components is made of plain carbon steel that has a yield strength of 220N/mm<sup>2</sup>. The first joint piece made for the recline function is bended sheet metal formed in an L (Also seen on ill. 118.c). When the piece completed the FEM calculation, it clearly showed that it had to be modified to withstand to stress. In the most critical areas the joint piece was stressed by 7.744N/mm<sup>2</sup> nearly 36 time the yield strength (Ill. 119 A). To decrease the stress in the inner bend corner, multiple design were made where the main focus was to place sheet metal orthogonal to the direction of the force on both sides of the backrest mounting holes creating a U-profile and double seat mounting holes (Ill. 119, B). As the result was a local stress of 189N/mm<sup>2</sup> it was able to withstand the load, but the inner bend corner had to be filled completely to provide a safety factor. The final design performed a safety factor of 2 as the local stress, located around the backrest mounting holes, was around 112N/mm<sup>2</sup> (Ill. 119, C).[Appendix O] The general safety factor for the joint piece lies around 5.

**Ill. 119**  
Different joint pieces



Seat Part

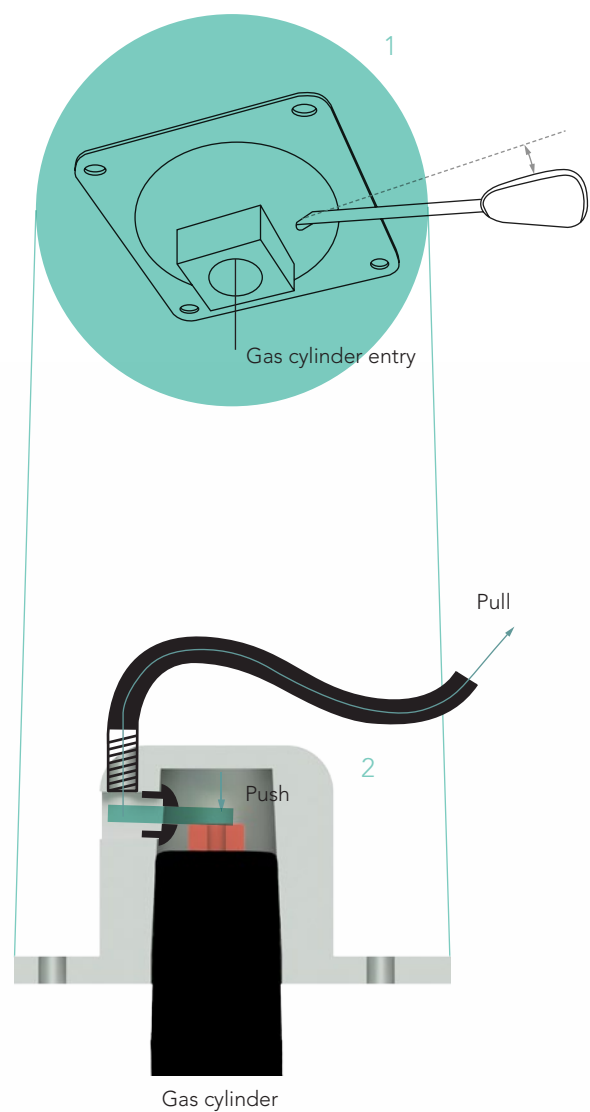
Assembly

Like the back part, the seat also consists of a three-dimensional formed plywood shell. The bottom centre of the shell provides the fixation of both the base and leg rest mechanism (Ill. 120.b a). The pressure release system (Ill. 120.b b) is bolted four places through this point and directly into the cylinder cover on the base (P. 123). The leg rest mechanism has cross member that stiffens the construction and securing it against torque. This cross member is bolted together with the pressure release, plywood shell and gas cylinder cover (Ill. 120.b c).

To create stability for both the plywood shell and the mechanical parts the leg rest mechanism is bolted four places on the sides to the shell and fixed with tee nuts (Ill. 120.b d).

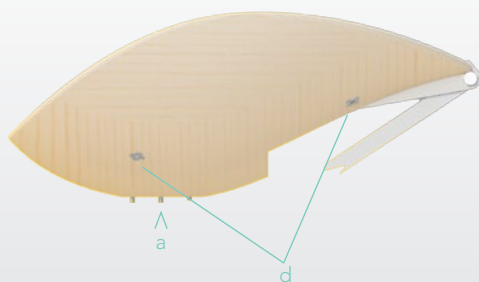
Gas cylinder pressure system

The gas cylinder pressure release system is a combination of two individual systems. The basic construction is the same as in ordinary office chairs (Ill. 120.a 1). A rod shaped handle makes a tilting movement that presses down the pressure release button (red). This rod is partially replaced by a wire, which is often seen when releasing the recline function and instead of a pull in the rod a pull in the wire tilts a substantial smaller rod inside the pressure release house (Ill. 120.a 2). By using a wire pull it makes possible to freely decide where to place the interaction point.

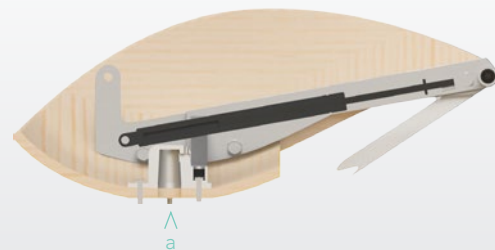


III. 120.a  
1: Standard gas cylinder release.  
2: Pressure release system by wire pull.

I III. 120.b



Side view



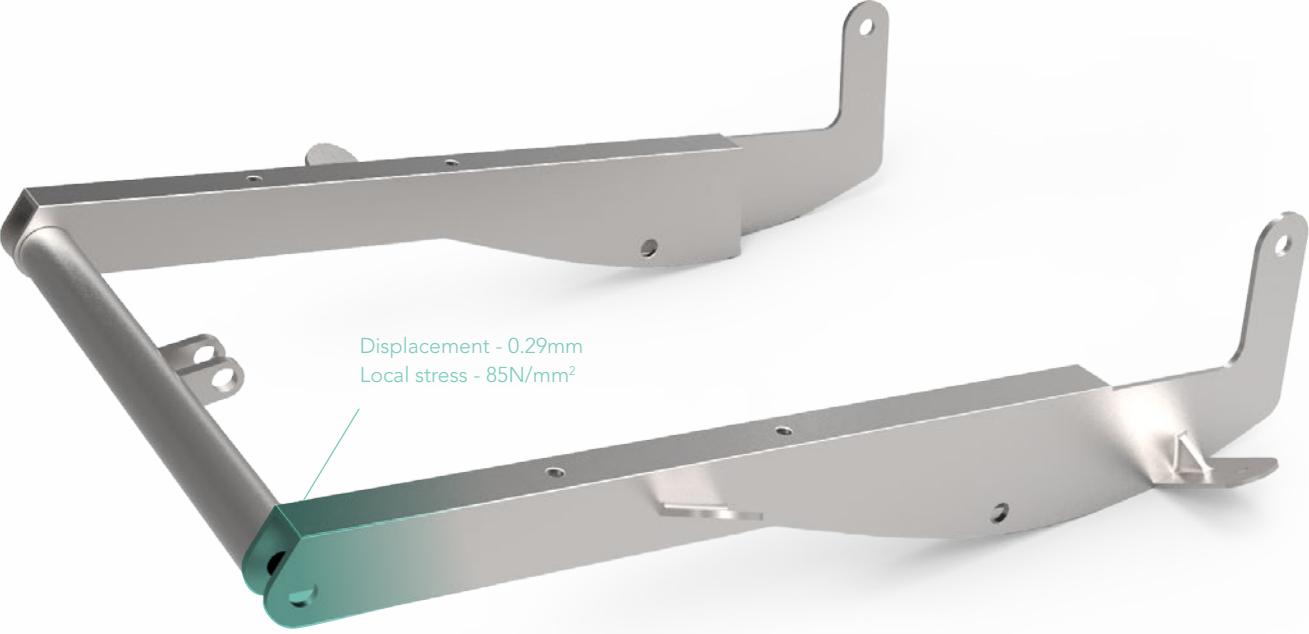
Side view (center cut)

**FEM analysis - u-profile (leg rest mechanism)**

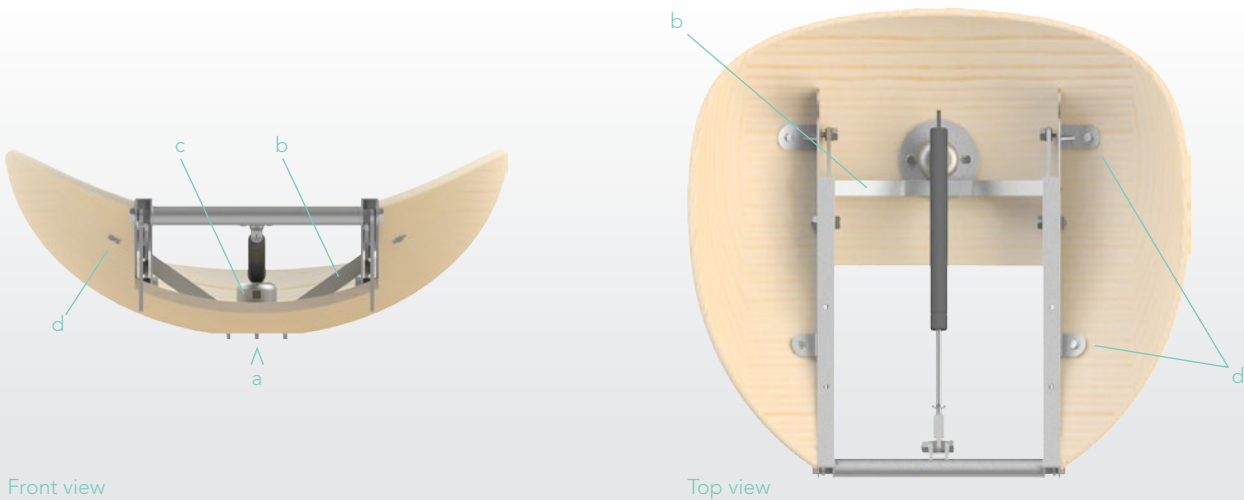
For a smooth movement and reliable mechanical constructions it is crucial that they are totally stable and do not twist or bend. Therefore it is seen as a must to test the u-profile that holds all the moving components. The test is made based on a 120kg person sitting on the very edge of the chair and as there are two of them it will be 60kg pressing on the tip of each profile.

Like the joint piece this mechanical components is also made of plain carbon steel that has a yield strength of 220N/mm<sup>2</sup>. The result shows deflection of 0.29mm at the very end and the local stress at the area is around 85, which gives a safety factor of 2,6 (Ill. 121).

The result is considered by the design team to have minor relevance and is not going to affect the system. [Appendix O] In consideration of optimizing the construction in a product maturing phase, it could be relevant to look at reducing use of material to reduce the weight of the chair and production cost. It could also be relevant to look at other materials such as aluminium, which has great mechanical properties and a very low density.



**Ill. 121**  
U-profile for recline and leg rest mechanism.



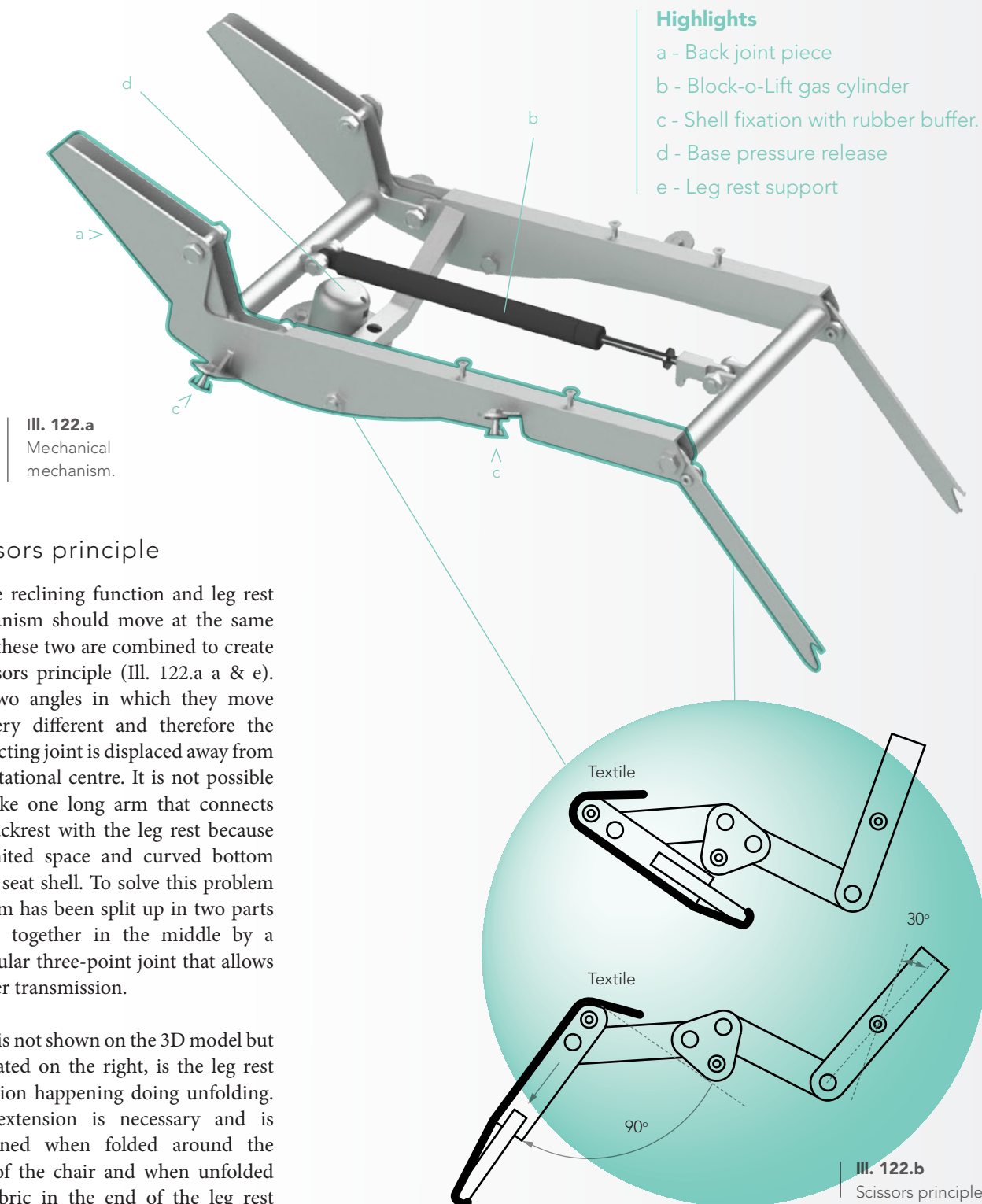


## Recline and leg rest assembly

To increase the user experience of the chair a mechanical mechanism have been constructed that are able to move the leg rest and reclining back at the same time. In this area a lot of components need to fit together in a small area and be able to move simultaneously. The backbone of this assembly is the two u-profiles described on page 119. These elements contain the scissor principle that moves the backrest and leg rest in relation to each other. The recline joints (Ill. 122.a a) are connected to the front of the u-profiles with a gas spring (Ill. 122.a b). The choice of gas spring is important for the

user experience – if the gas spring is too weak it feels like the back is dropping without supporting and does it become too hard, it will be difficult for light persons to recline the chair and the back. To evaluate different weights a spring test was made. [Appendix P]

The result showed that a spring with a pressure force of 600N equal to a standard Stabilus Bloc-o-Lift gas cylinder and already used in Nordic Easy Chair chairs. It moved smoothly and felt supporting the back at the same time.



## Scissors principle

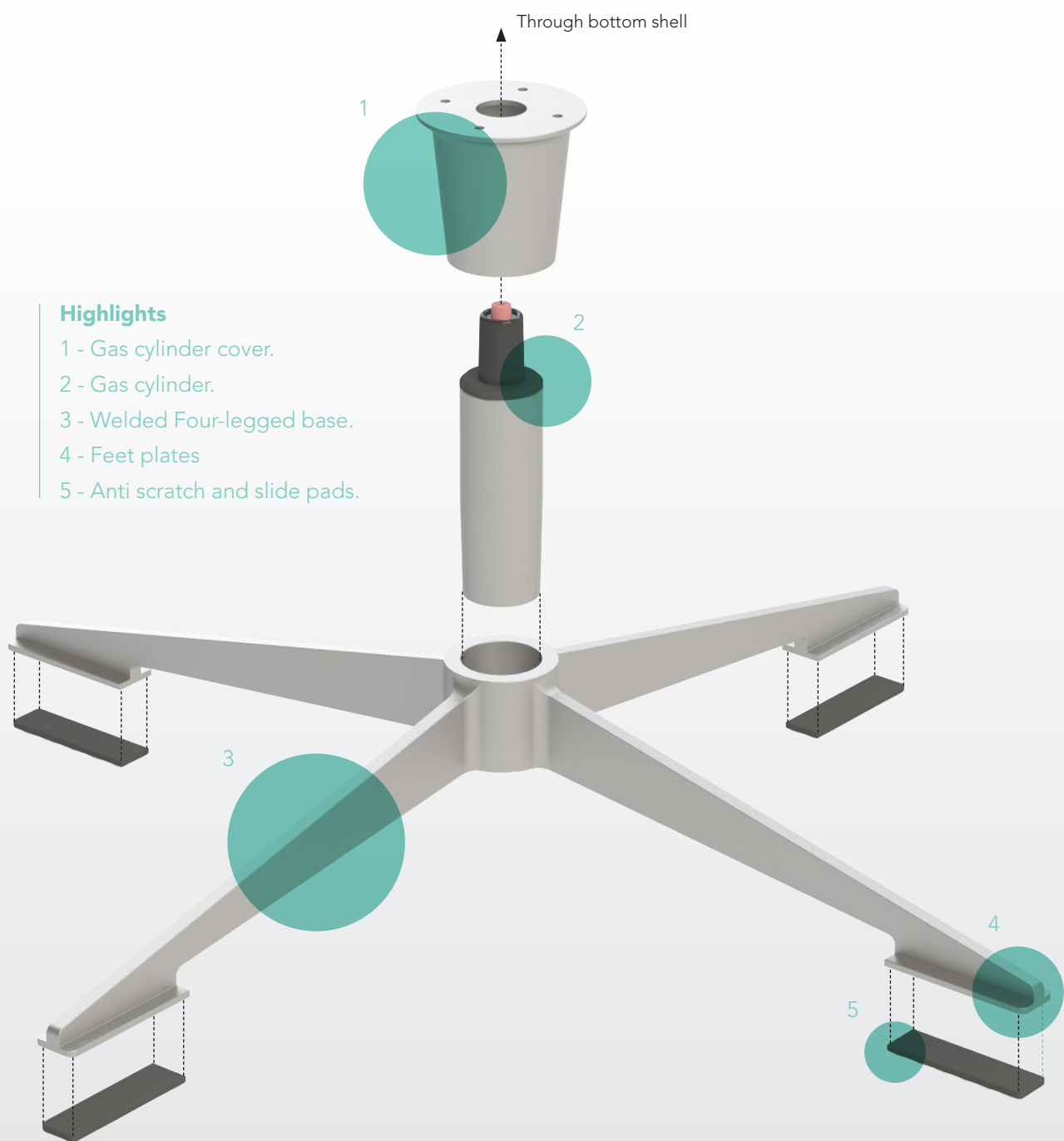
As the reclining function and leg rest mechanism should move at the same time, these two are combined to create a scissors principle (Ill. 122.a a & e). The two angles in which they move are very different and therefore the connecting joint is displaced away from the rotational centre. It is not possible to make one long arm that connects the backrest with the leg rest because of limited space and curved bottom of the seat shell. To solve this problem the arm has been split up in two parts joined together in the middle by a triangular three-point joint that allows a flatter transmission.

What is not shown on the 3D model but illustrated on the right, is the leg rest extension happening doing unfolding. This extension is necessary and is shortened when folded around the edge of the chair and when unfolded the fabric in the end of the leg rest needs to be supported to be stiff.

## Base assembly

To make the base as simple as possible the amount of components are kept as a minimum. A conically shaped pipe is covering the gas cylinder and mounted on the bottom of the seat shell (Ill. 123.1). Besides covering the moving part of the gas cylinder, the cover also functions as the assembly point for the leg rest mechanism and seat shell. Illustration 123.2 show the gas cylinder. Both top and bottom of the gas cylinder are conically shapes to respectively wedge into the pressure release house (P. 120) and the four-legged base part.

On the ends of the four legs, wider feet plates are screwed in place to provide a larger pressure contact to the floor. To prevent the legs to scratch wood floors and ensure that the chair do not slide, a rubber pad is glued underneath each leg (Ill. 9.4).



### Highlights

- 1 - Gas cylinder cover.
- 2 - Gas cylinder.
- 3 - Welded Four-legged base.
- 4 - Feet plates
- 5 - Anti scratch and slide pads.

### III. 123

The constructional elements of the base assembly.

# COST PRICE ESTIMATION

## Introduction

To get an understanding of the potential cost price for the end-user the production costs of key components are obtained. This will show the design team if the cost is too high and where it can be possible to optimize the chair later in the product maturing phase. Nordic Easy Chair has during meetings explained that the cost price in store is approximately four times higher than the production price. This means that a production price is 2500DKK the retail price will be 10,000DKK. Torben Thodsen Petersen, NEC explained that with the special construction of mechanical components the Duck chair may be more expensive and reaching a cost of 12,000DKK. The team is aiming for a production cost of 2500DKK. [See Appendix R for detailed information]

## Contacting suppliers

Suppliers of bases, mechanical components, foam were contacted to get an understanding of how much these components will cost in production. The design team presented themselves as writing a Master Thesis in collaboration with Nordic Easy Chair, where many of the companies already knew Nordic Easy Chair or had done business with them before. The responses were fast and often they suggested ways to optimize the form for production and cost, which can be included in the further optimization of the design. The price estimation of the shell can be found on p. 104-107.

### Base

Two suppliers of bases were contacted, AB Components and Scaniro A/S. Scaniro would be welding the legs to the base by hand at their facilities in Fjerritslev, and this would give an estimated price of 1000DKK per unit. AB Components said that they would be able to produce the base in China for half the price. Both manufacturers suggested that the weldings to the centre of base could be covered by a cap, which would reduce the man-hours and also cost price. The base can in the product maturing phase be optimized in collaboration with the supplier to reach a lower price.

### Scissor and recline mechanism

Schultz Seating and Scaniro were asked to give estimated prices on the mechanical leg rest and recline mechanism. Both Schultz and Scaniro retruned with an estimated price of 800DKK for the mechanical parts. This cost needs to be reduced, as it is a third of the entire budget, which it too high cost for a single component. The mechanics can in a collaboration with the manufacturer develop a leg rest mechanism that consists of some standard components to lower the cost.

### Foam

The foam prices were collected from Cesco. Cesco were recommended by upholsterer, Jette Andersen. The prices they returned were approx. 139DKK for foam for the entire chair and cushions. Cesco added that they are able to deliver the foam ready for upholstery for a small additional fee. Nordic Easy Chair explained that they receive their foam from Claudious Foam in Aars, however their prices have not been obtained to compare the offers.

### Standard components

The catalogues of YKK, Klee and Häfele were researched to find standard components for the chair for respectively a zipper and slides. The suppliers were contacted to get a cost price, and also to verify if this component would work as it was believed.

### Textile

The cost of the Europost textile from Gabriel is shown in the calculation. The current textile prices that Nordic Easy Chair uses, is shown as NEC textile A, B and C in the table on the right.

An overview of cost prices is illustrated in the table on the following page.



Item	Supplier	Cost per chair	
Shells	Midform	380DKK	<b>Not included in the price</b> Brackets Screws Kroyer beads pillow for lower back Neck rest mountings Handles Felt and wadding for collar and legrest Two wire-rope haulage Packaging Transportation Man hours Cost estimation and optimization
Base	AB Components ApS	500DKK	
Scissor mechanism	Schultz Seating A/S	800DKK	
Foam	Cesco	139DKK	
Textile	Gabriel	1716DKK	
Slides	Häfele Danmark A/S	35DKK	
Gas springs	Schultz Seating A/S	240DKK	
Zipper	YKK	15DKK	
3825DKK			

Fabric types	Manufacturing cost
NEC textile A	2439DKK
NEC textile B	2535DKK
NEC leather C	2961DKK
Gabriel Textile Europost	3825DKK

### Conclusion

The prices marked red illustrate, which are the most expensive parts in the product, and these are the ones that needs to be reviewed first in the optimized for production phase. This optimization will be carried out in collaboration with the manufacturer, and in the end it may have an impact on the design of the chair to reach an acceptable cost price.

In the calculations the cost price is 3825DKK when using the Gabriel textile, where Nordic Easy Chair’s existing textile gives a cost of 2439DKK. The end-user can choose the type of textile they would like on the chair, which will reflect on the cost that they pay.

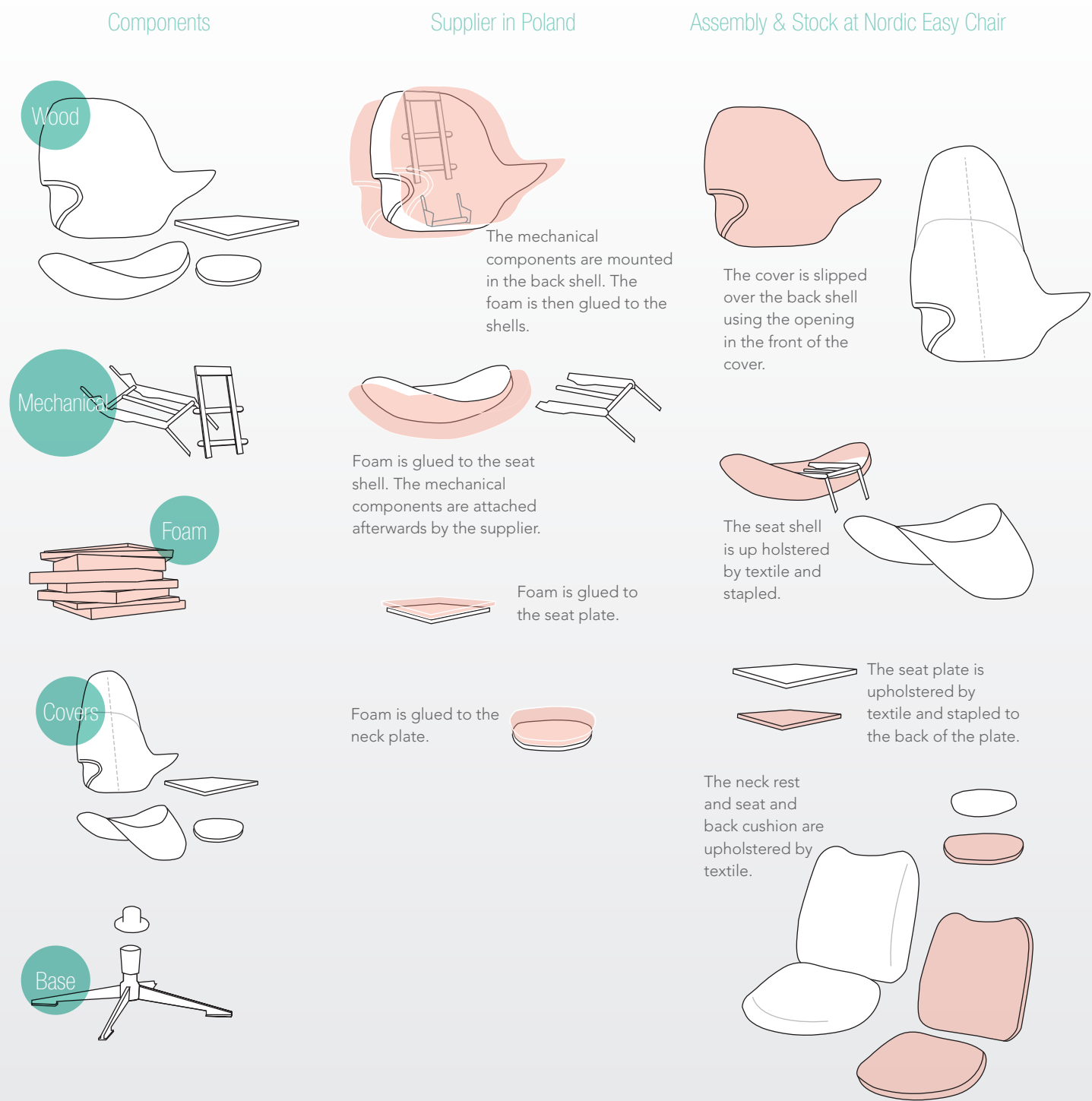
The cost of manufacturing is higher than expected, and it needs to be revised to reach the goal of a chair that costs 2500DKK to manufacture. It is to be noted, that the prices are given from Danish manufacturers, where it is expected to use a Eastern European or Asian suppliers to reduce the costs in production.

# ASSEMBLY PROCESS

The illustration below shows the assembly process. The final supplier for each component has not been found. Nordic Easy Chair's existing suppliers work in cold cure foam, while the upholstery method requires a different production machinery.

## Production

The sub-suppliers of components for the chair are divided into five main categories. These categories are wood, mechanical, foam, covers and the base. The first three categories are assembled in an Eastern European factory, where foam and mechanical components are attached to the wooden parts. These parts are then shipped to Nordic Easy Chair in Aars. The facilities at Nordic Easy Chair will hold an immediate stock, since it is only the textile and leather straps that are different. At the facilities in Aars, they will attach textile to the upholstered elements, and mount all the elements so it is ready for shipping (Ill. 126).



Three other options for manufacturing the chairs were considered.

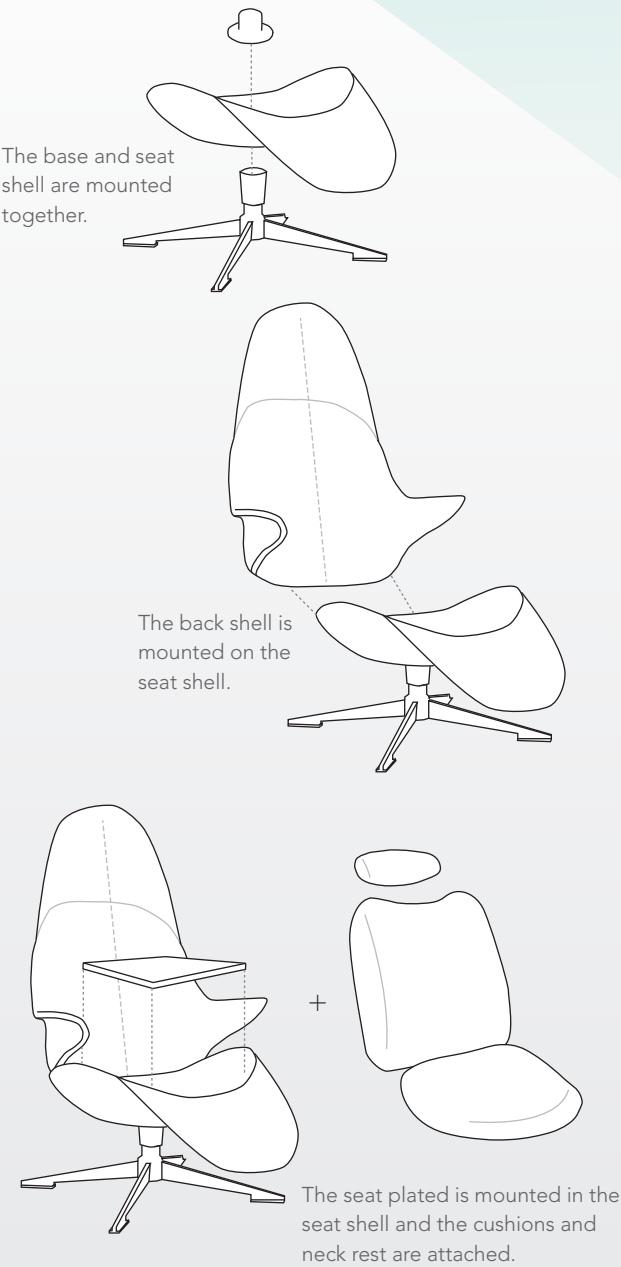
1 All assembly in Aars. All components are sent from the sub-supplier to Nordic Easy Chair’s warehouse. This is not a possible solution, as they do not have the facilities for this type of assembly process.

2 All assembly in Poland. The chairs are made from orders through Bolia’s system. These orders go through Nordic Easy Chair, that uses the sub-suppliers in Poland to build the entire chair in a similar manner to the process explained above. This will make Nordic Easy Chair superfluous in the process.

3. Textile covered shells are sent to Aars. By adding the textile to the shells in Eastern Europe and shipping them to Aars will mean that Nordic Easy Chair will hold a stock of fully upholstered chairs, that are to order by Bolia. This can result in dead-stock when the colours change. Plus it will require a much larger warehouse for storage.

The prices that are given in the cost calculations are from Danish manufacturers. It is decided to have the production and foam upholstery in Eastern Europe as these sub-suppliers may be able to provide a lower cost for production. The textile is chosen to be attached by Nordic Easy Chair, as this means that they do not hold a lot of upholstered stock in specific colours. By attaching the textile in Aars, means that they stock several covers and fewer shells.

Bolia is a by-order company, meaning that when an order is placed for a piece of furniture they send the order to the supplier (Nordic Easy Chair) which will then start the manufacturing process. The delivery time is approximately six weeks. When holding some stock themselves Nordic Easy chair will be able to provide a short delivery time if the colour and shells are in stock.



The DUCK chair© is sold in shop-in-shop at Bolia and delivered at Bolia warehouses. (Cf. Case: Bolia p. 48)





# STORYTELLING

## Storytelling in marketing

Storytelling can be incorporated in the marketing , where the story can be a way to tell the end-user how the company differentiate themselves from the competition. The story becomes a method to create a universe and a story around the product. This story is what shows the value of the brand and make them differentiate from the competitors. [Fog, Budtz & Munch, 2009, 164]

### *Case: BoConcept*

BoConcept used storytelling in the launch of a new in-store collection. The furniture warehouses had, through research, found that their loyal customers found that their prices were too low for the quality they received. As an answer to this, BoConcept launched the new collection while instructed the sales personnel in the stores to give the story of the quality materials that are used for the furniture. The sales personnel were given the story of how wood type were selected in the Nordic forests and because of the weather conditions in these countries, the wood grew a little slower, but in return became stronger and was more durable.

These stories were part of the strategy to increase the price on the furniture, while selling the products as having a specific story that tells the customers that the materials are carefully selected to choose the best quality available to their customers. [Fog, Budtz & Munch, 2009, 164]

### *Nordic Easy Chair*

The values that Nordic Easy Chair brand themselves on are comfort, Nordic, timeless and quality (P. 12) These values could easily be their competitors' values, as they are not specific. They offer no additional value to their customers about their products as the storytelling is lacking. This means that it becomes more difficult for the customer to differentiate between Nordic Easy Chair and a competitor.

### *Duck chair*

The Duck chair is significantly different than the existing recline chairs on the market. The name, the Duck chair, provides a subconscious reference to the customer. These may be:

- The flying bird signals a freedom.
- The feathers, is connected to pillows, can signal softness and comfort.
- The surplus of time can be viewed in the act of feeding ducks in the park.
- Ducks being in the exclusive country lifestyle.

The design has physical references to the animal too where the armrests carry a resemblance to the wing. These are all personal references that vary from person to person.

In the storytelling for the Duck chair, it is decided to illustrate the back to nature approach in the press materials, where the chair provides a nature element in the living room. This is tied in with the alpine trends.

The quality that Nordic Easy Chair is known for may be found in the craftsmanship, that will be in the manufacturing of the chair. The timeless design is present in the references to the classic Danish furniture from the 50's.

The values are still present but are more tied in with the design of the chair. The exact stories (in the list above) can be attached once the most relevant and unique is found. They will then need to be communicated to the Bolia sales team to be able to explain to the customers.

# DUCK CHAIR

The final product, DUCK chair, is a recliner designed for to fit into a new brand by Nordic Easy Chair, sold through sales channels by Bolia.com. DUCK chair is a transformable chair with an active seating position for activities and a more relaxed reclining position when the user needs resting.

The name and logo of the DUCK chair is a reference to the freedom in the nature and wildlife. This reference has been kept throughout the design process.

The primary element of the concept is a collar on top of the back that can be unfolded when the user needs a private space. It is unfolded by a manual system, which is controlled by the user. The DUCK chair is designed with comfort, ergonomics and styling in mind to approach a younger and more style conscious segment than Nordic Easy Chair current elderly segment.

The ergonomics and comfort level of the DUCK chair is developed based on the interviews and tests of a focus group consisting of members that fits to the approached segment.

Besides fixed ergonomics measures the user is able to define the height of the seat, the reclining position and the place of the neck rest in order to create an optimal seating position. Additionally the base is designed with a swivel function that makes it possible for the chair to turn 360° around.

The chosen textile for the upper body is high durable and in the latest trend colours by Gabriel A/S. This textile together with the leather straps exude quality. The matt, stainless steel base brings an contrast to the soft, curved upper body.

The overall design of the DUCK chair is a reflection of the core values of Nordic Easy Chair: Quality, Nordic and Comfort. In the future it will show if the DUCK chair can fulfil the last core value by Nordic Easy Chair: Timeless.



III. 129  
Duck chair and logo

# COMPETITIVE PRODUCTS

The DUCK chair will have other competitive products than the competitive products to Nordic Easy Chair's existing product range. The design team has not found any products that provides the same transformation possibilities from a lounge chair to a recliner however competitive products within these two categories are listed in the diagram.



## Recliners

Compete on recline function, comfort and style appeal. All of the chairs provides a tall back for reclining however when seated they have a closed form which do not invite for conversation or activities.

## Lounge chairs

Compete on flexible sitting positions and style appeal. The differentiate on low or tall back but invites to activities. The do not provide a reclining position, which do not make them suitable for relaxation.



# REFLECTION

Through the development of the final product concept the design team used several tools i.e. scale models, mock up model and sketching. In addition the product was further developed in 3D modelling software, Rhino, which showed to be helpful because it allowed more freedom in the development of the shape. SolidWorks was used as the more precise modelling tool and used for FEM simulation for the mechanical components.

The development of the product also added more specific design criteria besides the needs and wishes, which were collected in *Researching & Analysing*. The chosen solutions of comfort level, ergonomics and functions were all based on the needs of the user were the styling were chosen based on the trend analysis.

The principle of the collar system took a lot of time for the design team to solve and will require testing in the correct materials to verify, but this was not possible due to the time

limitation. The design team could have chosen to remove the unfolded collar however it was such a big part of the overall concept that the design team instead chose to change on some of the other parameters such as the height of the back. Because of the collar problem the design team had to postpone some deadlines and the making of a prototype, which in the end entailed to a product scope. However the only parts of the final product that was not fully detailed were the leg rest, the shape of the seat and back cushion and the different layers of the upholstery.

Last in the design process the design team contacted several manufacturers and companies that could help with production methods, construction and price. The final product consist of several different elements and in order to get a price estimate some components were chosen from an empirical, deductive method i.e. the rails and some a empirical, inductive method i.e. the shells and textile.











# *Evaluation*



# CONCLUSION

## Product

The final product, the Duck chair, will be compared to the needs and wishes and how it fulfils these.

- Consumer
- Nordic Easy Chair
- Furniture market
- Ergonomic research

## Needs

● ● High quality	High quality has been expressed in the choice of materials, which have been chosen based on their durability. Furthermore the ergonomic experience of the adjustable comfort exudes quality.
● ● ● Modularity	The Duck chair does not meet the modularity in its appearance, however its transformation offers the user variations in seating positions and personal comfort.
● ● The concept should not look like an helping aid	The appearance of the Duck chair does not look like a helping aid. The vision of the concept was changed to adapt to the current needs of the approached segment, and do not approach elderly people that may need electrical help to exit the chair.
● ● Innovative	The innovative approach of the Duck chair is the transformation from a lounge chair to a recliner which is not seen on the recline market before.
● User interaction	The use of the comfort adjustments in the Duck chair is kept simple and recognizable. The three main comfort adjustments; the recline position, height adjustment and neck rest, have visible and easy to use straps.
● ● ● Adjustable comfort	The user can manually adjust the height and back while seated. The lumbar support has been designed as a transformable support that will change from user to user.
● ● Room for movement	Room for movement is achieved through user research and mock up models. This entailed in a seating position where the user is able to change posture.
● ● ● Recline function	The recline function in the chair has been chosen based on Nordic Easy Chair's current product strategy and comparative analysis solutions. The solution in the Duck chair is chosen based on the experience with recline function in other chairs.
● Neck support	The neck rest in the Duck chair is designed to different heights of people. The initial idea was to incorporate the neck rest in the sandwich construction of the collar however this solution did not allow personal adjustment of comfort and a flexible neck rest was developed to fulfil the need.

Wishes

	<p><i>Researching &amp; Analysing</i> created different wishes, which primarily were based on trends. The trends are followed on different levels.</p>
<ul style="list-style-type: none"><li>● Alpine trend</li><li>● Structure/Construction trend</li><li>● Quiet design trend</li></ul>	<p>Quiet design trend is the primarily styling approach that the design team have used throughout the design process. The alpine trend has been used in the branding and visualization of the Duck chair and Structure/Construction have been approach in details such as handles and straps.</p>
<ul style="list-style-type: none"><li>● ● Swivel function</li></ul>	<p>In the design process, the swivel base became relevant because it was experienced as an increase of the comfort experience in the Duck chair and was therefore incorporated in the final design.</p>
<ul style="list-style-type: none"><li>● No electricity needed in functions</li></ul>	<p>The functions in the Duck chair do not need electricity, however the targeted segment do not require this additional help to exit the chair.</p>
<ul style="list-style-type: none"><li>● Accessories</li></ul>	<p>Accessories such as integrated light, table or storage have been a part of the initial concept development, however due to the time period, and the wish to expand the brand in the future this is not thought into the Duck chair.</p>
<ul style="list-style-type: none"><li>● ● Price estimate</li></ul>	<p>The last wish was to design a chair that would have an estimated retail price of 10,000-15,000DKK, which is the price range of several of Nordic Easy Chairs current products. The price estimate of the Duck chair approach this price, however some components have not been included in the estimation as well as production man power, packing and shipping of the Duck chair.</p>

## Process

Through this Master Thesis project the design team has become acquainted with the development of upholstered furniture and the recline market. The design team was not given a specific task from the collaboration partner Nordic Easy Chair however four areas of interest were mentioned at an early meeting by Nordic Easy Chair. These four areas were followed up by the design team and two of the areas, were of interest: developing a recliner for a younger segment or a recliner for an online sale. In the start of the project period the design team took part of the Stockholm Furniture Fair 2013, where competitors to Nordic Easy Chair were visited and trends within the recline furniture market were analysed. It came apparent that Nordic Easy Chair and several of the competitors approached the same segment and had little variation in the styling. This segment is, according to Futurologist Jesper Bo Jensen, getting limited and the design team used this statement, to change the direction for the new recliner and instead approach “the free seniors”, which, through mappings of competitive recliners, were not highly represented.

To find out, which parameters appealed to the approached segment in a buying situation of seating furniture the design team created a questionnaire and visited furniture stores where the segment was approached. The outcome of the questionnaire was, that this age group would primarily buy on the parameters such as comfort and style. The output was compared with an exhibition at Trapholt in 2007 where the result was almost identical: People went for comfort and style in seating furniture. This approach was chosen to be implemented in the concept development.

During *Researching & Analysing* the design team became aware of the active and passive chair, which were defined by the level of activity possibilities the chair offered to the user. Chairs through history had offered the user a specific activity and different chairs were designed to meet a specific need. However the design team saw a change in this behaviour after analysing the output from the second questionnaire, that was handed out to a focus group, that consists of people into the approached age group. One of the questions was what they did in their seating furniture and the answers were several different activities e.g. reading, knitting, watching TV and conversing. All the approached members of the focus group however required that the seating furniture could be used for relaxation and sleeping. The design team had primarily focused on combining comfort and style in the recliner, but based on the output from the focus group, the focus became the possibility for different activities. In order to approach the activity needs, the design team invited members from the focus group to a workshop where the Sorø chair from Nordic Easy Chair was tested. The design team made observations that confirmed the need for a chair that offered versatile seating positions, rather than add-ons that suited the activities.

In order to combine an active position and a relaxed position the design team researched on ergonomics in the subject of an optimal seating position. The output was a position, where the user could change posture. Furthermore the ergonomic research demanded a reclined position for relaxation that was different compared to the active position. In order to meet the requirements from the focus group and the ergonomic research the design team developed concepts that would contain these two behaviours. In addition the design team built a mock-up model where seat and back angle could be tested to verify the ergonomic research. This mock-up turned out to be helpful throughout the project period, because the design team could test, verify and understand ergonomic issues in the chair.

The design team had little experience with ergonomic aspects in seating furniture, which is noticeable in *Researching & Analysing*, where several parameters had to be verified by different sources. The design process elapsed with ergonomic experience gathered by testing on the team's own body by trying different chairs in furniture stores, verified it by research and last, test the theory on the mock up model or by other people e.g. the focus group. In addition the design team found it helpful to analyse other products and companies in order to find out, what they have done right or wrong.

The first vision for the concept development was a modular system where the user was able to customize the comfort level of the chair. Three different concepts, based on this vision, were developed, each with a level of modularity. The initial vision for the concept was a product that could adapt to the user throughout their life, and the design team interpreted this vision as elements that could be added to fulfil specific needs of the user. However the Duck concept that, in the end was chosen, did not exude modularity but instead fulfilled the needs of the user through transformation possibilities. The vision was changed from being an “Egoist chair” that suits the need of one specific user, and instead the chair is made to meet several people's needs through transformation.

The chosen Duck concept was based on a manual transformation however in order to meet the ergonomic needs, the collar of the Duck concept had to be unfolded from the user's seating position. The initial idea was to use a felt material that had structural self-support however when the chair was in reclined position, there was a need of neck support, which the material did not provide. The design team spent a lot of time trying to find a suitable material or sandwich-construction, but due to the time period it was chosen to use a solution, where steel rails were the supporting element. Because the design team had used much time finding the right solution for the collar principle, it was decided to postpone the making of a prototype in order to meet the deadlines. Instead the mock up model was used as verification of scale, and test of principles in connection



with the 3D modelling. Without the prototype, the design team at times found it difficult to discuss the experience of comfort in the Duck concept, and how the different layers of foam and textile in the upholstery would benefit the concept. Instead these parameters were tested separately by the focus group and in mock up principles.

During the development and detailing of the Duck concept it was discovered that the initial goal of creating a fully detailed product would have to be reconsidered in order to meet the deadlines. A product scope was made, which helped the design team to focus on the chosen elements. Sub suppliers of primary elements and components were contacted to find production methods and receive price estimations that were relevant for the final product. Different manufacturers of shells were contacted, because the back and seat shell were the primary element of the appearance of the Duck chair. It was important to maintain the initial appearance and the chosen production method of the shells was therefore decided primarily on the appearance and thickness of the shells and secondly on the price. The chosen production method was also the one with the lowest estimated price.

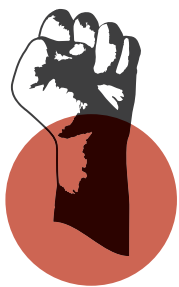
The Duck chair is developed to meet the user's needs of seating or relaxed positions for different activities as well as needs in adjustable comfort. The appearance of the Duck chair is developed based on trend research and the transformation possibilities from a lounge chair appearance to a recliner. This transformation is seen, as the key element of the concept, however has not been experienced in a

prototype. The three main principles; the collar, the leg rest and recline function have not been tested together but as individual experiments due to the postponed prototype. The outcome of the test of functionality and ergonomics on these principles however is believed to make a great foundation for the further development of the Duck chair and to achieve a chair that offers the user a great adjustable comfort for different activities.

The design team have throughout the project period mainly focused on the product development and the strategy for the concept should therefore be seen as a concurrent development. The foundation for the strategy is based on a sub-brand to Nordic Easy Chair's existing strategy and how a product with different approached can be sold without changing the current strategy of Nordic Easy Chair. Bolia was seen as a potential sales channel because they approach a younger segment, and do not have recline chairs in their product portfolio that would compete with the Duck chair. The strategy for the Duck chair was to create a shop-in-shop concept inside Bolia's current showrooms. The strategy of the Duck chair is only developed on a concept level and only the sales channel and supplier chain have been touched.

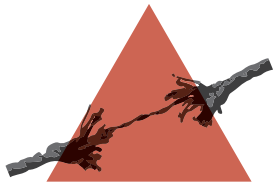
### Strategy

A SWOT has been made on the strategy for the new sub brand, which the Duck Chair be included in.



#### Strengths

- Collaboration between Bolia and Nordic Easy Chair
- New type of recliner
- The Duck chair reflects the core values of Nordic Easy Chair
- The chair can appeal to a segment that is younger than 55+



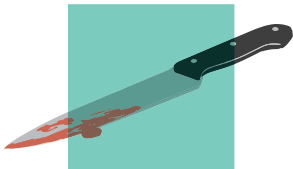
#### Weaknesses

- The existing brand of Nordic Easy Chair may not be strong enough to support the sub-brand and launch of a new chair-type
- The cost price still needs to be fully defined and could be higher in product optimization



#### Opportunities

- Broaden NEC's brand internationally
- Expanding the product range
- Creating awareness of existing brands of Nordic Easy Chair



#### Threats

- New competitors on a new market
- Nordic Easy Chair is approaching an unknown market

# PERSPECTIVE

For future development of the Duck chair different elements can be optimized in order to meet commercial requirement and ready for volume production.

## ***Collar***

The design of the collar has not been tested with the shape of the Duck chair. The rail system and different materials have been tested individually, however in order to test the durability of the material and the user-friendliness in the rail system, these parameters have to be optimized. The collar can only be unfolded if the neck rest is used, which could be optimized, so the user can unfold the collar without moving the neck rest. The tests, that have been made, only focus on the ergonomic functionality of unfolding the collar and ergonomic optimization on folding the collar down again have to be made.

## ***Lumbar support***

The lumbar support in the back cushion, which is detailed with Krøyer beadings, has only been tested in a bag with Krøyer beadings and not behind foam as it is intended in the Duck chair. This area has to be tested in order to optimize the comfort experience and if the Krøyer beadings have the same functionality behind foam as in a bag.

## ***Back joint assembly***

The detailing of the construction of the reclining mechanism may need to be re-designed to improve to ergonomic comfort. It is believed that the two hinges connecting the back and the seat may be felt through the upholstery. The time period of the project did not allow changing this part, as the whole construction would need to be re-organized.

## ***Textile***

The Gabriel textile chosen for the Duck chair is usually used in furniture for the contract market and the tactile experience of the material surface could be improved by choosing another textile or add textile or leather on the places where the user will place hands, arms and head. In addition the Gabriel textile is expensive compared with the supplier for Nordic Easy Chair.

## ***Optimization of price***

The mechanical components in the leg rest mechanism account for 1/3 of the total estimated production price. Even though the prices of these components are estimation, the leg rest have to be optimize in terms of function and parts in order to lower the price.

## ***Ottoman vs. leg rest***

Through out the design process, the ottoman have been a issue in terms of ergonomics and the fact that the focus group found it difficult to enter and exit the Sorø chair at the workshop. An integrated leg rest was chosen but in future development, the ottoman have to be rethought to meet a commercial concept that approach most people and not only people that would chose and integrated leg rest.

## ***Armrest***

Calculation of strength on the armrests was not made in the design process. The armrests are exposed to great torque when the user exits the chair and uses the armrests as a helping aid. In ordinary recliners this strength is transferred to the seat, however in the Duck chair the armrests are a part of the backrest, which means that the shells and the hinges of the reclining mechanism have to take the strength.

## ***Centre of gravity***

In a future prototype the centre of gravity will have to be defined exactly. The point of gravity is defined on estimated calculations and is moved further back in the chair to make sure that it is not overturned, when the user recliners.

## ***Experienced comfort***

The chosen foam for the upholstery has only been chosen on short time tests. In order to increase the comfort for long time seating, the foam could be tested to achieve a better-experienced comfort.

## ***Strategy***

The Duck chair could be developed with elderly people in mind. Helping aids such as seat lift or electronic reclining and leg rest mechanism could be designed as an add-on to the existing concept in order to approach a broader segment. Furthermore the sub-brand that consists of the Duck chair could be extended with add-ons for the Duck chair e.g. storage and lighting. Other products such as sofas and tables could be incorporated in the brand, if market research showed an interest in other product types.

An extension of the brand for Bolia could also be several types of easy chairs that Nordic Easy Chair produced. These chairs could be designed to meet specific needs and approach a segment that demands several functionalities in their chairs or a segment that wants a lounge chair with original appearance.

The future strategy of the brand to Bolia will also mean a detailing of the visual appearance of the shop-in-shop concept in Bolia's existing showrooms.





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# LIST OF ILLUSTRATIONS

## Align

Ill. 2: Own photo  
Ill. 4a-c: Own illustration  
Ill. 5a-b: Own illustrations  
Ill. 6a: [http://www.nordiceasychair.com/Files/Billeder/NEC/Ecom/Balance/Produkter/Boston\\_PS.jpg](http://www.nordiceasychair.com/Files/Billeder/NEC/Ecom/Balance/Produkter/Boston_PS.jpg)  
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Ill. 9c: <http://www.drinkstuff.com/img/normallazyboy.jpg>  
Ill. 11: File sent from Nordic Easy Chair  
Ill. 12a: File sent from Nordic Easy Chair  
Ill. 12b: <http://www.nordiceasychair.com/Files/Filer/NEC/Flash/ImageSlideshow/images/F4.jpg>  
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Ill. 14: Own illustration based [Jensen, 2002]  
Ill. 15a-d: Own illustrations  
Ill. 16a: [http://www.barkerandstonehouse.co.uk/images/uploaded/zoom/STRESSLESS\\_oxford\\_1\\_Zoom.jpg](http://www.barkerandstonehouse.co.uk/images/uploaded/zoom/STRESSLESS_oxford_1_Zoom.jpg)  
Ill. 16b: <http://www.hjortknudsen.com/documents/00142.jpg>  
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Ill. 17: Own illustration. Chair images are from the manufacturer's websites.  
Ill. 18: Own illustration. Logos are from the companies' websites.  
Ill. 20: Own illustration

## Researching & Analysing

Ill. 34.a: <http://4.bp.blogspot.com/-P-wPTZeGemQ/Tr2J1oewGEI/AAAAAAAAAYY/naPetu2xnUI/s1600/Egyptian-folding-stool-Tomb.jpg>  
Ill. 34.b: <http://www.denstoredanske.dk/@api/deki/files/68474/=loejbaenk.jpg>  
Ill. 34c.: <http://aarf.com/images/chair1.jpg>  
Ill. 35a.: <http://www.lauritz.com/no/auksjon/spansk-barok-stol/i1910823/>  
Ill. 35b.: <http://www.lauritz.com/da/auktion/italiensk-rokokostol-18-aarh/i2460076/>  
Ill. 35c.: [http://www.1stdibs.com/furniture/seating/lounge-chairs/neo-classical-boudoir-chairs/id-f\\_721243/](http://www.1stdibs.com/furniture/seating/lounge-chairs/neo-classical-boudoir-chairs/id-f_721243/)  
Ill. 35.d: <http://193.238.185.184/images/2275004?size=large&index=2>  
Ill. 35.e: <http://gallerifeldt.dk/wp-content/uploads/Galleri-Feldt-Danish-Modern-Kaare-Klint-Safari-chairs-with-footstool-4.jpg>  
Ill. 35.f: <http://www.antikogauktion.dk/Konkurrencer/~media/websites/antikogauktion.dk/Website/6.Vind/stol/stol09.ashx>  
Ill. 35.g: <http://www.creagenda.dk/2012/11/photo-lauritz.html>  
Ill. 35.h: <http://vliving.dk/wp-content/uploads/2012/03/poet-1181-11.jpg>  
Ill. 35.i: <http://lauritzblog.files.wordpress.com/2012/09/c3b8reklapstol-1-wegner.jpg>  
Ill. 35.j: <http://www.danish-furniture.com/images/verner-panton-chair.jpg>  
Ill. 35.k: <http://www.miniaturechairman.com/uploads/2/7/1/9/2719619/5428805.jpg>  
Ill. 35.l: <http://3.bp.blogspot.com/-qhCECoyTosU/TzQrPhhu7uI/>

AAAAAAAAA4M/Q2hYxWgdFuU/s1600/863.jpg  
Ill. 35.m: [http://www.domesticshop.com/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/H/A/HAY\\_SILLA\\_NOBODY\\_LITTLE\\_P.jpg](http://www.domesticshop.com/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/H/A/HAY_SILLA_NOBODY_LITTLE_P.jpg)  
Ill. 37.a: [http://shard3.1stdibs.us.com/archivesE/1stdibs/011013/10713RobertStilin\\_SW//02/X.jpg](http://shard3.1stdibs.us.com/archivesE/1stdibs/011013/10713RobertStilin_SW//02/X.jpg)  
Ill. 37.b: [http://www.onlineamishfurniture.com/assets/images/2009/2009\\_ajs\\_mission/410basmc\\_460basmf.jpg](http://www.onlineamishfurniture.com/assets/images/2009/2009_ajs_mission/410basmc_460basmf.jpg)  
Ill. 37.c: [http://www.skandium.com/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/skandium/1452\\_01.jpg](http://www.skandium.com/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/skandium/1452_01.jpg)  
Ill. 37.d: [http://i.oodleimg.com/item/3139480186u\\_2x424x360f?1345167754](http://i.oodleimg.com/item/3139480186u_2x424x360f?1345167754)  
Ill. 37.e: <http://www.aphaus.com/wp-content/uploads/Le-Corbusier-LC4-Chaise-Chair.jpg>  
Ill. 37.f: <http://designmuzeum.webceruza.hu/img/default/galeria/finn-juhl-pelikan-szek.jpg>  
Ill. 38.a: <http://kjaersgaard-bolighus.dk/images/thumbnails/250x250/FFFFFF/images/variants/nap%20coffee%20brown.jpg>  
Ill. 38.b: <http://blog.danishdesignstore.com/wp-content/uploads/2011/08/wegner-ch28-sawhorse-side-2.jpg>  
Ill. 38.c: <http://visavu.nl/wp-content/uploads/2012/01/Pernilla-by-Bruno-Mathsson1.jpg>  
Ill. 38.d: [http://img.dooyoo.de/DE\\_DE/orig/1/1/9/5/8/1195811.jpg](http://img.dooyoo.de/DE_DE/orig/1/1/9/5/8/1195811.jpg)  
Ill. 39.a: <http://www.casanovafurniture.dk/images/ff-tremmesofa-white-brown-p.jpg>  
Ill. 39.b: <http://www.viaduct.co.uk/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/d/i/dim-sum-2.jpg>  
Ill. 41.a: [http://www.babysam.dk/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/9/a/9a1b68b1d6cf4380b37aafb3ee4de3b5\\_1200.jpg](http://www.babysam.dk/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/9/a/9a1b68b1d6cf4380b37aafb3ee4de3b5_1200.jpg)  
Ill. 41.b: [http://blog.greenngreen.com/wp-content/uploads/2012/06/TrippTrapp\\_Grow\\_Line.jpg](http://blog.greenngreen.com/wp-content/uploads/2012/06/TrippTrapp_Grow_Line.jpg)  
Ill. 42.a-c: Own illustrations  
Ill. 43.a-b: Own illustrations. Chairs and lamps are taken from furniture warehouses' websites.  
Ill. 44: <http://www.project-inrichting.nl/lev/Stokke-TokStokke-Tok-2.jpg>  
Ill. 46a: <http://i-cdn.apartmenttherapy.com/uimages/ny/7-12-twin-1.jpg>  
Ill. 46.b: <http://www.i-decoracion.com/Uploads/i-decoracion.com/ImagenesGrandes/muebles-ruche-inga-sempe-1-5.jpg>  
Ill. 46.c: <http://www.abc-computers.com/wp-content/uploads/2012/11/Sugru3.jpg>  
Ill. 47.a: <http://www.archdaily.com/129977/four-cornered-villa-avanto-architects/fourcorneredvilla024/>  
Ill. 49-53: Own illustration  
Ill. 54a-g: Own photos  
Ill. 56: Own illustration  
Ill. 57: Pictures are from manufacturer's websites.  
Ill. 58-63: Own illustrations, photos and sketches.

## Concept & Strategy

Ill. 71a-77.c: Own illustrations, photos and sketches.  
Ill. 80: Own illustration based on [Rosenkrands, 2004]  
Ill. 81: <http://idealstudioblog.files.wordpress.com/2012/11/sofa-favn.jpg>  
Ill. 82-84: Own illustrations based on [Hambrick and Fredrickson, 2005]  
Ill. 85: <http://thesweetspot.dk/wp-content/uploads/2012/08/Recliners.jpg>

## Drafting

Ill. 89-105c: Own illustration  
Ill. 107.a: [http://www.previewmod.com/wp-content/uploads/2012/05/IMG\\_9543.jpg](http://www.previewmod.com/wp-content/uploads/2012/05/IMG_9543.jpg)  
Ill. 107.b-111:  
Ill. 112.a-d: Images from <http://www.gabriel.dk/nc/textiles/textiles/>  
Ill. 113.a-129: Own illustrations and photos  
Ill. 130: Chairs are taken from the manufacturer's website  
Ill. 131: See Ill. 85



## Method report

Ill. 5: Own illustration  
Ill. 6: Own illustration  
Ill.9.a: [http://www.magazynoffice.pl/files/uploads/articles/gallery/l/540\\_1361871750.jpg](http://www.magazynoffice.pl/files/uploads/articles/gallery/l/540_1361871750.jpg)  
Ill. 9.b: [http://e3.vingle.net/c\\_limit,q\\_85/gvf0otosjlxhjo2bhvwy.jpg](http://e3.vingle.net/c_limit,q_85/gvf0otosjlxhjo2bhvwy.jpg)  
Ill. 9.c: [http://0.design-milk.com/images/2013/02/Note\\_Design\\_Studio\\_for\\_Zilenzio.jpg](http://0.design-milk.com/images/2013/02/Note_Design_Studio_for_Zilenzio.jpg)  
Ill. 9.d: Avenir Next.ttc  
Ill. 9.e: [http://www.kinnarps.com/Images/NewsPress/Stofair2013/Stand/Kinnarps4\\_G.jpg](http://www.kinnarps.com/Images/NewsPress/Stofair2013/Stand/Kinnarps4_G.jpg)  
Ill. 11.-21: Own illustration

## Product report

Ill. 2: Own illustration  
Ill. 4: Own illustration with <http://www.wallpapershd.biz/wallpaper/green-moss-hd-widescreen-wallpapers/>  
Ill. 6: Own illustration with <http://www.atomicinteriors.co.uk/images/products/76/1754.jpg>  
Ill. 8-9: Own illustrations  
Ill. 11: <http://offthecuffdc.com/wp-content/uploads/Bag-Production.jpg>  
Ill. 12: Own illustration with <http://www.purity.co/wp-content/uploads/2012/03/poul05.jpg>  
Ill. 13.a: Own Illustration with <http://www.fritzhansen.com/da/lounge>  
Ill. 13.c: Own illustration with [http://2.bp.blogspot.com/-tK9lM3vL52Y/UVIKMXwb\\_TI/AAAAAAAAAHj0/n4Rs7vxEeMY/s640/\\_R5A5570.jpg](http://2.bp.blogspot.com/-tK9lM3vL52Y/UVIKMXwb_TI/AAAAAAAAAHj0/n4Rs7vxEeMY/s640/_R5A5570.jpg)  
Ill. 14-17: Own illustrations  
Ill. 18.a: [http://www.pengellydesign.com/assets/images/news/hm87a\\_and\\_c.jpg](http://www.pengellydesign.com/assets/images/news/hm87a_and_c.jpg)  
Ill. 18.b: [http://www.kvadrattextilefield.com/media/img/final/ERB\\_2011\\_textile-field\\_09.jpg](http://www.kvadrattextilefield.com/media/img/final/ERB_2011_textile-field_09.jpg)  
Ill. 18.c: [http://fc03.deviantart.net/fs27/f/2008/134/5/5/SWEDISH\\_OCEAN\\_by\\_PhotoWoman.jpg](http://fc03.deviantart.net/fs27/f/2008/134/5/5/SWEDISH_OCEAN_by_PhotoWoman.jpg)  
Ill. 18.d: [http://www.minimalhub.com/wp-content/uploads/2012/12/pe\\_041012\\_10.jpg](http://www.minimalhub.com/wp-content/uploads/2012/12/pe_041012_10.jpg)  
Ill. 19.a: [http://th00.deviantart.net/images/PRE/i/2003/41/5/a/Alpine\\_Forest.jpg](http://th00.deviantart.net/images/PRE/i/2003/41/5/a/Alpine_Forest.jpg)  
Ill. 19.b: <http://media.trendland.com/wp-content/uploads/2013/01/hallingdal-65-03.jpg>  
Ill. 19.c: <http://www.notcot.com/images/2012/09/Bed-linen-on-line.jpg>  
Ill. 19.d: <http://www.andreasengesvik.no/wp-content/uploads/2009/11/Mandal-veveri-111452ret.jpg>  
Ill. 19.e: <http://www.seatingzine.com/wp-content/uploads/2010/03/The-Kurven-Chair-Furniture-Detail-560x372.jpg>  
Ill. 20-23: Own illustrations  
Ill. 25.a-h: Images from manufacturers' website  
Ill. 28.a-b: Own illustrations  
Ill. 29: Own illustration with [http://cdn.bloggersdelight.dk/wp-content/blogs.dir/1073/files/2012/10/BL4\\_living-room\\_300-dpi.jpg](http://cdn.bloggersdelight.dk/wp-content/blogs.dir/1073/files/2012/10/BL4_living-room_300-dpi.jpg)

# APPENDIX A

## Competitors

Nordic Easy Chair's competitors have been divided into three groups: Primary, secondary and indirect. The primary competitors are companies that Nordic Easy Chair sees as a threat because they either have the same kind of product range or sell to the same retailers. The secondary competitors are companies that in the future can be a threat for Nordic Easy Chair if they target a new segment or/and country. The last group are indirect competitors, which do not have similar products as Nordic Easy Chair or sell through same channel. However these are still competitors because the consumers chose these retailers instead of some were Nordic Easy Chair is present. It is also companies that Nordic Easy Chair sees as front-runners on the respective sales channels.

The companies that are present are found from meetings with Nordic Easy Chair, at the Stockholm Furniture Fair 2013 and a short research on well-known brands. However the design team is aware of the possibility of other existing companies that can be primary competitors or future competitors. Because of the short amount of time it has not been found necessary to investigate this area of competitors any further.

### Primary

**Hjort Knudsen** has a similar range to Nordic Easy Chair. The furniture by Hjort Knudsen are voluminous and the focus seems to be on leather. According to Nordic Easy Chair, Hjort Knudsen is their number one competitor but where Nordic Easy Chair focus on quality Hjort Knudsen focus on low retail price. They have a small range of designed chairs but they look out-dated (Ill. 146, Pic. 17 and 18).

**Stressless** is likely the most famous brand in the industry. It is a brand by Ekornes in Norway. The aesthetics of their furniture are similar to the range of Nordic Easy Chair and the recliners follow the same principles as other recliners with a swivel base, upholstered seating and back with rocking function. Based on the look of their chairs, their target group is seniors and upward. Stressless have a lot of chairs in their range compared to Nordic Easy Chair. On their homepage the client can browse an online catalogue of stressless chairs and they are all customizable (Ill. 146, Pic. 13 and 14).

**Farstrup** is a Danish company situated on Fyn. Their own point of view is that they want to make "beautiful future orientated furniture with a high sitting comfort". The range of chairs reminds of Nordic Easy Chairs brand Sorø. Beside private home they also sell to the contract market and their services includes home visiting by a "chair bus". The customer orders the bus and a sales person demonstrates the chairs. This fits perfectly with the segment they want to address. However looking at their range of products they do not seem as future orientated, as they want to be (Ill. 146, Pic. 16).

**Stordal** is a Norwegian company producing high quality furniture with modern aesthetics. They try to focus on a segment that are younger than Nordic Easy Chairs segment

and offer a range of chairs on base and sofa arrangements. The aesthetics have a more graphic touch but with less add-on functions. Based on their homepage and product range they seem to address their products towards 40-60 years old, high-end market (Ill. 146, Pic. 15).

**Hjellegjerde** is situated in Norway and is one of Nordic Easy Chair high-end competitors who focus on design classic furniture. According to Hjellegjerde their design strategy is based on attractive products that suits the market needs. [hjellegjerde.com]

Their product range can be divided into recliners, sofas, chairs and functional sofas. The aesthetics are broad where chairs seems to be most designed objects but with less functions and recliners have additional functions but are less designed with more focus on comfort (Ill. 146, Pic. 1 and 2).

Hjellegjerde could be primary competitor for the new market segment because they provide the market with more designed chairs. However the high prices of their chairs limit the segment, so only a segment having a high budget for their furniture can be purchasing their products.

According to Nordic Easy Chair Hjellegjerde is not design orientated as they profile themselves. The products that they sell the most are target at the same segment as Nordic Easy Chair.

**Kebe** is situated in Hornslet near Aarhus and is producing medium price furniture. Compared to Nordic Easy Chair's product range, Kebe is targeting a younger and more design-conscious segment. Looking at their web page Kebe is moving in many design directions, which make their brand aesthetics confusing for the consumer. With three new products for 2013 they seem to address a more playful aesthetics to the market (Ill. 146, Pic. 6).

**Himolla** is a German company who brand themselves on functionality and comfort. As Nordic Easy Chair their segment seems to be 65+ based on the aesthetics of the furniture, however on their homepage they use young models and everyday quotes that try to sell the products. Furthermore they have additional functions that are integrated in their upholstered furniture from storage to massage programs (Ill. 146, Pic. 7 and 8).

**Brunstad** is a Norwegian manufacturer who has more or less same retailers as Nordic Easy Chair. Their product range seems to follow a more playful aesthetic where a lot of the chairs and sofas have "ears". This specific touch to the products makes Brunstad stand out. Their aesthetic is also more graphic inspired with sharp lines and where the upholstery looks less comfortable. (Ill. 146, Pic. 4 and 5)

## Secondary

**NC Nordic Care** is a Swedish company who have few recliners and their range is characterised by dining chairs. They have more chairs that seem to target a younger segment and their commercials are more modern and with younger people. NC Nordic Care is a potential competitor if the product is going to be sold in Sweden and/or to a younger segment (Ill. 146, Pic. 25).

**Elano/Sitbest** is a Norwegian company that focus their range on medium to heavy recliners with different functions integrated. The design aesthetics seems out-dated and with primarily focus on comfort. Like some the other companies they try to sell their products using younger models and placing them in modern contexts. At the fair their focus were primarily on leather for the recliners (Ill. 146, Pic. 12).

**Schou Andersen** is a Danish company who sells to the home and contract market. The aesthetics reflects a Scandinavian design tradition using beech and a light construction. Furthermore they have several detail pictures of joints of the wood on their homepage, which reflect their focus on craftsmanship. As one of the few they still produce their furniture in Denmark, which is also, something they brand themselves on – quality and Danish design (Ill. 146, Pic. 19).

**Isfjord** is a new, Norwegian company that primarily focus on well-upholstered recliners with multiple functions. Their product portfolio is very limited and only features a couple of products in different textiles and colours (Ill. 146, Pic. 9).

**Skalma** is situated near Limfjorden in Denmark and their opinion of their design aesthetics are Scandinavian and timeless. Their products are entirely made to order which gives the customer greater chance to customize. Based on their homepage and product setup they seem quite out-dated like Nordic Easy Chair (Ill. 146, Pic. 21).

**Nelo** is a Swedish company and first impression is that their product is modern and targeting a younger segment. However they also have a lot of references in their design from design classics like the Barcelona and Corona chair. They are not a direct to Nordic Easy Chairs current product portfolio however they could be a potential competitor in the future when targeting a new segment (Ill. 146, Pic. 3).

## Indirect

**Bolia.com** is a Danish company who have focused entirely on online sale. Their strength is that the consumer can try out the furniture in showrooms located in Northern European cities. There is no direct sale from these showrooms but the consumer will have the same service as in regular retail stores. Bolia is targeting a younger segment than Nordic Easy Chair and with a more modern and fast moving design aesthetic (Ill. 146, Pic. 20).

**IKEA** is the largest furniture manufacturer and retail store in the world. They offer products at a cheap price but with a lot of self-service attach. This is not a competitor that Nordic Easy Chair can compete against because they target to different segments (Ill. 146, Pic. 22 and 23).

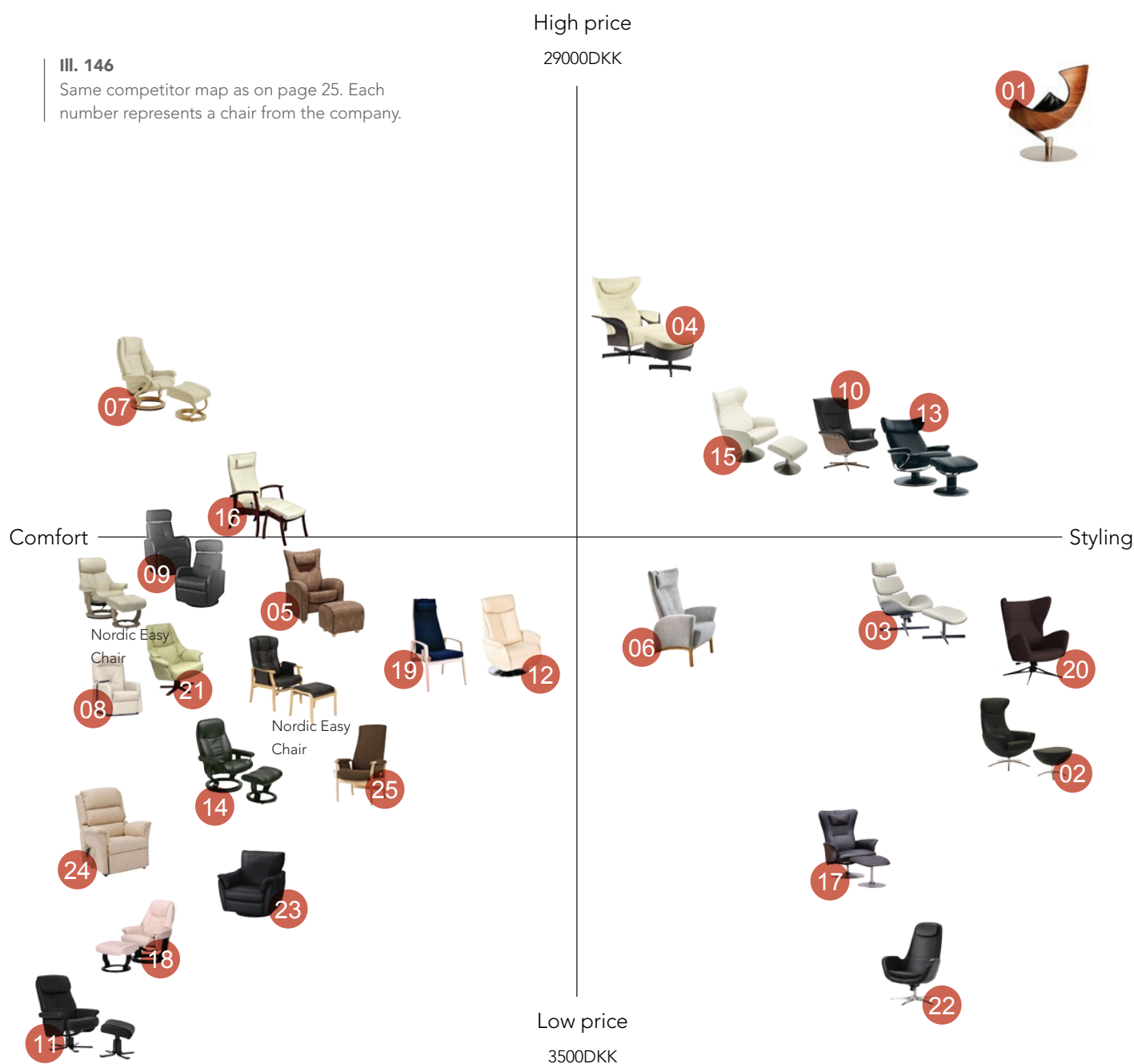
**MIO** is a Swedish retail store. Similar Danish companies would be ILVA or Idemøbler. Nordic Easy Chair have shown an interest in selling recliners to MIO however a visit at MIO Stockholm showed that the interest for recliners with Nordic Easy Chairs current aesthetics did not have that much interest (Ill. 146, Pic. 10 and 11).

**HighSeatChair** is an online company situated in England. Nordic Easy Chair mentioned them because they are front-runners in the area of selling furniture online for a senior segment. Their target would be a segment that prefers comfortable products over more aesthetic ones (Ill. 146, Pic. 24).



### III. 146

Same competitor map as on page 25. Each number represents a chair from the company.



- 1: Hjellegjerde, Norway Lobster Chair from 29,900DKK
- 2: Hjellegjerde, Norway Bamboo Chair from 6,499DKK
- 3: Nelo, Sweden Chair from 12,000DKK
- 4: Brunstad, Norway Feel chair from 20,200DKK
- 5: Brundstad, Norway Ami Chair 12,300DKK
- 6: Brøderna Andersson, Norway Jupiter Chair 11,000DKK
- 7: Himolla, Germany ZeroStress Chair 9,000-15,000DKK
- 8: Himolla, Germany Cumuly 7,000-12,000DKK
- 9: Isfjord, Norway 9,100-11,100DKK
- 10: Mio, Sweden Primetime 13,500DKK
- 11: Mio, Sweden Bern 3,500DKK
- 12: Sitbest, Irland/Norway Reena 9,000DKK
- 13: Ekornes (Stressless), Norway Jazz Chair 13,400DKK
- 14: Ekornes (Stressless), Norway Consul Chair 5,999DKK
- 15: Stordal, Norway DesigNature Runde 14,000DKK

- 16: Farstrup, Denmark 12,499DKK
- 17: Hjort Knudsen, Denmark Opus Chair 5,000DKK
- 18: Hjort Knudsen, Denmark Kansas Chair 3,700DKK
- 19: Schou Andersen, Denmark 9,000DKK
- 20: Bolia.com, Denmark Sion Chair 9,000DKK
- 21: Skalma, Denmark Adam Eve Chair 9,000DKK
- 22: IKEA, Sweden Arvika Chair 3,599DKK
- 23: IKEA, Sweden Älvros Chair 4,999DKK
- 24: HighSeatChair, England Nevada Chair 5,200DKK
- 25: NC Nordic Care, Sweden Freja chair 8,100DKK

Note: All prices are collected from different internet source and the given price will therefore vary from retailer to retailer.

# APPENDIX B

Research about sitting furniture in the home

Gender

☐ Male

☐ Woman

Age

☐ - 45

☐ 46 - 55

☐ 56-65

☐ 66-75

☐ 76-85

☐ 85 +

Household

☐ 1 pers.

☐ 2 pers.

☐ 3 pers.

☐ 4 or more

Residential type

☐ Freehold flat

☐ Rented flat

☐ House

☐ Care home

How often do you replace your living room furniture?

☐ Every year

☐ Every 2<sup>nd</sup> year

☐ Every 2-5 year

☐ Every 6-10 year

☐ infrequent

What was the reason why you replaced your furniture? Please choose more

☐ Worn furniture

☐ New home

☐ Need of better comfort

☐ Desire for renewal

☐ Offer/Sale

☐ Outmoded

Andet

Which price do you think is acceptable for a new recliner? (DKK)

☐ - 2.000

☐ 2.000-4.000

☐ 4.000-6.000

☐ 6.000-8.000

☐ 8.000-10.000

☐ 10.000-15.000

☐ 15.000 +

Which criteria are important for you when you are going to buy new furniture?

	Not relevant	Less relevant	Important	Very important
Material and colour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The retailer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comfort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Setting possibilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

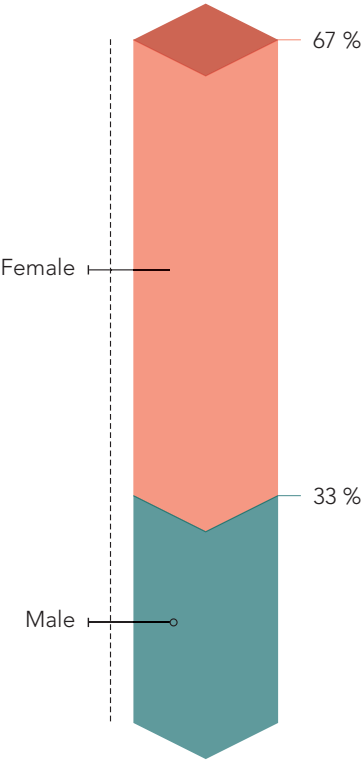
Other

Which one of these five chairs appeal to you the most? Choose only one and please write why

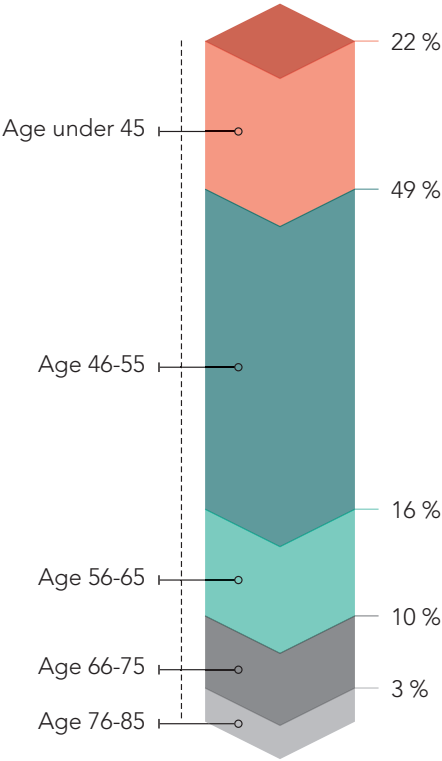


Questionnaire results

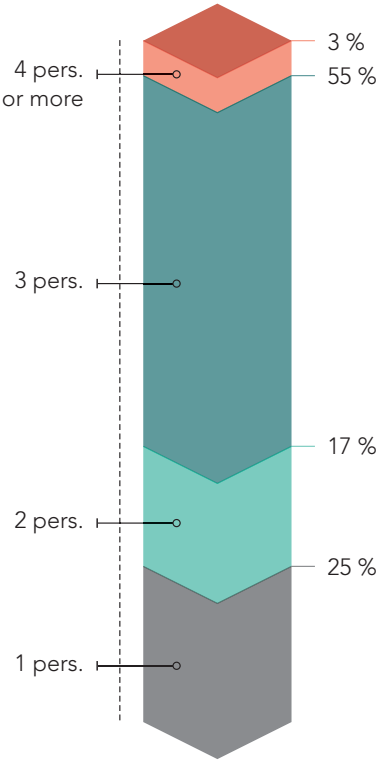
Gender of respondents



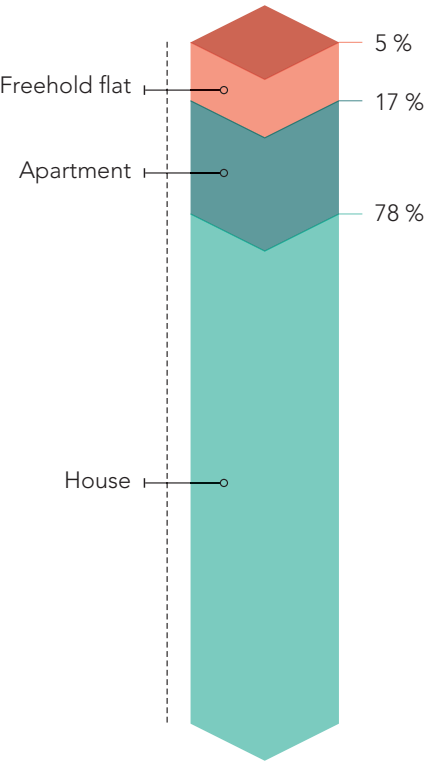
Age of respondents



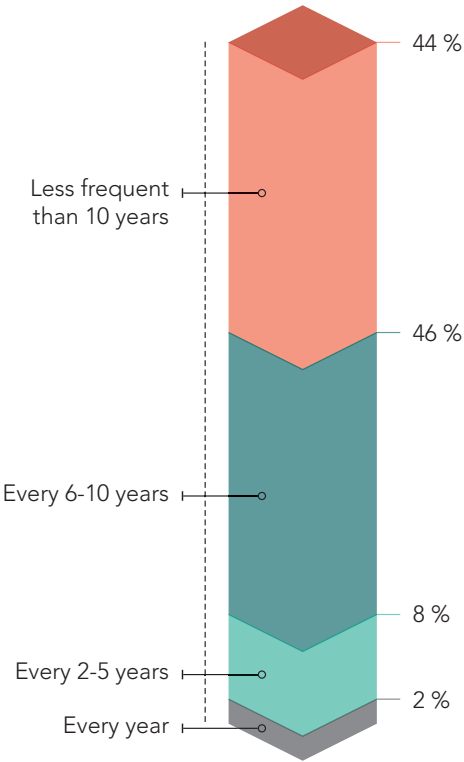
Number of people in the household



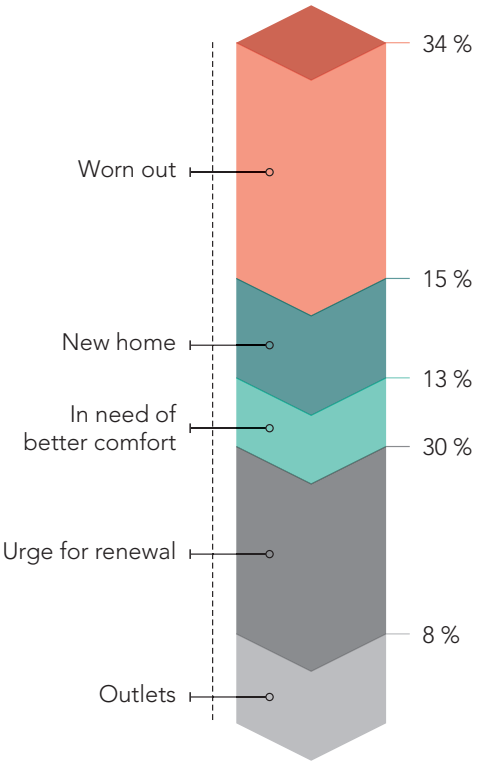
Residential type



How often do you replace your living room furniture?

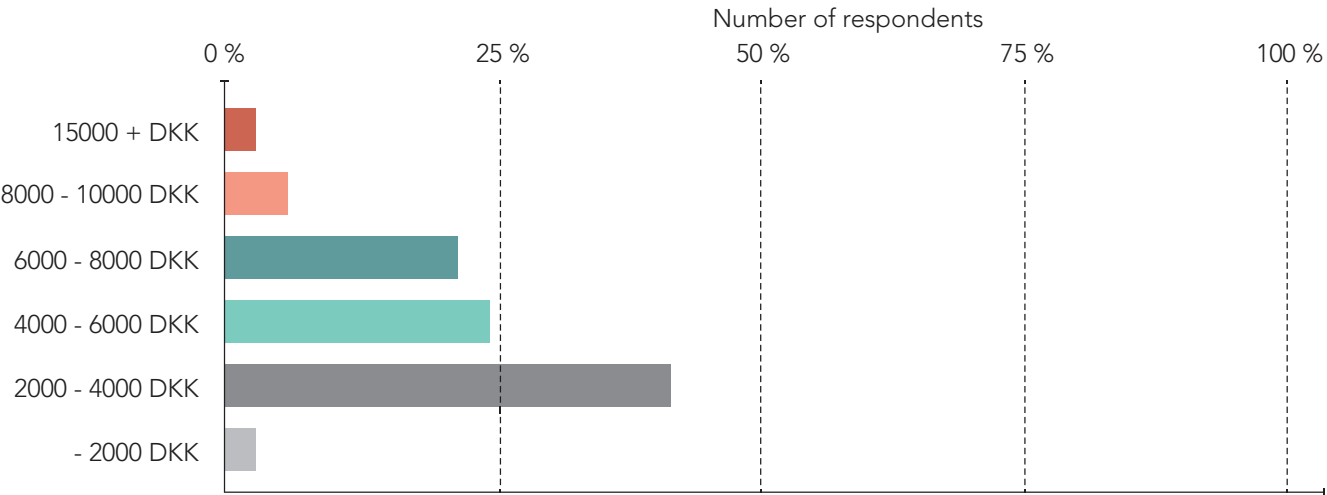


What was the reason why you replaced your furniture?

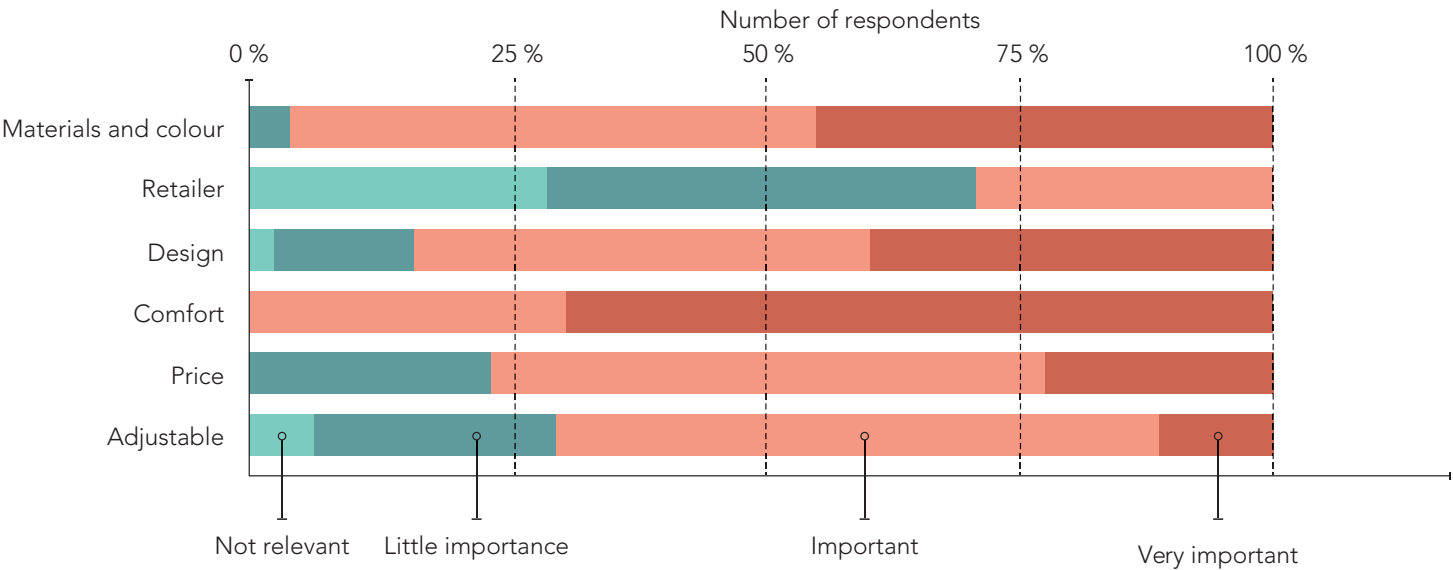




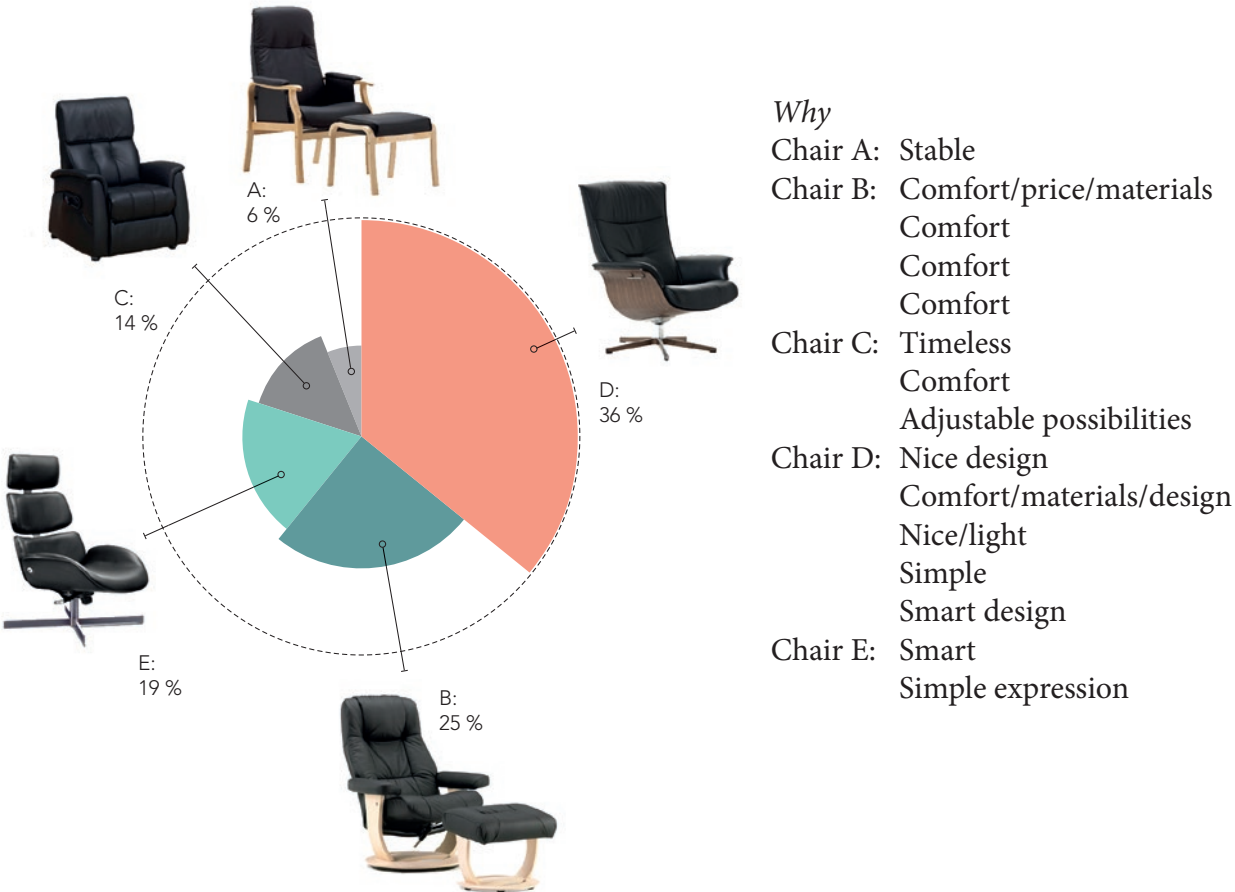
Which price do you think is acceptable for a new recliner? (DKK)



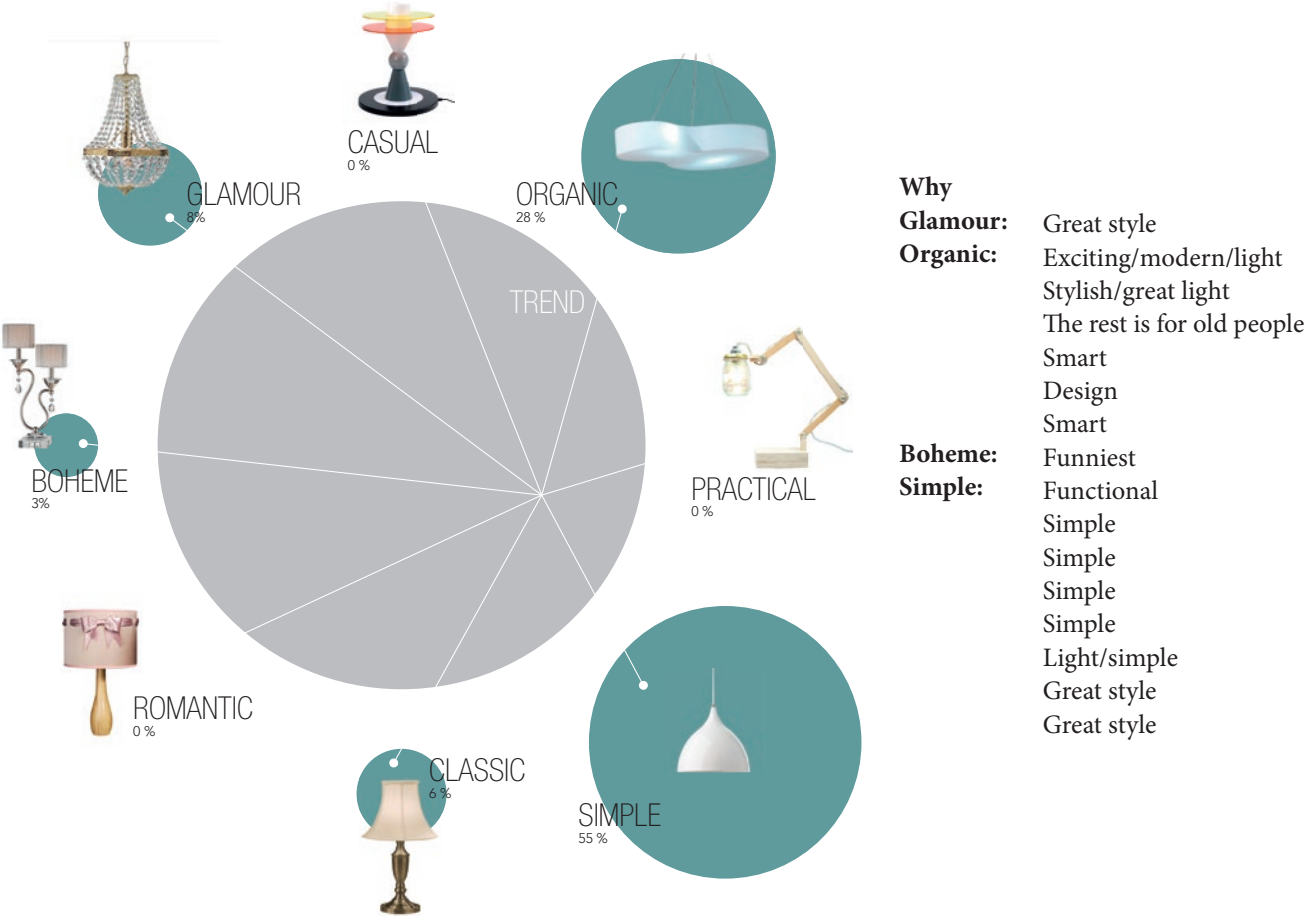
Which criteria are important for you when you are going to buy new furniture?



Which one of these five chairs appeal to you the most? Choose only one and please write why

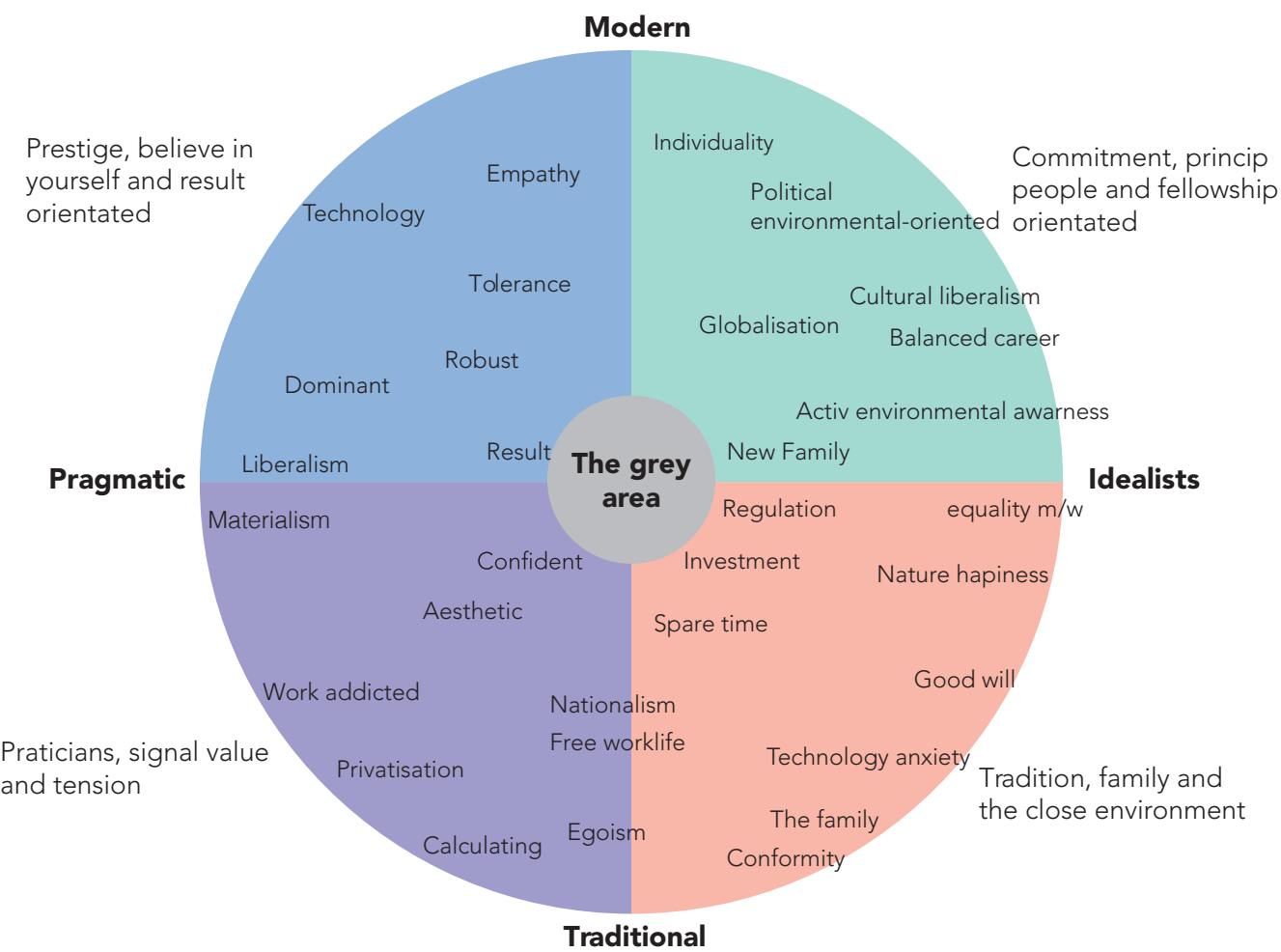


Which one of these eight lamps appeal to you the most? Choose only one and please write why



APPENDIX C

Minerva model



III. 151  
The Minerva is divided into segments. This model is used in the understanding of the results from the "Smagsdommerne" survey.  
[http://www.e-pages.dk/esh/63/280, 279-283]





III. 152.a  
Stokke Tok by Toshiyuki Kita



III. 152.b  
Model 4396 by Kaare Klint

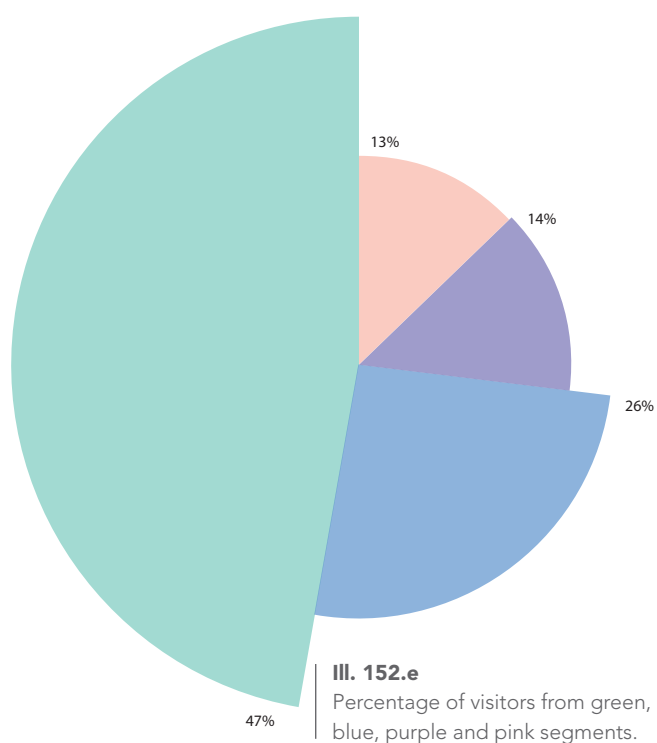


III. 152.c  
Corona by Poul Volther



III. 152.d  
Stressless by unknown designer

"Smagsdommer"-visitors distributed  
on the Minerva model segments



III. 152.e  
Percentage of visitors from green,  
blue, purple and pink segments.

## APPENDIX D

### Lifestyle map

The last question in the questionnaire is derived from Henrik Vejlgard's lifestyle map from his book "Forbrug i designersamfundet" in mind. The map is divided into nine areas; eight lifestyles and one trend area.

The map can be used to find the positioning of a specific brand or where it is positioned with other brands. The model is used in the beginning of the design process if the product should approach a specific segment. [Nielsen, 2004, 40]

### The map

The lifestyle map is based on specific materials, colours, accessories, brands to mention a few. (Ill. 154) The design team have used the lifestyle map to determine where the participants of the questionnaire were placed. Based on the results the design team could conclude that a organic and simple approach was most appealing to the participants.

<p>Golden decoration</p> <p>Funky style</p> <p>Bright colours</p> <p>Supersizes</p> <p>Flamboyant</p> <p>Glass decoration</p> <p>Versace</p> <p>Empire</p> <p>Zebra fur</p> <p>Modern art</p> <p>Oversized porcelain animals</p> <p>Verner Panton</p> <p>Antique statues</p> <p>Leopard patterned fabrics</p> <p>Antique inspired furnitures</p> <p>Postmodern style</p> <p>Pop-art</p>	<p>Faux Art Deco</p> <p>Geometrical patterns</p> <p>Deco style</p> <p>Tall dinner table chairs</p> <p>Bang &amp; Olufsen</p> <p>"New" antiques</p>	<p>Contrast colours</p> <p>Patterns on walls</p> <p>Memphis inspired style</p> <p>Shiny metal</p> <p>Shapes with edges</p> <p>Oversized leather furnitures</p> <p>Indian patterns</p> <p>Santa Fe style</p> <p>Cowboy environment</p> <p>Ranches</p> <p>Western style</p>	<p>Informal</p> <p>Contrast pastels</p> <p>Casual</p> <p>Log cabin style</p> <p>Rustic</p>	<p>Visible steel</p> <p>Naked walls</p> <p>Concrete floor</p> <p>Ron Arad</p> <p>Metal chairs</p> <p>Loft style</p> <p>Graffiti</p> <p>Visible iron/aluminium</p> <p>Eero Aarnio</p> <p>Graphic-organic patterns</p> <p>Organic</p> <p>George Nelson</p> <p>Frank Gehry</p> <p>Driftwood</p> <p>Curvature shapes</p> <p>Adirondack style</p> <p>Humoristic design</p> <p>Isamu Noguchi</p> <p>Soft shapes</p> <p>Untreated wood</p> <p>Organic design</p> <p>Plastic</p> <p>Eco design</p>
<p>Decadent</p> <p>Art Nouveau</p> <p>Sculptural</p> <p>Opulent</p> <p>Mix between historical eras</p> <p>Brocade</p>	<p>Philippe Starck</p> <p>Dwell</p> <p>Nest</p> <p>Marc Newson</p> <p>Wallpaper</p> <p>Retro</p> <p>Elle Decoration</p> <p>Livingetc.</p> <p>Fendi</p> <p>Martha Steward Living</p> <p>Zara</p>	<p>Trendy</p>	<p>Practical</p> <p>Function</p> <p>Vinyl</p> <p>Rocking chairs</p> <p>"Homemade crafts"</p> <p>Wall-to-wall carpets</p>	<p>"Coincidental"</p> <p>Christiania</p> <p>Sod house style</p> <p>Garbage</p> <p>Trash</p> <p>"Slum"</p>
<p>Ornamentation</p> <p>Colourful fabrics</p> <p>Ethnical inspired</p> <p>Mexican style</p> <p>Folklore</p> <p>Potters things</p> <p>Style mix</p>	<p>Boheme</p> <p>Bourdoir style</p> <p>Expressive art</p> <p>Crafts</p> <p>Artistic look</p> <p>"Cave-ish"</p>	<p>Classic</p> <p>Colonial style</p> <p>Crystal chandelier</p> <p>Antiques</p> <p>Old master arts</p> <p>Town &amp; Country</p> <p>Manor house style</p> <p>Four poster beds</p> <p>Formal</p> <p>Plantation style</p> <p>Gobelin</p> <p>Silver candlesticks</p> <p>Mahogany furnitures</p>	<p>Simple</p> <p>Few furnitures</p> <p>B&amp;B Italia</p> <p>Plain</p> <p>Poul Kjærsholm</p> <p>Mies Van der Rohe</p> <p>Canvas</p> <p>Japanese style</p> <p>Minotti</p> <p>Tight</p> <p>Minimalistic</p> <p>Donald Judd</p> <p>Shaker</p> <p>Long island style</p> <p>2-coloured stripes</p> <p>Polished wood</p> <p>Beach House style</p> <p>Cape Cod</p> <p>Marine blue</p> <p>Lexington</p> <p>White coloured woodwalls</p> <p>White</p> <p>White/black</p> <p>White</p> <p>Indoor deck chairs</p> <p>Photo art</p> <p>Red</p> <p>Gant</p> <p>Alvar Aalto</p> <p>Bruno Mathsson</p> <p>The Egg</p> <p>Modernistic design</p> <p>The Swane</p> <p>Giorgio Armani</p> <p>Beige</p>	<p>Real carpets</p> <p>Drift couches</p> <p>Winged armchair</p> <p>New England style</p> <p>Possements</p> <p>Chesterfield couch</p> <p>Antiques</p> <p>Old master arts</p> <p>Town &amp; Country</p> <p>Manor house style</p> <p>Four poster beds</p> <p>Formal</p> <p>Plantation style</p> <p>Gobelin</p> <p>Silver candlesticks</p> <p>Mahogany furnitures</p>
<p>Mediterranean style</p> <p>Terracotta colours</p> <p>Provence style</p> <p>Patterns</p> <p>French style</p> <p>Mismatch</p> <p>Kilims</p> <p>Flower patterns</p> <p>Ruffles</p> <p>Liberty</p> <p>Quilts</p> <p>Bow as decoration</p> <p>Draperies</p>	<p>Romantic</p> <p>Shabby chic</p> <p>Country</p> <p>Chintz</p> <p>Scottish style</p> <p>Heavy draped pelmets</p> <p>Visible bric-a-brac</p> <p>Stencils</p> <p>Rosa</p> <p>Pastels</p> <p>Basket furnitures</p> <p>Wrought iron</p> <p>Windsor couch</p> <p>Tricia Guild</p>	<p>Classic</p> <p>Colonial style</p> <p>Crystal chandelier</p> <p>Antiques</p> <p>Old master arts</p> <p>Town &amp; Country</p> <p>Manor house style</p> <p>Four poster beds</p> <p>Formal</p> <p>Plantation style</p> <p>Gobelin</p> <p>Silver candlesticks</p> <p>Mahogany furnitures</p>	<p>Simple</p> <p>Few furnitures</p> <p>B&amp;B Italia</p> <p>Plain</p> <p>Poul Kjærsholm</p> <p>Mies Van der Rohe</p> <p>Canvas</p> <p>Japanese style</p> <p>Minotti</p> <p>Tight</p> <p>Minimalistic</p> <p>Donald Judd</p> <p>Shaker</p> <p>Long island style</p> <p>2-coloured stripes</p> <p>Polished wood</p> <p>Beach House style</p> <p>Cape Cod</p> <p>Marine blue</p> <p>Lexington</p> <p>White coloured woodwalls</p> <p>White</p> <p>White/black</p> <p>White</p> <p>Indoor deck chairs</p> <p>Photo art</p> <p>Red</p> <p>Gant</p> <p>Alvar Aalto</p> <p>Bruno Mathsson</p> <p>The Egg</p> <p>Modernistic design</p> <p>The Swane</p> <p>Giorgio Armani</p> <p>Beige</p>	<p>"Coincidental"</p> <p>Christiania</p> <p>Sod house style</p> <p>Garbage</p> <p>Trash</p> <p>"Slum"</p>

## APPENDIX E

Jan Sørensen of Brdr. Sørensen

***How long have you been employed at Brdr. Sørensen?***

I served my apprenticeship in this store 18 years ago, and we were two who took over this store five years ago.

***Which age groups are the typical visitors in your store?***

That varies a lot, it is between 20 year old customers up to the 70-80 years old.

***Is there a difference in what the different age groups chose in your store?***

Naturally there is. We have two stores, where this one (Danmarksgade 25) is more classical and exclusive, and the other (Danmarksgade 58-60) is for the younger segment. So the customer for the new concept store on the corner attracts a younger segment. But there are also younger design orientated segments that comes into this one and buys furniture. It is everyone.

***We are currently making a new recliner. When people are looking to purchase a recliner or seating for their living room, what are they looking for?***

There are two directions, the first is comfort and the second is design. And then there are the people who wants both. And in Denmark we are so lucky that there are some architects that have made such furniture for us. It has to be aesthetics and comfort. Comfort is paramount. When the consumer is out and spends a lot of money a name and a brand is important too, that means that the consumer feels more secure.

***Do your customers come in and request eg. A Finn Juhl chair and then that is what they buy?***

Yes, generally speaking, they have seen the chair somewhere and thinks "I would like to try sit in this chair". There is definitely a signaling effect in having the right brands and products. It also includes the right jacket, shoes and car everything – and that is also the way in the furniture industry. It's part of your identity and your home.

***When there is a couple that visits the store, have you noticed who the decider in the purchase is?***

[Long silence] It varies a lot; there is the stereo typical situation where it's the woman who furnish the home. That is still very usual.

***You said earlier that you have different age groups purchasing your furniture. Is there a difference between the different furniture that the age segments purchase?***

Yes that is evident, when there are people from 20 years and upwards. And then, saying that, a lot of the furniture that we have are relatively valuable, so the majority of our revenue are found in the more adult segment. They are in the 30-50 years old. Also when people establish themselves they are between 25 and 35 and we see a lot of those people. There are people who have good jobs and good salaries. And people value quality and design. Quality is a huge factor for people – And aesthetic.

We have been here for a long time, 35 years, for the past 10-15 years have been an extremely high focus in all age groups on design and quality. There was a high boom under the economical recovery several years ago when people moved, and sold their house and then they had an extra million (DKK) with them, and then they had to fill their new home with "all the good things". During this phase it went extremely well for our line of business. But our business is not that sensitive to the state of the market, it goes a little like this (shows a close to flat curve with his hand), but it is fairly level.

***Have you not felt any change?***

Yes, we have felt some change. In 2011, like the rest of the retail industry, we were able to feel a reduction in our turnover, but we're back again now. We do not feel it as much as Idémøbler or Hansen Møbler where their customers say "We cannot purchase furniture now, we cannot afford it". If you are looking at a chair like that (Points towards Wing Chair by Wegner) it means that you possibly at some point have the possibility of buying such a chair. And if you have fallen in love with that chair, the customer may postpone the purchase with a year and then it just be there later. This is the reason that we are more stable. We don't have those enormous deviations that follow the state of the market, which one should think as it's a luxury. There will always be a segment that has an interest and find it attractive to have these types of products that this store is based upon.

If you look around in the store, after we took over the store, we have modernized the selection of furniture. The average age of the furniture is no longer 50 years, which it may have been some years ago- but now it is slightly younger. The furniture still have many years on them. Much of the furniture was designed in the 1950s.



***Is the furniture that is sold now primarily from that period?***

That's some of our core competences in a store like this. If you look at Wegner's old chair from the late 1960s and (points towards different chairs) 1948, 1958.

***Is this a tendency within the past 5-10 years?***

We have done this for the past 35 years. That's what we are famous for.

***You say that you have opened the new concept store recently.***

In that store we have classics too, i.e. the String shelving unit and we also have Eames chairs from the late 1940s-50s. We have many classics in that store too, but people don't believe they are classics. (Laughs). And lamps too, the Jielde Lamps from the 1950s, with the joints. That's very in at the moment, where you revive the old classics or unknown products, and then you revive them and then they become a new hit.

***Are the customers influenced by the trends that they see in furniture magazines, and bring the magazine and ask "do you have this"?***

An accessories store like that is very influenced by trends, which is not that occurring here (Danmarksgade 25)

***People will not ask for a Børge Mogensen in pink?***

It does happen. At the moment when Paul Smith was very hot, many Wegner chairs were upholstered with a striped fabric, which will not happen now. Now people have seen it and they are now looking for something different. But, yes, people do follow the trends in the furniture industry.

***At this moment this store is dominated by light brown and black.***

***How does this change? It is steady, or do you change?***

We do not have a large floor-plan, and the furniture is very close together, since it's a city-boutique. We cannot make something that is too wild, because it will make the shop look awful. We have tried it a hundred times. So we have to keep it in natural tones and a little light and dark and then we put some accessories with some colour and some art on the walls. That's the way it actually works the best. Black leather is a classic, and that is what we sell the most.

***Do the customers purchase what they see in the store, or do they choose it in a different colour, i.e. dark blue?***

This furniture is made on demand. i.e. If you want this sofa (Børge Mogensen) but you don't want a white frame, if you want it in soap treated oak or white treated wood. Then it is made just for you. Unless of course, you need it right now, then you can purchase the one in the store because there is six weeks delivery.

# APPENDIX F

## Focus Group questionnaire

Hanne, 47 years

**Profession**

Social- and healthcare worker.

**Spare time activities**

Zumba, bicycling, walking the dog, reading, house/garden, socializing with family.

**The use of the primary chair**

Reading, listen to music, working on computer, watching TV, resting, warming the feet on the radiator, sleeping.

**The buying criteria**

Great comfort, nice to look at, good price.

Hanne, 53 years / Bjarne, 59 years

**Profession**

IT professional / Aircraft Mechanic

**Spare time activities**

Knitting, reading, iPad gaming, watching TV, walking the dog.

**The use of the primary chair**

Knitting, watching TV, reading.

**The buying criteria**

Great comfort, easy to clean fabric.

Karin, 54 years

**Profession**

Independent.

**Spare time activities**

Socializing with friends and family, watching movies, going for a walk.

**The use of the primary chair**

Resting, reading, watching TV, socializing.

**The buying criteria**

Great comfort, nice to look at, fits to the rest of the interior.

Mette, 56 years / Jens, 56 years

**Profession**

Medical Laboratory Technologist / Engineer and teacher

**Spare time activities**

Gardening, DIY crafts (wood, metal and composite FRP), sailing, flying.

**The use of the primary chair**

Sleeping, reading, eating, watching TV.

**The buying criteria**

Not too bulky, nice to look at, fits to the rest of the interior.

Mette B, 56 years

**Profession**

Accountant

**Spare time activities**

Running, reading, patch work, knitting.

**The use of the primary chair**

Reading, working on computer, watching TV, relaxing.

**The buying criteria**

Great comfort, able to both sleep and rest in it.

Pernille, 59 years

**Profession**

Independent

**Spare time activities**

Cooking, golfing, traveling, reading.

**The use of the primary chair**

Reading, resting.

**The buying criteria**

Great design, good quality, fits to the rest of the interior.

## APPENDIX G

### Focus group interview

#### *In-depth interview and furniture testing*

The focus group members during the interview.



Mette N, 56, (MN) married to Børge N, 65, (BN)



Mette J, 56, (MJ) married to Jens J, 56, (JJ)



***How do you use your furniture in the lounge in your daily life, how often and what is it used for?***

JJ: We use it to eat, we watch TV, we sleep.

***Also in the chair?***

JJ: Also in the chair. It is used for everything, both when watching TV and also when eating in front of the TV.

MJ: And reading.

JJ: And also reading.

***In the questionnaire you answered why you purchased the furniture that you did. Did you try the furniture before you bought them?***

MJ: I barely remember.

JJ: Yes we went to the shop in Sindal, Christensen, Erling Christensen. And they had them.

***Did you buy them because of the way they looked, or was there a different reason? Was the cost a factor?***

JJ: The cost was not a factor. We did not look at the price.

MJ: That was the time we were looking for something for Mads, and we found these. I had seen their brochure and we had talked about it.

JJ: We looked after rattan chairs, it had to be rattan chairs. So we were focused on a specific type of furniture with a specific construction. We had already looked into the setting that it was placed in, so the decision that it had to be rattan chairs were decided from home.

MJ: We looked at the selection of chairs and found a sofa and found the matching chairs.

***Same questions are directed to MN og BN. What do you use your furniture for in the house?***

MN: If it's only the chair, we use it for sewing, reading.

BN: Relaxing.

MN: And spoil the dog. And when Børge (BN) has the rare opportunity to borrow it, it is to watch football in.

***Where did you buy it?***

MN: Franks møbler in Arden.

***Did you know what you wanted before you purchased the chair?***

MN: We had seen it before, but the price was 15.000 with chair and footrest, but at that price we wouldn't buy it. But then luckily there was a sale and we were able to purchase the chair for 9.000. I had seen the chair for a long time but for a chair was a lot of money.

JJ: Then it would be possible to scratch your back, would it not? Or massage.

MN: Sadly no. But I could probably have gotten a cheaper chair, but this was a Brunstad from Norway. I was crazy about that chair, and then it was reduced price so I was willing to buy it.

***Did you buy it because it suited the rest of the furniture? Or was there another reason?***

MN: It matches the rest of the furniture, and then it is a bit lighter than other leather chairs. For example those "Stressless" chairs". I think they are too heavy looking.

***You said it was a Brunstad. Was that a specific brand that you targeted?***

MN: Yes, and then it was a good quality of leather. That was the reason.

***How long time would you estimate that you use in the furniture per day?***

MN: A lot of hours. But I'm in and out of the furniture all the time. When I'm knitting or sewing, it's probably from 8 pm to 10-11 pm.

MJ: It's difficult to say.

JJ: We can probably figure it out. When do I come home after work?

MJ: We don't work in the chair.

JJ: We don't use the computer in the furniture. Either we do what we mentioned earlier in the interview

MJ: And relax with the cat.

JJ: We use the furniture for reading a paper, watch the TV, The TV is always running when we sit there. Also relaxing, sleep. But it does not have an integrated function, where it can be tilted or...



MN: We got ours when I started having problems with my neck, and I had been on a look for a special chair, where the one we have has this neck pillow that can be adjusted. So the back of my neck can rest.

JJ: Can it recline like this one (points towards Sorø)?

MN: Yes it slides all the way back and then there is a footrest.

***But when you say that your furniture does not have a function, does it mean that you move from furniture for different sitting positions?***

JJ: Yes, we sometimes move from the chair to the sofa, to get the possibility to lie down. (Laughs)

MN: That's where mine is really good, but it does not have a handle like this one. (MN is currently sitting in the chair)

***Can you imagine purchasing furniture online?***

MN: Then I should have visited the store in advance.

MJ: Then you should know the furniture before.

MN: If it meant that the product was cheaper there, I would not be worried at all. I would always look at the cost.

JJ: Not this kind of furniture. I don't believe. I think I would buy an office chair online, which is a more standard piece. With all those adjustment features. I don't think I'd have a problem with that at all.

MJ: Without knowing the product at all? I don't believe you would.

JJ: But it's an office chair! In this case you know how they work, and you choose more on the look of the chair. Because they generally can do the same things.

MJ: I think you are critical about the chair, that you already have at home.

JJ: That was bought with less focus on how it is to sit in it, and more focus on that it is nice to look at.

MJ: What about when it reclines?

JJ: But all office chairs do that.

MJ: That is not irrelevant, when you have to sit in the chair for a long time.

***Is the black KEVI chair good enough? (Knowing that this is a chair they already have)***

JJ: But that cannot do anything. It only have a spring effect. ***If you have the option of purchasing it online, and you had a service of easily returning it. Would that be more appealing than for example trying it in a shop?***

MJ: A thing like furniture is not purchased very often.

JJ: Yes, it should definitely not be very complicated, before I lose interest. Then I'd rather try it first. And also trying it, there still will be some problematic in returning them.

MN: I can imagine trying it and then see if it's something and then make a decision.

MJ: Yes.

JJ: It has to be a lot cheaper. It should have a much better price online than in the stores.

MJ: And delivery should be free.

MN: Oh, IdeMøbler does not deliver for free. Is that not only the first attempt at delivery?

BN: Yes, they have some specific days that they deliver for free.

JJ: We did not pay anything for delivery at that guy up there". (Erling Christensen)

MN: Yes, but he's also a different store. I think he's easier to negotiate a price with.

JJ: That's also the impression that I got. The people from Northern Jutland...

MN: That's actually the place I saw the chair the first time, it has been many years. (Laughs)

***How old is your current furniture?***

JJ: 5 years. At the most. It was newer than our silver anniversary.

MJ: That was in 2008... 2009.

JJ: Is it not older?

***What is the reason why it was changed?***

JJ: It needed it.

MJ: It was worn out. We had been looking for a long time for something new.

***How old are your current furniture?***

MN: The sofa is from last year and the chair is two years.

JJ: Do you want to know how old the previous furniture is?  
If we can calculate it. It's probably 40 years. The sofa-bed was yours (MJ) and you bought them, in 1978. (Laughs)

***Were the leather chair and sofa bought at the same time?***

JJ: Yes, that was bought at close to the same time, when you moved to Viborg. Around 1978?

MJ: That's right.

***Was there a big difference between the previous furniture and the current furniture?***

MJ: That can be said.

JJ: The last furniture were more accumulated, random, where this is chosen in relation to the living room and the use of the furniture. They were completely worn out.

***And yours? (Asking MN and BN)***

MN: 7 years. But they are being reused. But that's because Børge (BN) is somewhat of a luxury animal and he could not sleep in the sofa. He needed a sofa there the end of the sofa could be reclined so he could lie down.

BN: The old furniture were placed in the summerhouse because we needed new furniture up there.

MN: He (BN) originally wanted to return to the old-fashioned, and wanted a corner-sofa, but when he found out what the price was, than we were not getting a corner-sofa. The price was 45,000DKK. Then he found out that he could make do with a normal sofa.

JJ: Like a chaise long. Is that not what that extra part is called.

MN: Yes, but our sofa is where you tip the end of the sofa.

JJ: Like a two persons sleeping sofa?

MN: No, it's the ends you tip. You know the spokeback sofa? Where you pull up the ends and place it in position, and then he can rest his head on there.

BN: It's long enough to lie down in.

JJ: So it's not meant to be slept on.

MN: It's just a plain leather sleeping sofa, with a spoke back.

JJ: You can sleep anywhere.

MN: I also think you can sleep anywhere.

***What is the cost of the furniture?***

JJ: I think they cost 20 for everything.

MJ: No 24.

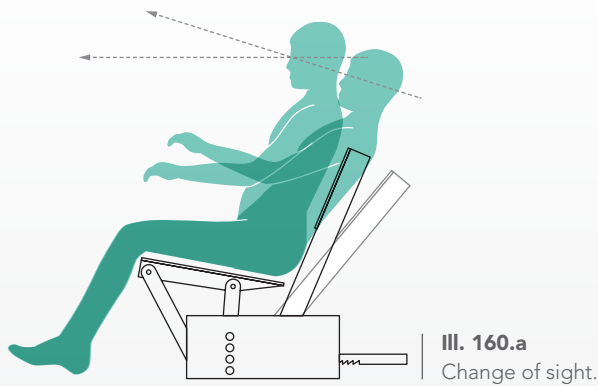
JJ: 24?

MJ: We wanted to try with the one chair to see how much we had room for and then we got the second chair.

# APPENDIX H

## Seat angle

The starting point for the seating angle was the theoretical 10° but was tested both a 0° and at 20°. At a planar angel (0°) the test person experience uncomfortable unstable position and felt a slight sliding feeling towards the seat edge (also referred to as shear). When adjusting the angle to around 20° the user sat very stable but as the angle increases the buttock's placement becomes very low. Mette N, one of the focus group members, found it difficult exiting the chair as she was sitting very low. Although the armrests can help getting up from this position it still becomes significant harder.



## Back angle

One of the tested areas was the maximum upright seating position and the maximum lying position. The comfort machine is able to change backrest angle in eight different positions – from an angle of 100 degrees to 145 degrees. The angle was tested on a focus group member to figure out both a sound seating- and lying position together with the good angle for activity.

At a very steep back angle the focus group members did not feel it very stable, as it felt like the upper body was tipping forward. At a more leaned back angle the member experienced difficulty keeping the eyes on the activity as the direction of the sight pointed upwards.

The chosen sitting position angle is 105 degrees which is considered as the preferred back angle of the focus group members.





# APPENDIX I

## Interview with Jette Bangshaab

16<sup>th</sup> of April 2013

Interview with Jette Bangshaab, associate professor for the for physiotherapy education at University College Nordjylland.

Prior to the interview she has been briefed about the project and showed images of scale models.

*The chair should have a good comfort where there is no unnecessary strain on the body. We found some angles for seating comfort (See page 59 for illustration). Does these angles match what you know from your work at UCN?*

The illustration is showed and explained

Firstly I'd like to speak a bit generally. The way you sit in a chair is determined by the way that you are build. How the relationship is between the length of the thigh and the body's length. That means that this seating angle can be beneficial to many. It's been a while since I have worked with furniture, but there are these anthropological measurements, that I do not know if you have researched. This information will tell you what the average length of a thigh for a person is, and these measurements have been used to calculate how furniture should approximately be.

If you want to avoid pressure in example here (points to the hollow of the knee), it is important that the length of the seat is not too long to a person who has short thighs. If the lengths of the furniture is approximately close to the average measurements, it means that these angles and lengths will suit most people. This will mean, that when a person sits correctly in a chair he or she will be able to hold an acceptable position between "columna" (spine) and the pelvis. What can happen when a seat is tilted downwards (closer to saddle position) is that your pelvis makes your spine have a more vertical position and there is less strain on the sitting area.

*In research we have found that the saddle position is a good ergonomic position too.*

Yes, and by making this angle in a backwards position and giving a recline effect means that you compensate a little for these angles. If the chair suits the average person's thighs, and the person falls pleasantly and expectedly down into the seat and with the correct support in the lower back, that will give the most reduced strain on the supported areas.

*At the moment we are working with upholstery and the dimensions and support of the cushions.*

In upholstery you can try to work with a material that supports the idea, that it is important not to keep a position for too long, because even if it is a good sitting position, pressure will occur after prolonged sitting. So if you work with upholstery that incites the user to movement or give in to the movement.

*A sort of spring effect in the material itself?*

Yes or a material that forms itself after the body or it gives the effect that the sitter becomes a little more active in the chair. This will move the pressure points. You may know it from mattresses

*Tempur for instance?*

Exactly where the material shapes itself after the body and when a person move it will "push up" where it is not loaded anymore. If you can choose an upholstery that doesn't enhance the pressure, but instead suppress it. Not too soft and not too hard.

*The chair is a relatively hard shell with loose upholstery on selected areas. We have placed upholstery in seat, lumbar area, and possibly also in the armrests.*

How high is the chair?

*In our focus group there is a person who is very tall and also a shorter person, so we have not determined this yet. The lumbar support is close to the armrest (200 mm).*

Again, this chair will need to made from standard understandings of how people are, because there will be people who are too high or perhaps elderly. There are different postures in people. Some have a very curved back, and other's are straight or in between. If a curved person sits in such a chair it will give a pressure in the upholstery that you didn't upholster for, when the sitter is straightened. You cannot dictate the posture. But if you give an upholstery in the lumbar area, the armrests and a good sitting area and there is no pressure in the hollow of the knee. This will be the areas where you can risk pressure wounds.

*We have found that our focus group has an active lifestyle. And in and out of the chair all the time.*

If it is a chair that initially is not for people with disabilities, then the body is made so you constantly move yourself.

*We are incorporating the activities and hobbies that the users have in the chair. For instance knitting or reading a book. So the armrests needs to follow these activities too.*

Yes, it is important that they do not get too high.

*The chair should be used when people are 55 + and also when the user becomes older and perhaps gets some disabilities. I'd like to discuss the physical disabilities that can occur as you grow older.*

There are the average changes when you become older and then there are the changes that is caused by illnesses. The average changes will possibly not occur before you are close to 75 or 80 years old. Sometimes older, if you are lucky and free of illnesses and good at being active. In age you will get a stiffness in the body where you will need a little more comfort and you are less able to move muscles. This means it's imperative that it is neither difficult to sit in nor demands

a lot of movement of the user. Looking at your chair I do not believe this is the case. It is the force of the muscles that becomes weaker, but it is again important how the user maintains themselves, because if you stay physical active you can maintain muscle strength up to the age of 80-85 years of age. What I mean to say is, that it needs to have a height that it's not difficult to exit, because this means that the thigh muscles needs to be relatively strong to exit a chair – and it should rather not be too low.

***We have researched a rocking function in the chair***

That's difficult to say if it's a good or bad idea. This is perhaps prejudice against rocking chairs and the elderly. The idea is good in the understanding that you keep yourself moved, which some will probably like, where other's will find it irritating. It is a discussion that goes to what the chair is thought as? Is it for knitting, then it will probably not be beneficial. Is it more for looking out the window? What is the primary purpose of the chair. It's a good idea to think what is the need for the elderly and if this rocking function will give them that. This function can either be right or not right. The idea is good in the way of moving your body, but seems a contrast to the functions of the chair.

***In regards to the lumbar support. The lumbar support is needed in the two positions of upright and reclined.***

You can say that you need the support in the back and make sure it is not too high up. It will feel annoying if it is placed up here (in the ribcage). What you should consider is that the lumbar support is not too high. Lumbar support is mostly used in chairs where you work.

***We found that in a chair where you recline, the back of the chair reclines and the sitter will manually adjust themselves according to the new position.***

What you move when you recline is the pelvis, which is a central point in the sitting position. The reason is that legs and spine is connected in this place. Every time you make a movement with your back, you create a settlement in your pelvis. If the back is curved, it means that you will curve your pelvis, and this will mean that you will sit with more pressure on your pelvic bones. If you are more straight-backed you have a more distinct curve you are sat more upright. So what I mean to say is that your back and pelvis are connected. When you recline your back, you will rotate in your pelvis. And it will irritate you if there is nothing that creates a soft area for your lower back.

***People lose height (condense) when they are older. How does this happen and how much?***

Yes this is correct. When people are 70-75 years of age, the density of the bones change (lessen). This is natural aging process. When the bones in the spine de-calcify this results in that the body condense. I don't know how to think this into a chair, because it's an individual matter on how it affects people's bodies. But most people become a bit more arched in their backs. That posture will mean that the sitting bones will become a little more strained. So what you can do is to

be more aware of the strain suppressing upholstery. When people condense this may also have an effect of the height of the armrests. But the average aging process is not that noticeable, so what you can be aware of is that the lumbar support is not where you think it should be, but for elderly move it a little bit higher up. That could be beneficial to think where the armrests are and where the support for the back is.

What can be difficult about making "the chair" is that people can be very different in their bodies. This is both for young, middle-aged and elderly. You can try to think in as many things as possible, but there will always be a certain segment that cannot use that specific chair. I'm thinking, what yourself are mentioning, is to avoid unnecessary pressure on circulation, nerves and those places where the bones are closest to the surface of the skin – where one can develop pressure wounds if you're inclined to this. This is by thinking of the hollow of the knee and the blood vessels and nerves in the area. The sitting area where the skin is pressured. And in the armrests it's the circulation and nerves that are pressured. In the lower back it's the coccyx. And by age you get a more curved back and this can be aided by a softer upholstery.

## APPENDIX J

Interview with sales people Erik and Keld  
at Idemøbler – Max Jessen Terndrup  
14th of April 2013

--- : Indicates when the interview has been out of interest.

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**Ditte:** Do you know Nordic Easy Chair? The company that produce the chairs of Tradition and Balance.

**Erik:** Yes

**Ditte:** In connection with my master thesis we are three people making a recliner for a younger segment because their current segment is 65 years or older.

**Erik:** It is to a great extent the older segment that buys these kinds of chairs and I can tell you that you sit well. Whether you like the design or not, you sit best in a recliner. Remember to keep this in mind.

**Ditte:** It is also that we intend to connect. Styling and comfort.

**Erik:** Well then it could be Brunstad, which is multifunctional. Try to sit in it. I can tell you, it is strongly addictive.

**Ditte:** I like the recline function, which is gliding instead of stammering.

**Erik:** You can also adjust the seat angle.

**Ditte:** Okay, is it something you do while seating? (Looking for a handle)

**Erik:** No, it is not something you do while seated. But at least you can do it because these days we are not all tall and young. Today there are some standards you work with. For example can my wife stand underneath here (The salesman has his hand underneath his chin). We can never agree and she always says that I can just lie on the sofa.

---

**Erik:** Now it is just the trouble for you to see it. (He shows the function underneath the chair that regulates the seat angle) You can adjust here and here.

**Ditte:** That is the gas spring.

**Erik:** Yes it is. This is the angle of the seat. And for small people you can do this. (He tilts the neck part on the chair)

**Ditte:** Okay, that is smart.

---

**Erik:** There has to be some weight, but you have to try this. Now I have to annoy you the most. Maybe it is something with the age, it probably is. You can like it or not, but it is the most comfortable chair I have tried. And there is a lower back support. It is a bit low in the back, however I will just do this then (He lift the neck support). Try this lower back support. It is great.

**Ditte:** I can feel the difference.

**Erik:** There is more right? But I like the fur, maybe not the white...

**Ditte:** Yes, you can also have it in grey...

**Erik:** You can also have it in black. It is nature material; It is like what you see is what it is capable off. It is very beautiful. It is a Swedish product.

**Ditte:** I was at the Stockholm Furniture Fair this February to get inspiration and see what the competitors of Nordic Easy Chairs were doing and the Swedish people loved this kind of textile.

**Erik:** You also know that this kind of material is not to hot in the summer. But on the other hand you do not sit inside if it is great weather. Some of the chairs by Bruno Mathsson have something like this and also webbing. It is really nice. But it does not sell that much in Denmark. If a product cannot be disposed, then it does not matter if it is beautiful or not.

**Erik:** The latest products from Stressless. I think it is strange that you introduce a new model in a new colour and starts with selling it on sale. There is something wrong with this and not something I have been told.

**Ditte:** When you lying down it have quite a low back. (The Stressless chair)

**Erik:** No, no. What about now. (He moves the neck rest up)

**Ditte:** It is like in a car seat.

**Erik:** You can learn a lot from that. You sit really great on the driver's seat but with some exceptions. Try to think of a truck car seat.

**Ditte:** Yes, they sit for quite a long time.

---

**Ditte:** Those with integrated leg rest, I saw you had some at the entrance; do you sell a lot of those?

**Erik:** No, it is not those we sell the most, but there is a point with it so you do not have to move the Ottoman all the time. It is always in the way when you do not use it.

---

**Ditte:** I think this is smart (A hidden locking function on a recliner), compared with Nordic Easy Chair and their method to regulate, which is a big locking mechanism under the armrest. This is more elegant.

**Erik:** Nordic Easy Chair is not famous for their design. It can be done better however that also have another price. Himolla is another design and price range and they have recliners with massage functions but the market does not demand anymore.

**Ditte:** No?

**Erik:** Yes, that is over.

**Ditte:** Then there is Brunstad, which are recliners that last for many years.

**Erik:** Yes, if you use it what it is intended for. That is a precondition right. 8-9 years ago we imported some American La-Z-boy recliners. It is the most unattractive chairs on the world market. But you sit great in them and we sold a lot. I remember I bought one for my wife and there was also a massage function and everything but I could not stand to look at it so I threw it out at last. They had also integrated rocking chairs, like you see in Western movies, where he sits on the terrace smoking pipe right?

**Ditte:** This is also something we have research on that if you are just a little bit active with you legs it can reduce and in some cases cure varicose veins.

**Erik:** It is always good to be active and there are some people that cannot walk, but they can sit comfortably and do something with their body. They do not have to be like Keld, right? (The other salesman is lying in a Himolla massage recliner)



**Ditte:** We intend to combine these two things. When you are lying down you want to have this recreation area and when you sitting you need some space for the activities you are doing.

**Erik:** First of all you need some firm armrest so you can stand up if the recliner does not use electricity where you get help to stand up. It does not get greater looking with electricity. The more it consists of, the more unattractive it gets. It is almost a proportional rising. It has to be somewhere.

---

**Ditte:** Is it primarily black that you sell? In some of the more expensive furniture?

**Erik:** When we are in the higher price range, yes.

**Ditte:** Because it is a colour that last?

**Erik:** A piece of furniture in a cognac colour that is more for people in their seniors and the white one is not practical. New jeans come off.

---

**Ditte:** There is also a Poul Kjærholm replica? (A sofa arrangement in front of us)

**Erik:** We can call it Poul Kjærholm look. And this is a little bit of Le Corbusier. (A boxy sofa)

**Ditte:** I think we can call it that. It has some of the details.

**Erik:** In my youth I sold designer furniture. I miss some of the old furniture sometimes but I have to admit that the Danish market is no longer there.

**Ditte:** Yes, it has become expensive. Like a Corona chair (I point at a look-a-like)

**Erik:** Yes, it is not good. No, in the great old days, early 70's, I travelled around as a buyer, mainly in Sweden and that was completely different.

**Erik:** I learn from my earlier manager many years ago that I had to remember to buy butchers furniture. He called it that because that was where we earned our money. It was some very over upholstered furniture. I wanted the white style but we could not get any money on that and I have to agree with him. And it is still like that. It was fun at that time. I was employed at Vodskov bolighus, where I stopped in 74, it is that long ago, but sometimes a fish exporter came and showed me the drawings of the house to receive a suggestion of interiors. There was always more than one fish exporter so I had many and the last told me that his had to be better than the rest. My question was then what is better because we probably do not have same taste. I found out that it had to be more expensive. So it became more expensive.

**Ditte:** It is interesting the development that has happened. In the past you would decorate whole rooms but today you buy maybe a chair one year and a sofa the next.

**Erik:** Yes, today you spent you money different, but it was more fun.

---

**Erik:** Yes, we sell a lot of leather and steel.

**Ditte:** It is some materials with great durability.

---

**Ditte:** Do you have any furniture in felt?

**Erik:** I think we can find one. It is not something you are happy about. It lint and there is also something about the

wear.

**Ditte:** Can you treat it in any ways?

**Erik:** Yes, but the wear makes it lint.

---

**Erik:** This is some of the most feltish we have.

**Ditte:** It is very thin. About 1mm.

**Erik:** Yes, it has to go around the backrest.

**Ditte:** Is it able to be removed?

**Erik:** No, it cannot be removed. And do not think about something that can be removed. IKEA did that many years ago and they still do on some of their sofas but no one does that. Because why do you do it? Because you think you can buy something that is cheaper because it can be changed and washed but it will eventually be worn out. And if you wash it, it will shrink.

---

We walk to the department with recliners by Nordic Easy Chair.

**Erik:** My mother in-law past away few months ago and she had one of these chairs. (He points at a chair with textiles on the armrest) She has had it for almost 8 years and it was worn out on the armrest. She was 97 and it was not because she was that active.

Try to sit down. The worst is that you actually sit amazing. It is not long ago I had a couple of customers that was not that younger than me who bought a pair. You sit really well and I could not deny that. And the costumer always sits best where he tell he does. It makes no sense with the unattractive rounded frame but I must say great respect for these kinds of chairs because we sell a lot of them.

**Ditte:** But it must be because people have some kind of tradition with these kind of chairs and they know what it is?

**Erik:** Sometimes I hear a strange argument from a daughter or daughter in-law that the chair do not have to last that long. I cannot say that and would not even think about that either.

---

# APPENDIX K

## Upholstery foam

Several types of upholstery material can be used for furniture but have different purposes. Listed below are four categories of materials. Foam is often measured by the density or the IFD value, which is pounds of pressure and the higher value, the harder the foam is.

### Polyether foam

This upholstery material has a lightweight cellular flexible structure. [foamengineers.co.uk] The density of polyether foam ranges from 10 to 60kg/m<sup>3</sup>, which is usually denoted by a range of pastel colours. The material is suitable in furniture cushions, top mattresses and other products where there is a need of shock-absorbing material such as bicycle helmets. Because of Polyether foams composition it is not great alone for pressure absorption for a longer period.

### Cold foam (Polyurethane (PU) foam)

This type of upholstery has a higher level of elastic qualities compared to polyether foam. Cold foam, which consists of Polyurethane and is the primary material in the furniture industry for upholstered furniture. [jydsk-skum.dk] Compared with polyether foams, the composition of cold foams makes it suitable for cushions where there is a need of pressure absorption over a longer period of time. Cold foam in furniture is often used with densities of 38kg/m<sup>3</sup> up to 55kg/m<sup>3</sup>. Cold foam is what Nordic Easy Chair uses in their furniture today and they use density 50kg/m<sup>3</sup> and 55kg/m<sup>3</sup>.

### Viscous elasticity foam (Memory foam)

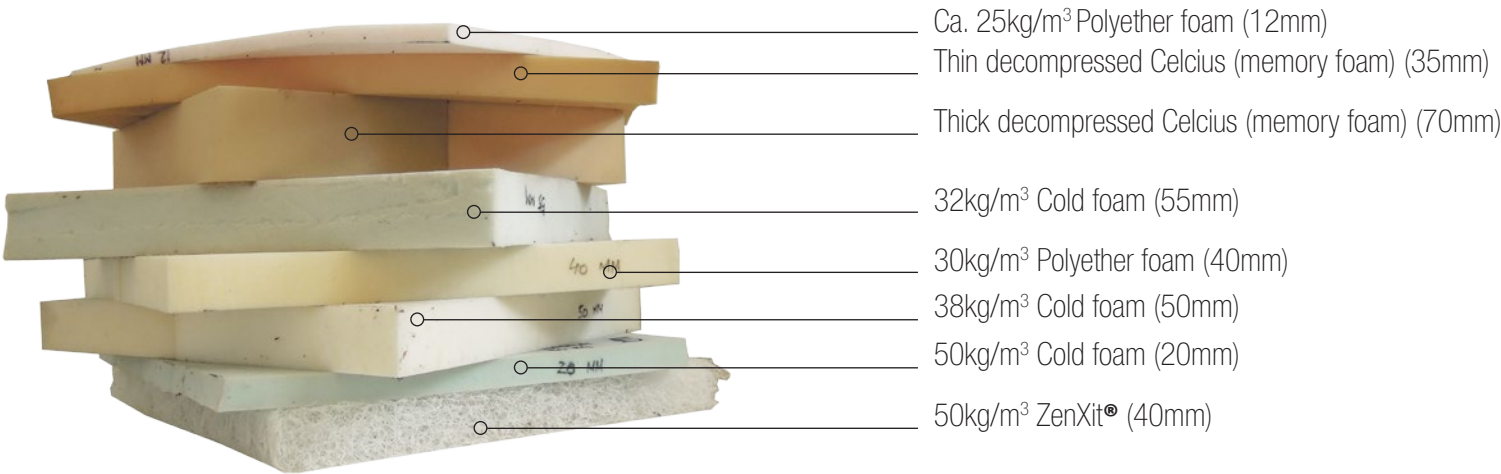
This material is often used in mattresses for beds. It is a temperature sensitive material, which shapes after the body. The reason why the material react like this is the open cells, which compared to other upholstery materials, would not be pressed together under the weight. This means that the open cells follows the body curves and creates great support without any backward pressure. When the weight is removed again the memory foam will return to its original shape. [s-ms.dk] This type of material is not often seen in upholstered furniture like recliners and sofas because of the high price.

### ZenXit

Zenxit is a material for upholstery that is in development by Gabriel A/S. It is used as an alternative to the PU-foam that can be found in upholstered furniture. According to Gabriel the material is user-friendly, recyclable and bacteria resistant. Gabriel has been developing on the material for several years, and holds the global rights to the material.

Zenxit consists of elastic flexible fibers that are injection molded into a netting structure. The density, stings and thickness can vary to create a material with different characteristic.

According to Gabriel the benefits using ZenXit is that the decompression for the body is more even in furniture using ZenXit. This is beneficial in cases of pressure sores. Their tests also show that it provides a better blood flow through the legs of the users. [gabriel.dk 2]



III. 165  
Different types of foam

# APPENDIX L

## Force Sensitive Application

A Force Sensitive Application (FSA) were borrowed from Christian Gammelgaard Olesen, Assistant Professor, PhD, The AnyBody Group, Dept. of Mechanical and Manufacturing Engineering.

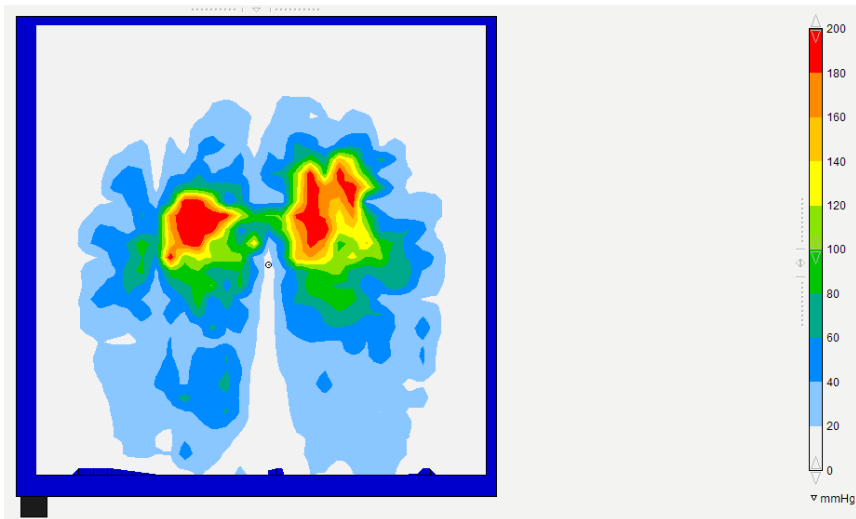
A pressure measuring was done on different types of upholstery with different densities and sizes to find out which type and size of upholstery were the best suited for the seat cushion. The measuring equipment is called a Force Sensitive Application, which is a mat that consists of 32x32 sensors connected to FSA software that calculates the pressure of the human body on the material into contour maps. (Ill. Xx) The mat is placed between the human body and in this case; the upholstery and in the FSA software. The test can then be recorded in picture frames and give a data on how the pressure load is distributed on the mat. The mapping of the pressure goes from 0mmHg (=0kg/cm2) in the white areas to 250mmHg (≈0,34kg/cm2) in the red. To keep a great seating position the best pressure load is when the picture do not display large red areas. In the contour maps where there is no indication of red areas the pressure load is distributed to a greater area of the buttock, which gives a better seating position.

The test results are based on two experiments. The first experiment was a test of the different upholstery individually and the second was combinations of different upholsteries. Three different body types tried each round of tests: Two people from the focus group (Mette N. and Børge N.) and the member of the design team. This was to ensure as great range of body types as possible to have a more general result data. Each test round would have 15-20 picture frame (video recording) to ensure a more stable data output in the end frames. The chosen picture frame for the result at the second last in each round.

The results have been evaluated based on the contour maps due to the little time in the project. However to get a more precise result of the pressure load output, the data could have been evaluated based on chosen areas in the contour map.



Ill. 166.a  
Set-up of test tools



Ill. 166.b  
FSA software tool. Each picture frame shows one second of the seat test. The more red the more pressure is loaded on the buttock.

Ditte



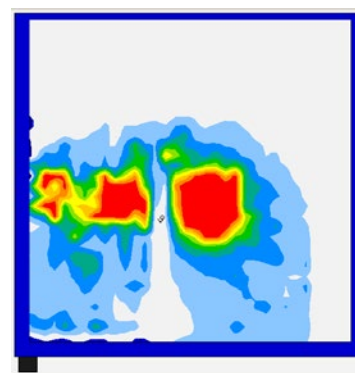
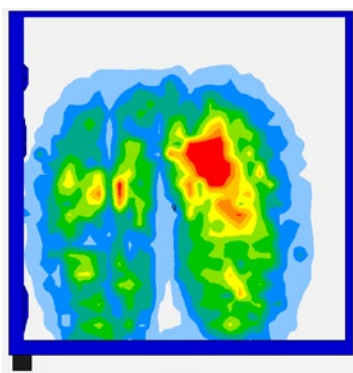
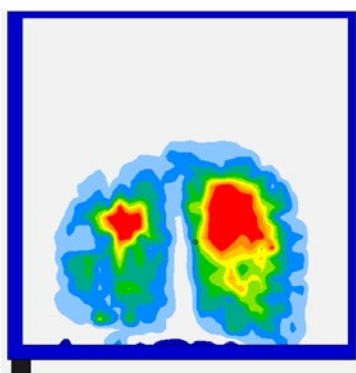
Mette



Børge



Ca. 25kg/m<sup>3</sup> Polyether foam (12mm)



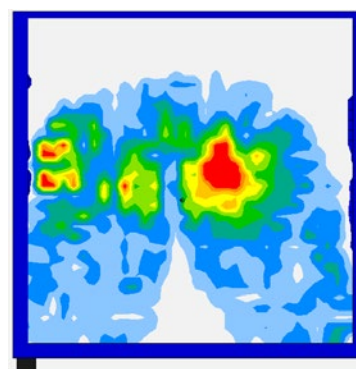
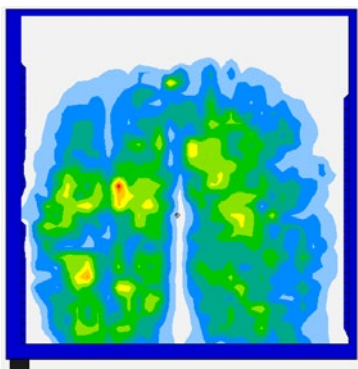
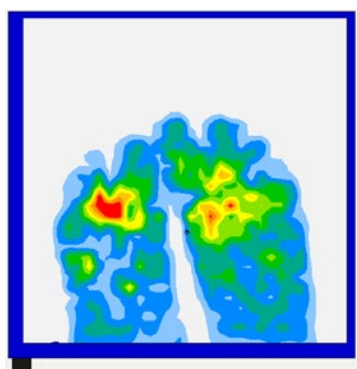


Ditte

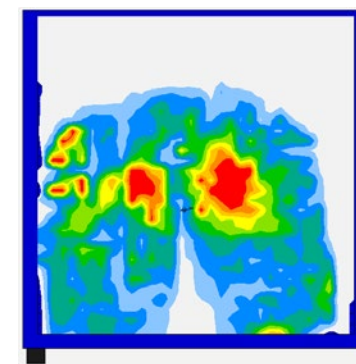
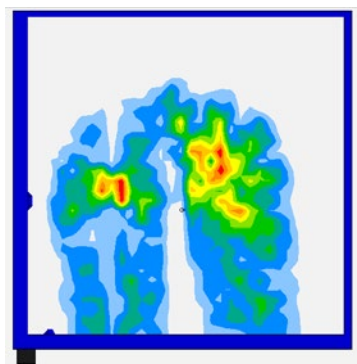
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Børge

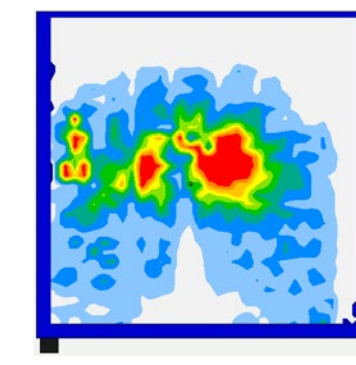
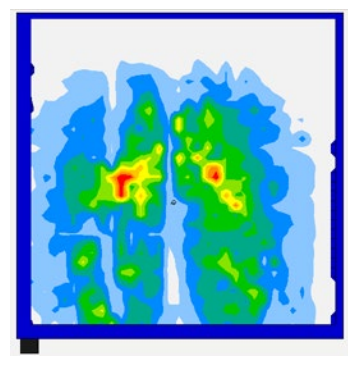
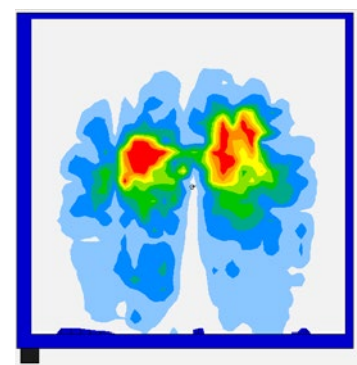
30kg/m<sup>3</sup> Polyether foam (40mm)



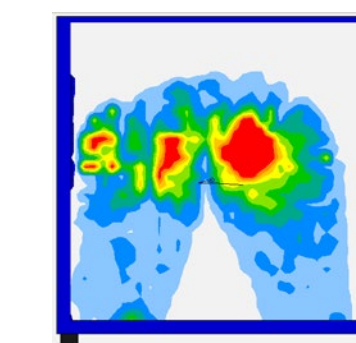
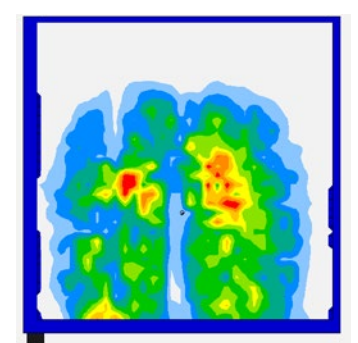
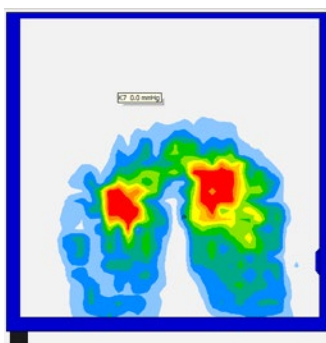
38kg/m<sup>3</sup> Cold foam (50mm)



32kg/m<sup>3</sup> Cold foam (55mm)



50kg/m<sup>3</sup> Cold foam (20mm)

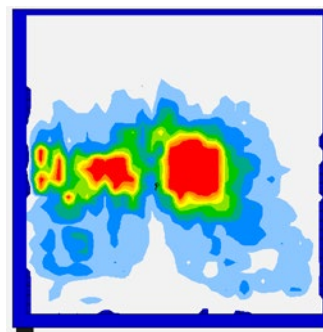
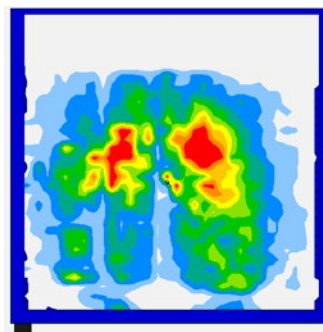
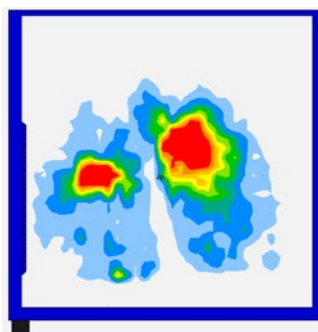


Ditte

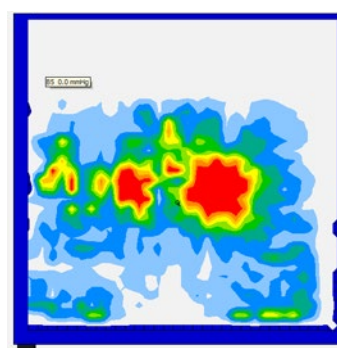
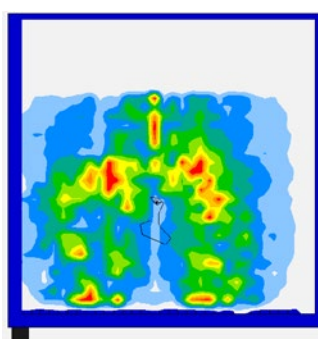
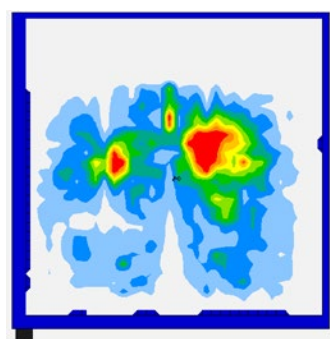
Mette

Børge

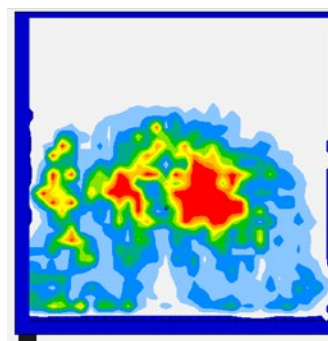
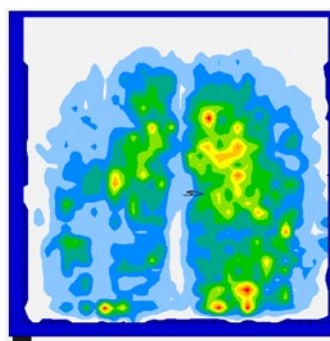
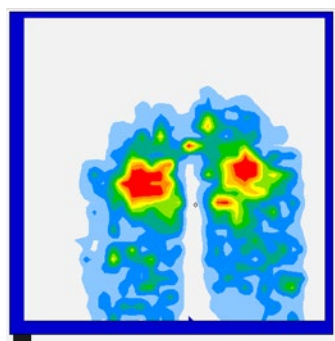
Thin decompressed Celcius (memory foam) (35mm)



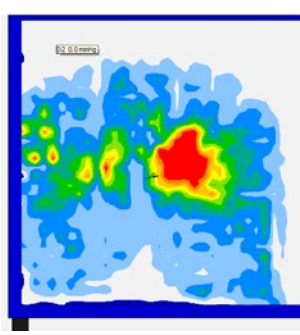
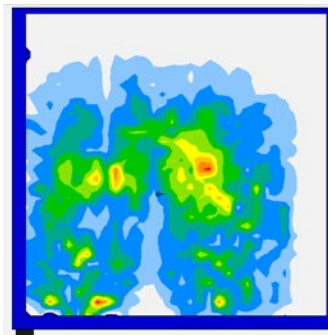
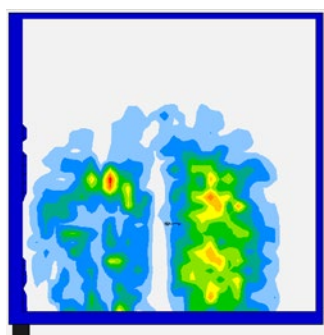
Thick decompressed Celcius (memory foam) (70mm)



50kg/m<sup>3</sup> ZenXit® (40mm)



Ca. 25kg/m<sup>3</sup> Polyether foam (12mm) on top of 32kg/m<sup>3</sup> Cold foam (55mm)



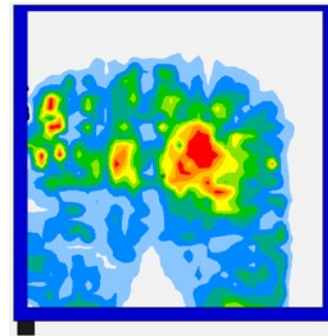
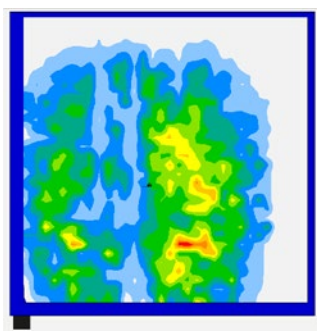
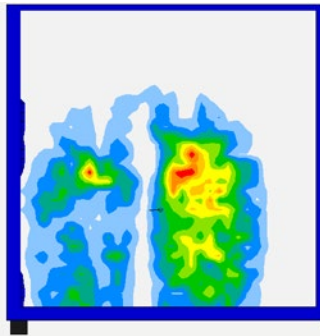


Ditte

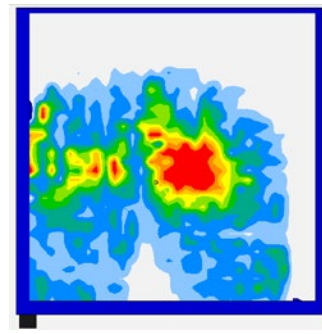
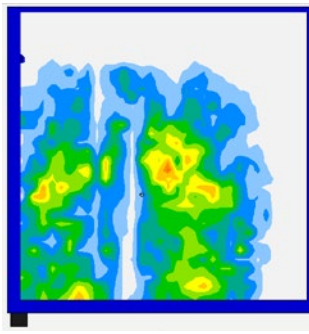
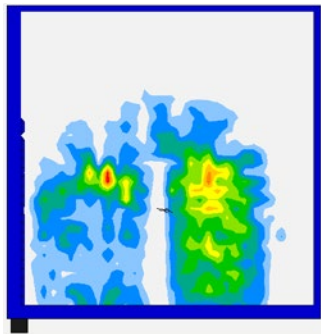
Mette

Børge

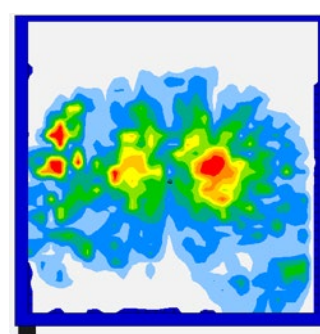
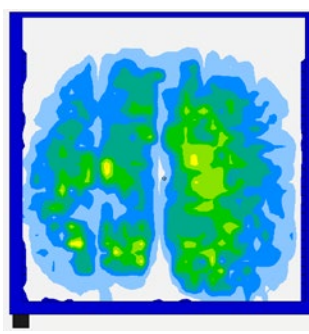
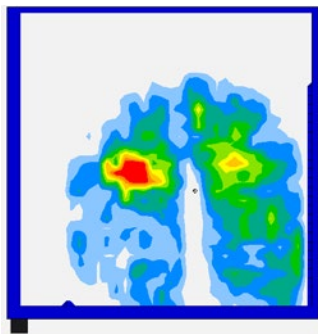
Ca. 25kg/m<sup>3</sup> Polyether foam (12mm) on top of 38kg/m<sup>3</sup> Cold foam (50mm)



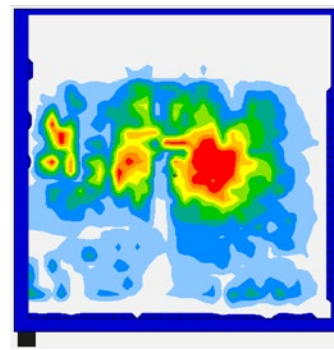
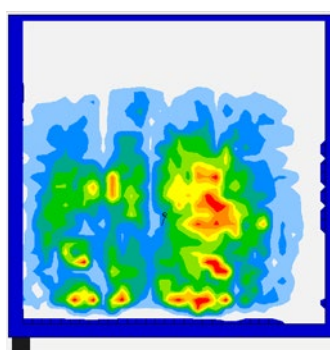
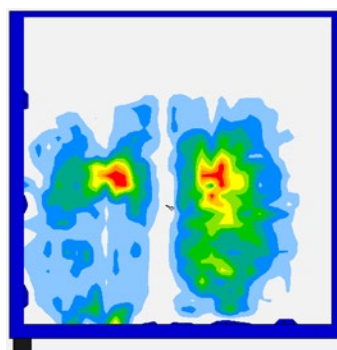
50kg/m<sup>3</sup> Cold foam (20mm) on top of 32kg/m<sup>3</sup> Cold foam (55mm)



50kg/m<sup>3</sup> Cold foam (20mm) on top of 38kg/m<sup>3</sup> Cold foam (50mm)



Thin decompressed Celcius (memory foam) (35mm) on top of 32kg/m<sup>3</sup> Cold foam (55mm)

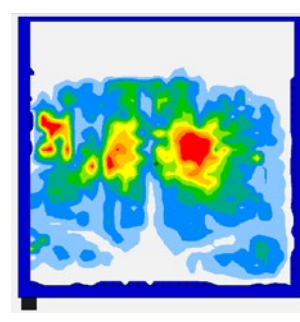
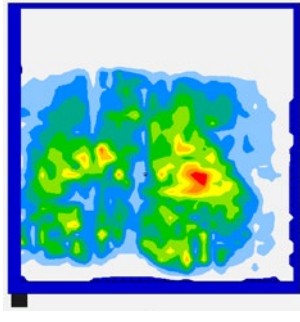
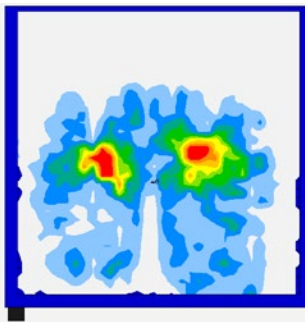


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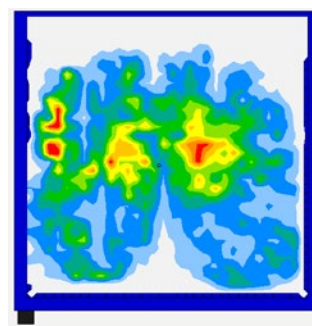
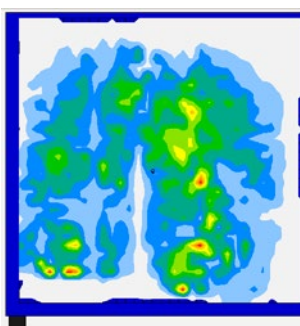
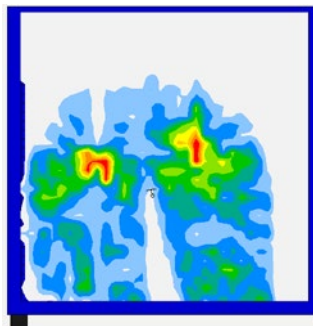
Mette

Børge

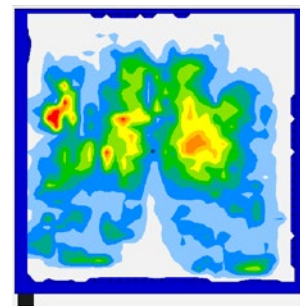
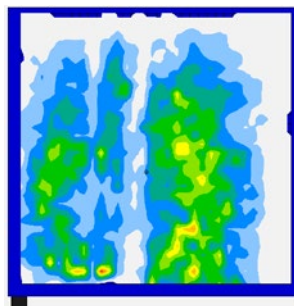
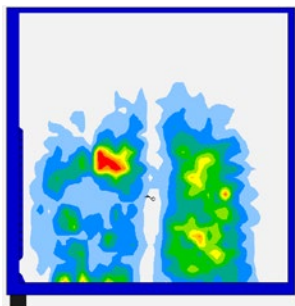
Thin decompressed Celcius (memory foam) (35mm) on top of 38kg/m<sup>3</sup> Cold foam (50mm)



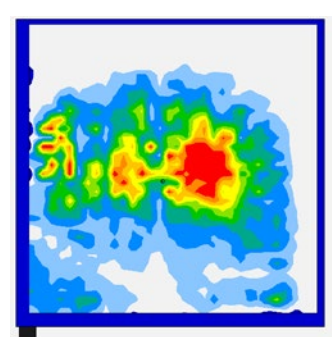
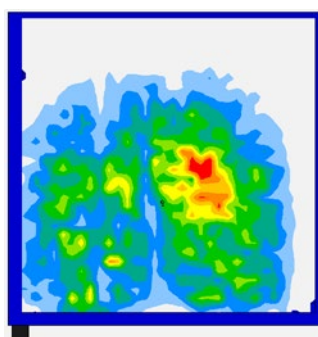
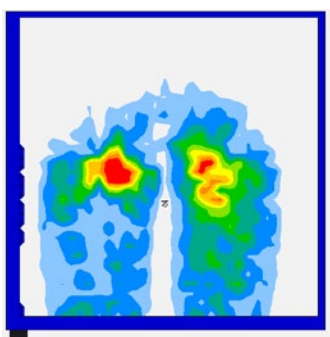
38kg/m<sup>3</sup> Cold foam (50mm) on top of 32kg/m<sup>3</sup> Cold foam (55mm)



32kg/m<sup>3</sup> Cold foam (55mm) on top of 38kg/m<sup>3</sup> Cold foam (50mm)



Ca. 25kg/m<sup>3</sup> Polyether foam (12mm) on top of 50kg/m<sup>3</sup> ZenXit® (40mm)





# APPENDIX M

## Textile specifications

### Gabriel textiles

A textile is tested after industry standards to measure the performance of each textile. Each test has detailed information on the results available for download on their website. In the table below the specific information from the Gabriel textile, Europost 2, is used as an example. This comes in 48 colours where colour 65071 is displayed below.

### EUROPOST 2

Dessin no.	1701
Composition	100 % Pure New Wool
Weight	800 (approx. grams lin. metre )
Width	140 cm
Abrasion resistance	50,000 Rubs Martindale
Piling	4 (Scale 1-5, max 5)
Colour fastness to light	5-7 (Scale 1-8, max 8)
Colour fastness to rubbing	4-5 (Scale 1-5, max 5)
ACT Standards	Pass - AATCC 8-2001 Wet and Dry Crocking Pass - AATCC 16 Ligthfastness Pass - California Bulletin CAL 117-E- Class1
Flammability	Calif. Bull. 117E BS 5852 Part 1 0,1 Cigarette & match Önorm B 3825 B1 3800-Q1 UK UNI 9175 Class 1 I EMME BS EN 1021 1&2 Will also pass other flammability standards. Flame retardant performance is dependent upon the foam used and fireproof treatment
Flammability with Flovan	BS 5852 Crib 5 IMO A.652 (16)
Flammability with Zirpo	NF P 92-503 M2
Environment	EU Ecolabel 100% free of heavy metals Oeko-Tex 100 certified
Warranty	10 years warranty
Design	Gabriel design team
Colour scale	Cenk Kivrikoglu

[gabriel.dk 3]

### Composition

The textile's material.

### Weight

The weight of the textile per linear metre on a roll.

### Width

The width of the roll of fabric.

### Abrasion resistance

The amount of rubs that a fabric can endure is measured on a Martindale machine. The machine rubs against the fabric to measure how many rubs a textile can tolerate before three threads on the fabric has broken.

6000 rubs: Occasional domestic

15,000 rubs: Light domestic

20,000 rubs: General domestic

30,000 rubs: Severe domestic/gen. contract

40,000 rubs: Severe contract.

### Piling

During the Martindale test the piling is also measured, which is the textile's tendency to form bobbles. 5 is no change in the fabric.

### Colour fastness to light

This is used to test how permanent the colour is in a fabric. This is tested by exposing a sample of the textile to artificial UV-light for 100 hours. The scale is from 1 to 8 and 1 equals the maximum colour change and 8 the minimum colour change. Upholstery should have a value of minimum 5.

### Colour fastness to rubbing

Colour transfer of the textile is tested in a crock metre, where it is tested on undyed cotton. This is tested in a wet and a dry state, by rubbing the textile ten times. The scale is 1 which is maximum staining and 5 is minimum staining. According to BS the textile must have 3-4 in a dry state and 3 in wet.

### ACT Standards

Association for Contract Textiles is a not-for-profit trade association for contract textiles.

[Interface Fabrics]

# APPENDIX N

## Stitchings

The stitchings on chairs and cushions have been researched to see how they are used to create an effect in the piece of furniture and how the detail adds a value. Below are the most common stitchings represented.



III 173.a  
Oculus by Hans J. Wegner



III 173.b  
Emma by Fredrik Färg and Emma Marga Blanche



III 173.c  
Cushion from Gabriel's showroom, Aalborg



III 173.d  
Ruche by Lignet Roset



The sides of the chair has a welt and boxing stitchings. The back of the chair has plain stitching that are attached to furniture fittings to hold the upholstery and textile in place.



The seat cushion has French seams on the edges.



The geometric stitchings on the back are plain stitchings where they provide a decorative element to the chair and gives a depth to surface and materials.



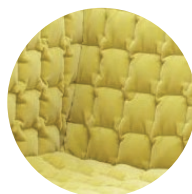
The edge of the chair is emphasized by a welt and box stitching. It's more defined than on the Oculus chair.



The cushion has plain stitches on the edges. The zipper is covered by a zipper boxing that hides the zipper when closed.



The material is a textile that is welded to create a linear pattern. These textiles are also joined by plain stitchings.



The cushion has a stitchings in the fabric that creates a graphical print. The technique is a ruching that becomes a decorative element in the sofa.

[Maisen Mosley. 2008]

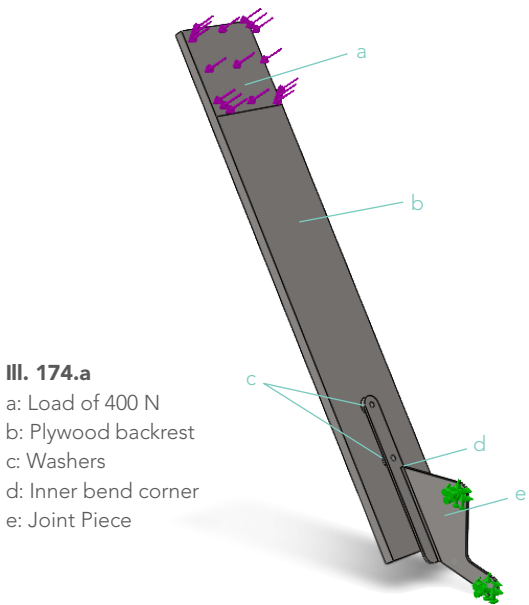


# APPENDIX O

## FEM Analysis

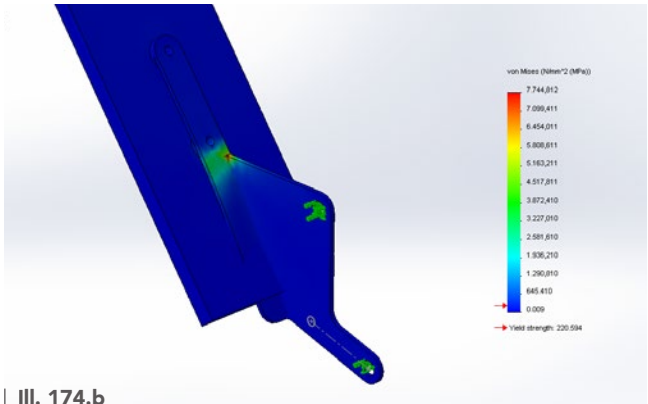
### Joint Piece

To make the most realistic analysis for the joint piece it is important to make the right connection from the plywood backrest and the joint. As the backrest is slightly curved it is likely that there is placed washers between the two components. These washer is also necessary to distribute the load. SolidWorks automatically makes connecting between touching components. The weight is distributing mostly from the upper back to the top backrest and is therefore placed on the top 100mm of a back shell representative. The construction is fixed in the holes of the joint piece as this is locked by the gas spring (Ill. 174.a).



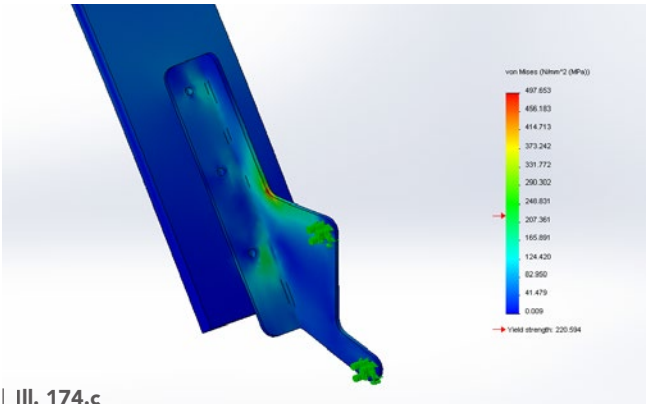
### Test 1

The first test is base on the originally design joint piece with no further thought on durability, which also shows on the result that is local stress 36 times higher than the yield strength of the material.



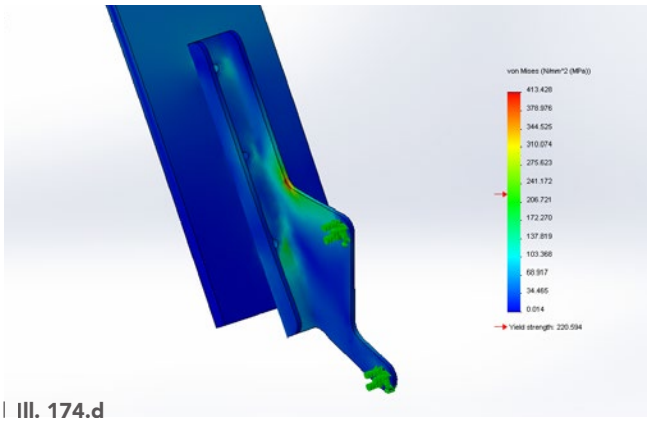
### Test 2

The second design is modified with an orthogonal placed steel plate that reduces the stress in the inner bend corner significantly. Although this solution helped a lot, it was still not durable enough.



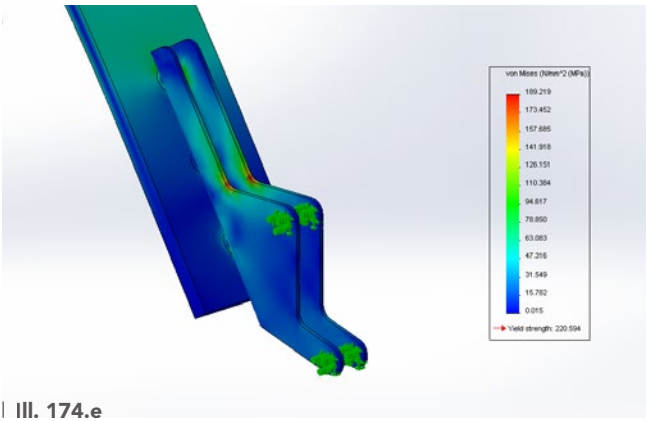
### Test 3

To decrease the strength even more the profile was bend to a U-profile but did not give much enhancement as the piece is still able to twist.



### Test 4

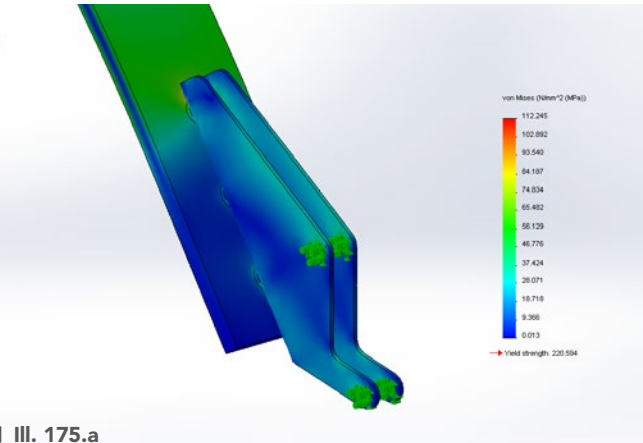
The solution to create a profile with the right strength is to mirror the connection the leg rest mechanism. This way the profile is able to withstand twisting.





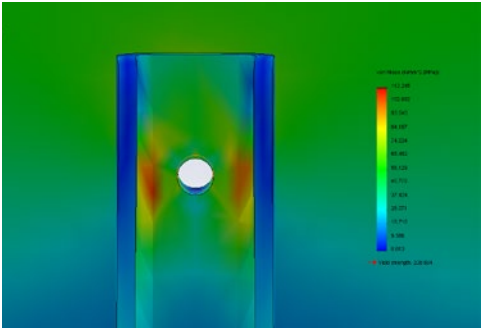
**Test 5**

By putting more material in the inner bend corner the stress is reduced to a minimal all around the joint piece with stress areas of around 40 N/mm<sup>2</sup>, which is a safety factor of 5,5.



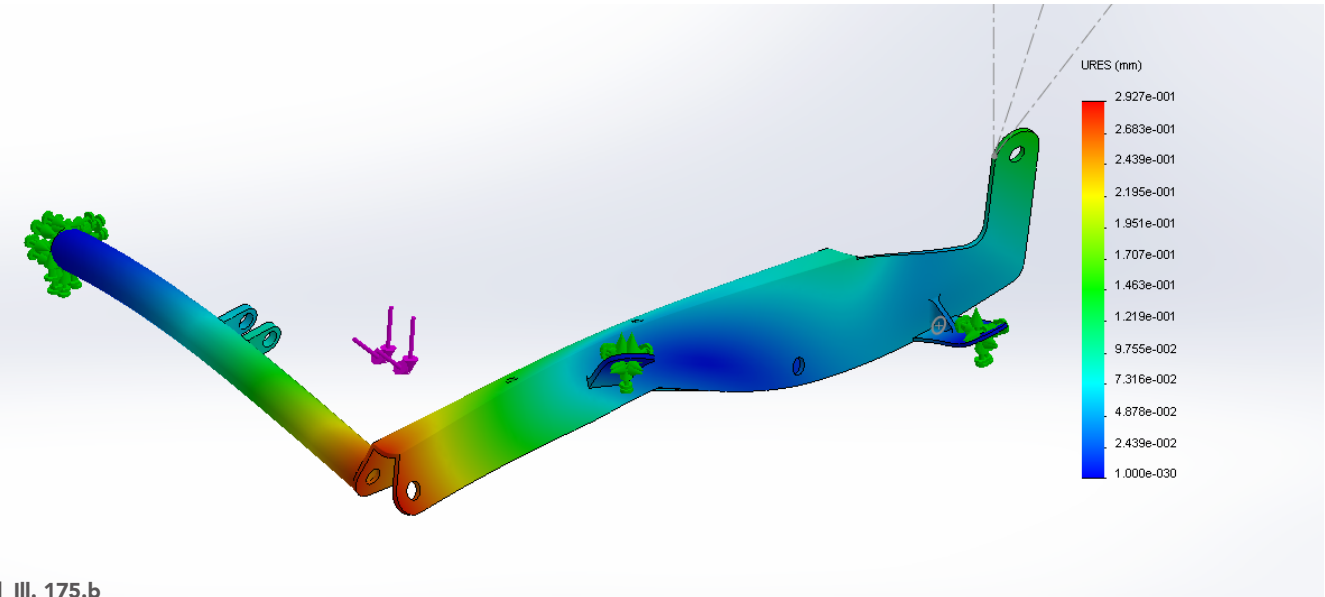
**Local stress**

Around the top mounting hole there is a local stress area caused by the washer “pulling” around the hole. It is unsure if this is a margin of error or a bolt head pushing form the other side will cause the same amount of stress in the area, but as the stress is still at a safety factor 2 it is not taken in serious consideration.



**U-profile**

The u-profile is a bit more difficult to calculate on as the plywood seat shell affects the profile various of places. In the analysis these places are fixed, which means that they cannot move together with the flexibility of the wood. This margin of error means that the local stress and displacement found on the part is higher than in reality. Note that the displacement on the picture below seem very high but this is only a visual trick for easy reviewing.



# APPENDIX P

## Gas spring test

The gas spring test was made to validate the strength of the gas spring, but only in terms of the experience of reclining the chair. Due to the design teams ergonomically situation and the roughness of the experiment, it was decided to test with ordinary tension spring instead of gas springs. Test was executed on three different springs; one with a tension of 564 N representing the gas spring already used in recline chars from Nordic Easy chair and two other springs with a tension around 200 N lower and higher. The springs were selected to have a very small spring constant to achieve fluent movement (Ill. 176.a).



The springs were mounted on a representative for the reclining backrest and combined with a office chair adjusted in the right high (Ill. 176.b).

Because of the big torque created by the backrest it was hard to tell the difference between the two strongest springs. What was especially noticeable was the light spring. As it had so little resistance, that it felt like the back was falling, which was not a pleasant feeling.

It was decided by the design team that there was no need to change the gas spring from what NEC is already using as the spring they are using is a standard component and a stronger spring did not create a better user experience.

A question that could be relevant in a product maturing phase would be if the same gas spring when the weight of the backrest and the leg rest is fully defined, which could result in using a stronger gas spring.

# APPENDIX Q

## Cost of shell

Three manufactures of furniture components were contacted to obtain comparable prices of components of the chair. They were each asked to give a cost price of tools needed and the cost of each unit when manufactured at as 100 pieces and 1000 pieces.

Cold cure foam moulded Schultz Seating	Back and Seat	200 Units	500-550 DKK
		1000 Units	475-522,5 DKK
	Tools		70,000 DKK

Rotation moulded Dan Hill Plast A/S	Back	100 Units	160 DKK
		1000 Units	195 DKK
	Seat	100 Units	130 DKK
		1000 Units	160 DKK
	Tool: Back		110,000 DKK
	Tool: Seat		70,000 DKK

3D bending of plywood Midform A/S	Back	250 Units	130 DKK
	Seat	250 Units	130 DKK
	Tools		120,000 DKK

In the process report the cost calculations are based on the unit price for 1000 units. If the cost of 1000 is not given, the cost of the highest volume is used.

If the cost is given as a price range, the average is chosen.

The cost is calculated as: Tools/1000 + cost per unit.



# APPENDIX R

## Cost estimation

### *Fabric by Gabriel*

The fabric needed for the shell and the cushions is measured using SolidWorks. The patterns are distributed on a roll of Europost fabric with the width of 1400mm. Using this method the design team were able to estimate the amount of fabric needed for each chair.

Flattening the surfaces of the shells, collar and leg rest in a 3D modelling program does not give an exact pattern as they consists of double curved surfaces. To account for this inaccuracy the patterns are enlarged with 15% and the overall measurements are checked in the CAD file. The 15% will also include the textile needed for the seams.

The patterns are placed so they follow the lines of the weave to prevent any diagonal pulling of the fabric. Ill. 178 show how the patterns are placed on a piece of fabric measuring 4000mm x 1400mm.

The same techniques is used for the cushions.

The total amount of fabric needed is:

Shells, leg rest and collar	4000mm (1400mm width)
Cushions	1500mm (1400mm width)

### *Cost*

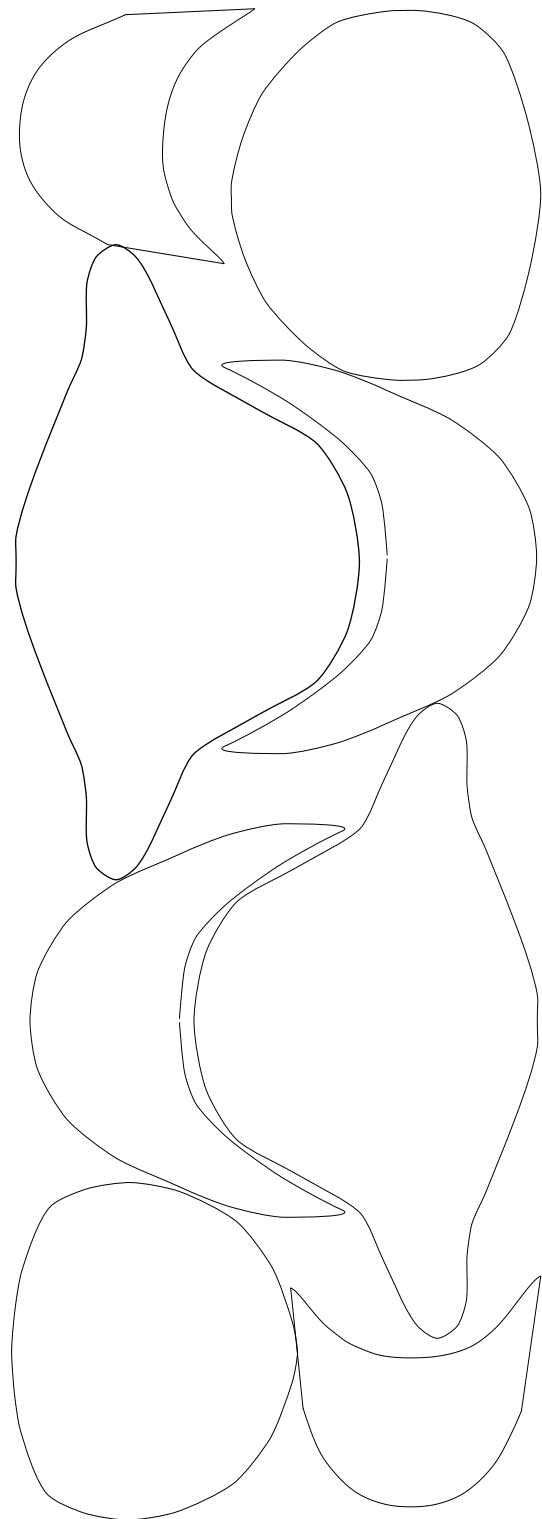
Nordic Easy chair provides their cost prices from their suppliers, which is chosen as cost range A B and C.

Gabriel provided cost prices per meter of fabric for the chair. These fabrics are chosen as a separate price group.

The table on page 184 show how selecting a different fabric has an effect on the costs.

### *Improving textile waste*

At the moment there is a waste of 28%, which is considered high. When the product is closer to the end of the product maturing phase, the exact amount of fabric can be calculated. The positioning of the stencils and placing selected stitching to optimize the fabric choice. This can limit the fabric needed and thus the waste. The cost of the fabric differs greatly in the price categories and this difference is reflected in the cost options for the customer.



### III. 178

The illustration shows the stencils placed on the textile measuring 1400mm x 4000mm.

Scale 1:20

## Foam by Cesco

The foam for the upholstery on the shells are measures using the same patterns from the fabric. The plate sizes that the foam comes in are 2100mm x 2400mm. The costs per foam plate is determined by the density of the foam and the thickness - and it is calculated per plate size:

I.e. 37kg/m<sup>3</sup> plate with a thickness of 10mm costs 75DKK  
37kg/m<sup>3</sup> plate with a thickness of 20mm costs 150DKK

The stencils are used to find the best use of a plate of foam. In the product there are three types of foam:

The shells have a 10mm 38kg/m<sup>3</sup> foam.

The cushions has a 40mm 38kg/m<sup>3</sup> foam.

The seat cushion has an additional layer of 20mm 50kg/m<sup>3</sup> foam.

It is calculated that one plate of foam will be sufficient to cover both shells. Five set of cushions (seat, back and neck) can be placed on a single plate. Twelve 20mm seat cushion layers can be placed on a plate.

The stencils for the foam will need to be re-calculated during the optimizing of the production. The cost of the foam in the table on page 182 shows that it is a small percentage of the actual cost price, which makes only a little difference in the final price.

## Scissor and reclining mechanism

Schultz Seating were contacted to give an estimation on the mechanical components for the scissor mechanism that includes the leg rest and the reclining part. Seeing initial drawings of the system, each side were estimated to have an approximate cost of 200DKK per side. The two gas spring would cost 120DKK each.

As the mechanical elements were tested in the FEM analysis some changes were made to the overall scissor principle. Schultz Seating was again contacted, however due to an international trade fair the design team was unable to obtain a more precise price before the deadline.

Instead Scaniro A/S was asked to estimate a cost of the overall mechanical elements. They estimated that the first copies are made from laser cut steel and a estimated cost of this component is 800DKK.

### ***Ways to improve the cost***

The solution cannot be made from standard components as it is now, however the mechanical construction may be optimized for manufacturing to reduce cost.

## Slides by Häfele

Klee was contacted to receive additional information on a set of slides. The cost was however 160DKK for a single set, which made us contact a larger supplier instead.

Häfele is contacted and different sets of slides are discussed for the use in the neck rest. The criteria are that they are approximately 13mm deep, has a length of maximum 450mm and the extension is a minimum 300mm.

A set of slides that matched the criteria, were found at the cost of 35DKK per set of slides. They have a load bearing weight of 35kg when mounted vertically.

Slide type: Soft-Roller 30 KTS verz. 350mm - 422.25.356

A larger quantity will provide a different price, that could not be established before deadline. In the prototyping phase the exact neck rest system will be tested, to find a solution that works as intended.

## The base

Scaniro A/S gave a estimation of the price on the base of 1000DKK. This cost covers the work force of a man hand-welding the parts. They suggested that the legs of the base were welded to the centre cylinder, and that these welding are hidden behind a cover. It will reduce the price compared to if the welding were removed manually.

AB Components were contacted with the same information to obtain a price for the manufacturing of the base. They suggested the same solution: to hide the welding behind a cape. A rough estimation for the costs were 500DKK if it is produced in China.

### ***Ways to improve the cost***

Detailed information of the base can be sent to manufacturers abroad to obtain a more satisfying price.

Item	Supplier	Details	Units per chair	Cost per chair	Note
Shells	Midform	Seat and back shell	1	380DKK	Calculated by the cost of 1000 chairs
Base	AB Components ApS	Entire base	1	500DKK	Estimated for production in China
Slides	Häfele Denmark A/S	Soft-Roller 30 KTS. 350mm	1	35DKK	Calculated by the cost of 10 units
Scissor mechanism	Schultz Seating A/S	Custom made	1	800DKK	Estimated price
Gas springs	Schultz Seating A/S	Recline and height	2	240DKK	
Textile for shells	Gabriel	Europost	4 metres	1144DKK	Calculated on the coupon rate
Textile for cushions	Gabriel	Europost	2 metres	572DKK	Calculated on the coupon rate
Foam for shell	Cesco	10 mm 37 kg/m3	1 plate	70DKK	Calculated by the cost of 1000 chairs
Foam for cushion	Cesco	40 mm 37 kg/m3	1/5 of a plate	56DKK	Calculated by the cost of 1000 chairs
Additional foam for seat	Cesco	20 mm 50 kg/m3	1/12 of a plate	13DKK	Calculated by the cost of 1000 chairs
Zipper	YKK	4 mm VSC-3* DADHR5	1	15DKK	Calculated by the cost of 1000 chairs
				3825DKK	
Fabric types				Manufacturing cost	Sales price
NEC textile A				2439DKK	9757DKK
NEC textile B				2535DKK	10,141DKK
NEC leather C				2961DKK	11,845DKK
Gabriel Textile Europost				3825DKK	15,301 DKK



### Calculated cost

The table on the right shows the different components and their respective costs if a larger production is set up. This is done to get an understanding of the actual cost price of the product. According to Nordic Easy Chair the cost difference between the manufacturing cost and the cost for the customer is 1:4, which means that the cost should not exceed 2500DKK.

In the tables on the right the cost of the major components are calculated and added up. The overall table shows the maximum cost, using Gabriel textile, where the table further right shows the variation in cost using different textiles.

### Conclusion

The cost price is calculated from the major part of the construction. The Duck Chair needs to be optimized for production, where the relevant sales price is established, which shows the maximum cost of production. Optimizing the chair for production may have an effect on the design of the chair, when Nordic Easy Chair is targeting the correct manufacturing cost.

Changing the fabric from a Gabriel fabric to a Nordic Easy Chair fabric reduced the price significantly. This cost has an effect on the cost for the customer, as they choose their fabric, and by that also the cost.

By finding suppliers for the base (500DKK) and scissor mechanism (800DKK) abroad, these cost of these components can most likely be lowered too.

The following components have not been included in the price:

- Brackets
- Screws
- Kroyer beads pillow for lower back
- Neck rest mountings
- Handles
- Sewing of the upholstery
- Two wire-rope haulage
- Packaging
- Shipping
- Mounting
- Work force
- Collar and leg rest (wadding)

Lowering the cost on the main components will allow for these costs to be included in the 2500DKK cost of manufacturing for the NEC textile A.