industri DESIGN

Beach Chair Inspired Seating Furniture
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Master in Product Development with a specialization
INDUSTRIAL DESIGN
BEACH CHAIR INSPIRED
SEATING FURNITURE
Strandstolsinspirerad sittmöbel

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This degree project is performed at the School of Engineering in Jönköping in the subject field Industrial Design. The project is a result of the master program Industrial Design. The writers are responsible of the result, conclusions and reflections.

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Abstract

This thesis evolves around developing a furniture in collaboration with the well-renowned Swedish furniture producer Källemo AB. The company works with independent designers and artists and strive to make characteristic products. But how do you approach this kind of product design when you’re not limited by a lot of restrictions? Seeing how many people are living in small and compact spaces nowadays, there’s a call for smart furniture that can be adapted to different situations. For this project I decided to make a seating furniture inspired by folding beach chairs – a product with high identity and at the same time have the mechanical solution to be folded together and stored.

The research for the project consisted of investigation of the company Källemo and their values, a study on different foldable beach chairs, and measurements for seating ergonomics. The findings from the research were elaborated and analyzed in order to create a base for further work with ideation.

After sketching, prototyping, modifications, and meetings with the company, the final idea was developed to a full scale prototype in the intended materials and colors.

The result is a foldable easy chair for indoor use inspired by folding beach chairs. It’s a unique yet characteristic design which is based on a way of folding a structure that can serve as a chair.

Keywords:
Seating furniture
Sitting furniture
Folding furniture
Folding chair
Smart furniture
Beach chair
Easy chair
Sammanfattning

Det här projektet har handlat om att utveckla en möbel i samarbete med det svenska möbelföretaget Källemo AB. Företaget arbetar med fristående designers och konstnärer och strävar efter att producera karaktäristiska möbler. Men hur går man tillväga i ett så pass öppet projekt utan många begränsningar? Eftersom många personer bor i små och kompakta boenden idag, finns ett behov av möbler som kan anpassas för olika situationer. I det här projektet bestämde jag mig därför att utveckla en sittmöbel inspirerad av fällbara strandstolar, en klassisk produkt som även har ett praktiskt värde i och med sin hopfällbarhet.

I min studie ingick att undersöka dels företaget Källemo och deras värderingar, dels olika fällbara strandstolar samt riktvärden för mått på sittmöbler. Resultaten från studien analyserades för att från dem kunna gå vidare i projektet.

Efter skissande, modellering, modifieringar och möten med företaget kunde den slutgiltiga idén väljas ut för att tas vidare för att resultera i en fullskalig prototyp.

Resultatet är en fällbar fåtölj för inomhusbruk, inspirerad av strandstolar. Det är en unik och karaktäristisk stol som är baserad på ett specifikt sätt att fälla en stomme som kan fungera som en stol.

Nyckelord:
Sittmöbel
Fällbar möbel
Fällbar stol
Smart möbel
Strandstol
Fåtölj
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1 Introduction

1.1 Background

When scanning through furniture store’s products, one can quickly draw the conclusion that there are many furniture on the market, yet there never seem to be too many. By creating a new armchair for example, the designer’s intention isn’t necessarily to solve a problem. Instead, the new armchair might serve as a source of identification for the customer, and which simply aims to deliver an aesthetic value. But how do you, as a designer, approach this way of designing?

Many people in Sweden are living in small and compact spaces. This calls for smart furniture that can be adapted to different situations. When you have friends or family over, you want extra space to sit on in order to make them feel welcomed. But when they are not there, you maybe want the possibility to put away the furniture for other things or activities. This is an issue that myself have and believe more people have. From this reflection I began thinking about foldable chairs, and later a more specific version of this kind of furniture - the folding beach chair.

1.2 Problem description

The project will be conducted in collaboration with Källemo AB, a well renowned Swedish furniture producer. Källemo produces furniture with a more artistic approach and their products have strong character and identity. This project will therefore have a similar approach where much effort will be put into Källemo’s values and philosophy.

The project evolves around two areas, and these fields will be researched parallel, and later merged together. One of them goes deep into the brand Källemo, their philosophy and values. The second covers the investigation of the folding beach chair and ergonomic features. When these fields have been researched, they will come together in one as a result.

1.3 Purpose and research questions

The purpose with this thesis is to investigate how a furniture can be designed with Källemo’s values, and in this specific case, with inspiration from folding beach chairs. From this execution, my hopes are that people will have a better understanding of the brand Källemo and how they work with product development.

The thesis evolves around one main question;

- How do I design a seating furniture with Källemo’s values, inspired by folding beach chairs?

This main question has been broken down into three individual sub-questions in order to get a clear picture of what have to be investigated;
Introduction

- What are some appropriate measurements for seating furniture that can be adapted to this case?
- How can I implement Källemo’s values when designing this furniture?
- How can critical reflection be integrated as a part of the process in a project with less restrictions?

1.4 Delimitations

This thesis is not to be seen as an investigation on how to develop a seating furniture with optimal ergonomics. Therefore, any user study regarding primarily ergonomic features will not be conducted, instead this part of the research will solely be based on literature studies. The project stretches from the middle of January to June 1st, when a full scale final prototype shall be exposed at the school’s thesis fair. The final prototype will to some extent be made by Källemo and their suppliers.

1.5 Disposition

I have now presented the problem description and purpose of the thesis. In the following chapter I present the theoretical background that this project is based on. In chapter three you can read more about the methods used, and how they connect to the research objectives described in this chapter. After that I go through the implementation and the process of the project. Empirical data that has been collected throughout the research is presented in chapter five, and in chapter six I present the result with a following discussion. Lastly, I list the references used in the project as well as the appendix.
2 Theoretical Background

2.1 The beach chair

The history of the beach chair dates back to 1882. German inventor Wilhelm Bartelmann was approached by a woman who, due to medical issues, was in need of a solution that could let her be at the beach, but not directly on the sand. Wilhelm then came up with the *strandkorb*. However, the *strandkorb* does not look like the beach chairs we usually see today. In 1892, Helen Petrie patented a chair that refers to be used “in camps, on yachts, at beaches and similar places.” and have many similarities with today’s beach chairs by being more open and foldable. [1]

The deck chair, one version of foldable beach chairs and closely related to the one Petrie patented, was a popular chair for being used at ships. Its inventor remains uncertain though. The deck chair has become somewhat of an icon, and its design has not been changed much throughout the many decades it has been around. [2]

Nowadays there are plenty of different kinds and versions of foldable beach chairs. Their frame is mostly made out of aluminum or wood so that their weight can remain low, and therefore convenient to carry. The seat and backrest are often made out of a water-resistant fabric.
2.2 Bootcamp bootleg

Chosen design process for this thesis is the Bootcamp Bootleg. This is a process developed by the d.school, the institute of design at Stanford. Bootcamp Bootleg is a user focused process where much effort is put into immersing with the specific user group. Although this project evolves more around designing something for a company rather than a specific user, the process can still be adapted with a similar approach. I'll now go through the steps of the process, what they consist of and their purpose.

Empathize

The first step in the Bootcamp Bootleg process is called Empathize. The objectives of this phase are to engage with the user by studies like interviews, observations, questionnaires etc. When developing products or services for a specific customer, it is crucial to know what and how they feel when performing acts this new product or service will solve. From making this study you’ll achieve a clear picture of what the customer actually needs. If you asked the customer in the beginning what they needed, they might have answered with a product they wanted. But after conducting a study you might find out that what they need can be solved in a totally different way they first stated, they just didn’t know that themselves.

Define

The data collected from the previous phase has to be elaborated and scrutinized in order to get clarity of the outcomes of the research. The purpose of this step is therefore to create a deep understanding of the needs of the customer and turn those needs into problem statements from your point of view. It is important to not underestimate the importance of your point of view, since it is based on the findings in the empathize phase. This is what will act as a guide towards the goal and make you develop a successful solution.

Ideate

The ideation phase is simply the phase when you, with starting point from your point of view, ideate different solutions. It is important that you don’t limit yourself in this
process, but rather have an open approach by going wide in the diversity and amount of ideas. Ideas can later be taken to prototyping.

**Prototyping**

By prototyping, you take your two dimensional ideas into physical things. The prototypes can actually be made up from anything physical that in some way lets you test the idea. There are different levels of prototypes, depending on how far you have come in your developing process. The purpose of the prototype is to let the team, as well as the user, test solutions and from that learn and come to agreements, or maybe explore disagreements. Another good thing is that you might find problems in an early stage of the process.

**Test**

The final step in the process is when you let the customer test. By testing you get feedback on your solution, which might lead you to make refinements, or in best case a very satisfied customer. You also have great opportunity to learn more about your customer in this phase by observing and getting response. [3]

### 2.3 Design and emotion

Emotional design is what makes you feel something from using or interacting with a product. Emotions play a huge role in our everyday life, and influence our decision making, perception and memory, to mention some. By developing products or services with design and emotion in mind, one can turn users into fans. Don Norman defines is as “making a product or service that delivers in a person the emotions that we [the company] cares about”. [4]

### 2.4 Cognition

Cognition is our ability to process information through perception. Perception works together with all our senses, and through cognition the absorbed information becomes knowledge. There are different cognitive processes, such as learning, memory, language, decision making etc. Cognitive processes occur naturally or artificially, or consciously or unconsciously, and mostly very quick. Imagine you are walking on the sidewalk and approach a crossing, and the stoplight turns red. Then you instantly stop because from memory and previous experiences you know a red light means stop. [5]

### 2.5 Design thinking

Design thinking is a mindset that can be implemented in everyone, in any profession, in order to solve problems. Design is a process, an action, and evolves around coming up with solutions to the problem and discovering new opportunities. [6]
2.6 Gestalt theory

This is a psychology which is based on the theory that the whole is greater than the sum of its components. It works with our cognition and deals with how we connect parts, such as four wheels, a metal body, front and rear lights, and windows, with a whole – a car. This we do because our mind always strives to simplify. [7]

2.7 Källemo AB

Källemo AB was established in the 1940’s by a couple of carpenters. In the 60’s, the company went into a bankruptcy situation. Sven Lundh, a local entrepreneur, took over the company during this period with the aim to save it. It failed, but he decided to keep the company’s name and move it from Vaggeryd, where it was located, to Värnamo where he started producing furniture. Sven is, however, not a designer. He ran the company and decided what to be produced. During the seventies, the company had license to manufacture Hans J Wegner’s, and other Danish designers, work. But towards the eighties, Sven started to break new ground by collaborating with new Swedish, radical architects and designers. Many of these collaborations have lasted multiple decades, and they include Jonas Bohlin, Mats Theselius and John Kandell, to mention some.

In 1992, the company decided to split up their product range in two categories; the regular serial production, and the more special, limited edition range. Most of the production is being made by nearby suppliers, but what is being made in Källemo’s own factory is painting, sewing and upholstery, production of cushions, assembly and quality control. They rarely produce for stocking, most is made to order. Their customers consist of mainly interior and architecture studios, and it was first in the eighties that private customers began buying their products.

Källemo AB is a relatively small company, compared to their main competitors – Gärsnäs AB and Lammhults Möbler AB to mention some. It is a family company with only 17 employees (as of 1998, however this figure is approximately the same). Sven’s children Erik and Karin got involved and took over the company in the end of the nineties since Sven had other projects to deal with, among them the evolution of the art center Vandalorum in Värnamo. [8]

Image 4. Examples of different products from Källemo
2.8 Seating ergonomics

One of the main dimensional parameters of a chair is the height of the seat. This, however, means that you have to know some dimensional aspects of the human body, preferably as close to the end user as possible. Other aspects of great importance regarding comfort, but which I won’t be able to control, are how long the person is sitting, position of the person sitting and body characteristics of the individual. [9]

2.9 Semantics

The notion of semantics evolve around that a part of a products function is to communicate with the user. There are different ways to control the communication, but most important is by the shape, surface and expression. It could also be features like sound and smells, and other stimuli perceived by our senses. The designer should always strive to deliver the features, such as character, identity and function in the product. [10]
3 Method

In this chapter, I'll present the methods and tools that were used throughout the project, and how they are connected to the research questions stated in the first chapter.

3.1 Connection between method and research question

The first research question – “What are some appropriate measurements for seating furniture that can be adapted to this case?” – will be researched through literature study on human ergonomics. What I will look for is figures on heights and angles and will be presented in chapter four.

The second research question – “How can I implement Källemo’s values when designing this furniture?” – will be based on both literature study and an interview. First, I am going to read two books about Sven Lundh and Källemo AB. Later, an interview will be conducted with the current CEO of the company, Sven’s son Erik. What I expect from this meeting is, to some extent, abstract descriptions and information. These will after the interview be elaborated through reflecting-on-action in order to get a more concrete description of the brand Källemo and their values.

Lastly, to answer the third research question – “How can critical reflection be integrated as a part of the process in a project with less restrictions?” – I will conduct a study on how people interact with a range of different kinds of folding beach chairs. The study will evolve around an observation on the steps people go through when using the chair, with a following questionnaire on their thoughts about different aspects of the product. This data will later have great impact on what elements to bring into the ideation phase. Later, I will also conduct a product analysis in regard to materials and mechanics. Reflecting-in/on-action will also continuously be present throughout the process as a part of critical reflection.

3.2 Methods used

3.2.1 Literature study

A way of gaining knowledge by studying literature. It involves identifying, locating and analyzing literature such as articles, research reports, books, theses etc. Important is to keep a critical mindset towards the literature and compare it to other sources of information collection. [11]

3.2.2 Interview

Interviewing is a feasible method for collecting qualitative data (unmeasurable data). There are different types of interviews; structured – a set of fixed questions that must not be deviated. Often used when you want to be able to compare results. Unstructured – a
more exploratory approached interview with following up questions on answers. A useful method for achieving understanding. [11]

3.2.3 Observation

A useful way to get understanding of behavior is to conduct an observation study. It basically consists of observing what people do in a specific situation. There are four different kinds of observation studies. In this project I’ll conduct an Ad libitum observation which is most suitable when the topic is new to the researcher. [11]

3.2.4 Questionnaire

Questionnaire is one of the most common research instruments and deals with collection of, mainly, quantitative data (easily measurable). Open ended questions can also be used in order to gain qualitative data. It is a relatively effective and easy method. Questions can be divided into different categories such as Factual, closed respectively open, and opinion questions. [11]

3.2.5 Product analysis

Product analysis is the act of examining different features of a product. The analysis enables us to better understand why a product is designed like it is, and might focus on different aspects such as choice of materials, economics, production etc. [12]

3.2.6 Reverse engineering

Reversed engineering can be applied in order to learn how a product works. The method aims mainly at the products functions, and how different parts collaborate with others. It is a well-used method among engineers since it is a way of learning by what has already been made, instead of spending resources on something that has already been solved. [13]

3.2.7 Mood board

A mood board is a tool that collects inspirational elements. It may consist of materials, colors, structures, environments etc. The goal with the mood boards is to make sure you have a clear picture of what the client wants, or if you simply want to share the “atmosphere” with other team members. [14]

3.2.8 Reflection-in-action

Reflection-in-action is a wide practice method which author Donald Schön presents in “The Reflective Practitioner – How Professionals Think in Action” (1983). In order to describe it, I’ll first give you a brief background to it. Professional projects have different character. There are the ones that are based on rigorous research-based theory and technique, on the other hand, there are the vaguer practices where technical solutions can’t be applied in the
same way. Interestingly, it is the latter that often deals with issues closest related to human concerns. It has turned into a dilemma of rigor or relevance, and how to make use of scientific knowledge by applying it in unique projects with different characters.

Before I get down to Reflection-in-action, I will also present Knowing-in-action. We humans know more than we think we know. Much of that is tacit-knowing, the kind of knowing we can’t really explain, but we just know it. Knowing-in-action is what we know when we are doing the specific action, but outside of the action, we can’t describe what it is we do or how we do it.

Reflection-in-action is the practice of thinking about doing something while doing it. An example of this is when a baseball pitcher explains how to “finding the groove”:
“Finding your groove has to do with studying those winning habits and trying to repeat them every time you perform.” (Jonathan Evan Maslow, “Grooving on a Baseball Afternoon,” in Mainliner May 1981) The pitcher is here reflecting on what it is that makes him find the groove. Indeed, there’s reflection-in-action, as well as reflection-on-action, which takes place after the action. Another example is a skillful teacher who sees a pupil struggling with his reading. The teacher sees the issue as a defect of his own instructions, rather than the pupil himself. There and then the teacher has to investigate how to solve the problem, and since this case is most probably unique, the teacher can’t apply the exact same explanations as previous times, and therefore has to reflect-in-action in order to invent new methods. When someone reflects in action, he or she becomes a researcher in the field. The reflections create a new theory base of the specific case. [15]

3.2.9 Function analysis

When designing a new product, it’s important to have a clear idea of the main purpose of the product. By phrasing functions in the wrong way, you risk limiting the ideas and solutions. The function analysis is a tool that can be used to create a base of the functions of a product. Functions can be divided in different levels; main function, sub-function, and support functions. The main function should be stated as wide as possible in order to not limiting the project. Functions that supports the main function, those that are necessary for the main function to be fulfilled, are called sub-functions. Then there are support functions that are not necessary for the main function to be fulfilled, but still adds value. [10]

3.2.10 Ideation

The ideation phase is simply the phase when you, with starting point from your point of view, ideate different solutions. It is important that you do not limit yourself in this process, but rather have an open approach by going wide in the diversity and amount of ideas. Ideas can later be taken to prototyping. [3]
3.2.11 **Morphology analysis**

A way to develop a great range of solutions when dealing with a design that includes different factors is to make a morphology analysis. The method consists of three steps, where you in the first step break down the functions, or factors, in the design. In the second step you list possible solutions to each of the factors. And in the last step you combine all individual solutions into different concepts. It’s crucial that the designer has great knowledge and creativity since the individual solution created a basis for the outcomes. [13]

3.2.12 **Prototyping**

By prototyping, you can test and evaluate ideas without spending too much time and resources. Prototyping can be done anytime during the developing process, since a prototype can be made up from any available material. It might be anything from trying an angle of a handle made up from two pencils, to a prototype that is supposed to resemble the final design. It is always a good idea to test ideas physically, and especially let others test. May it be the client testing for gaining better understanding of their wishes, or convincing your team members? [3]

3.2.13 **3D modelling**

This is a process of creating computerized three-dimensional shapes. It is one among different tools which goes under the category Computer-Aided Design (CAD). The introduction of CAD tools has revolutionized the way designers and engineers work, especially when it comes to efficiency. 3D modeling may be used for different purposes such as visualizing, making engineering calculations or production drawings. [16]

3.2.14 **Testing**

The final step in the process is when you let the customer test. By testing you get feedback on your solution, which might lead you to make refinements, or in best case a very satisfied customer. You also have great opportunity to learn more about your customer in this phase by observing and getting response.
4 Implementation

In this chapter I’ll describe how the methods described in 3.2 were implemented and conducted in this project. I have split up the methods according to the design process I followed, Bootcamp Bootleg. For results from the research methods I refer to chapter 5 Findings and analysis.

4.1 Empathize

4.1.1 Literature study

The literature study on Källemo was made in order to create a base for answering the research question “How can I implement Källemo’s values when designing this furniture?”. Books studied in this part were “Personakt Sven Lundh” (S. Nordgren, G. Lindqvist, C. Robach, J. Bohlin, G. Lindahl, J. Kandell, M. Theselius, I. Sommar, R. Hanson, P.I. Björlo, R. Tarschys, B. Nörgaard, 2007), and “Sven Duchamp – expert på auraproduktion” (I. Björkman, 1998), both provided by Källemo. The former consists of informal, yet useful stories and anecdotes about Sven and the brand Källemo told by close friends and co-workers. The latter is a thesis conducted by Ivar Björkman where he investigates Källemo’s ideology, and how to successfully operate and make an economical profit with a company that deals with artistic approached products. The books were read and marked where useful information could be extracted. The literature study also came to be the foundation for the interview that was later conducted with Källemo’s CEO Erik Lundh by referring questions to information gathered from the books.

Other literature studies were made on ergonomic features that could be applied into the project, and in order to answer the first research question “What are some appropriate measurements for seating furniture that can be adapted to this case?”. These studies were based on “Sittmöblers Mått” (E. Berglund, 1988), “Furniture Design” (J. Swardzewski, 2015), and “Seating Furniture for Public Interior” (V. Kameníková). Lastly, “The Reflective Practitioner” (D. Schön, 1983) was studied in order to learn more about the method of reflection-in-action, and how it could be applied into this project as a way of critical reflection, which refers to the third research question “How can critical reflection be integrated as a part of the process in a project with less restrictions?”.

4.1.2 Interview

A complimentary interview was conducted with Källemo’s CEO, Erik Lundh, at their head quarter in Värnamo (see attachment 1). The interview had an unstructured nature and was conducted after the books about Källemo had been read, so that the questions could be focusing on extracting information I could not gather from the books. By conducting an unstructured interview, I could more easily reach information that I maybe not thought of but would appear to have significant relevance for this project.
4.1.3 Observation

A user study was conducted on four different foldable beach chairs in order to increase the validity of critical reflection in the project. The study evolved partly around an observation of how users interacted with the different chairs one by one. This part consisted of going through the process one normally does when using the foldable beach chairs; carrying, folding up, seating and rising, and folding together.

The participants were asked to pick up the chair and carry it approximately ten meters. They were then supposed to fold up the chair without any previous experience, and then take a seat. Up until this stage the participants had interacted with the chair only by touching/holding and looking. When they took a seat, I could clearly see their opinions on the comfort of the chair. After a minute or so, they should raise, fold the chair together and carry it back to the starting point. By observing the users going through these steps, I could note the user’s body language and feelings while interacting with the different chairs, which they themselves might not be aware of.

4.1.4 Questionnaire

In the same user study, a complimentary questionnaire (see attachment 2) was conducted after the process to collect the participant’s concrete opinions about the different chairs. Features measured in the questionnaire was portability, ease of set up, comfort, and overall design. These features were evaluated in a range between poor and excellent. The reason for choosing these particular features was because they effectively summarize the all-over quality of each chair, but at the same time provide data on which chair was best at the different features. Other than evaluating the chairs performance according to the aspects, I also noted gender and length of each participant, which could be significant in case of deviating results.
4.1.5 Product analysis

A product analysis was conducted on the same four chairs used in the user study. Measured features of the chairs were price, measurements, weight, materials, design and mechanics. The reason for this analysis was to get a concrete comparison of the different chairs used in the user study and should be seen as a complimentary analysis to the outcome of that study. For example; a higher score in the user study might derive from a higher quality product which might be revealed by the price of that specific chair. The information that was gathered about the products was extracted partly from the product description on the internet, and partly from own analysis of the physical products, and compiled in a document (see chapter 5.3.1 Product analysis).

4.1.6 Reverse engineering

Reverse engineering analysis was made on one of the chairs used in the user study. The analysis consisted of breaking down the chair into its constitutional parts and analyze them in terms of quantity, shape and tolerances.

Image 6. Disassembling of the Brafab beach chair

4.2 Define

4.2.1 Mood board

After having collected the necessary information and data about Kållemo’s values from the literature study and interview, two mood boards were made; one that expresses the feeling and mood of the beach, and one that more describes what I aimed for in my result. What I aimed for expressing in the formed mood board was a feeling of The Beach Boys and their aura, set in the 60’s southern California. The latter presented a feeling of
the space I could see the result in, and also concrete inspiration from other furniture designers. Rather a Scandinavian environment with little connection to the beach chairs for an interesting interior contrast. The boards consisted of pictures gathered from internet and can be reviewed in attachment 3.

4.2.2 Reflection-in-action

Because what Källemo values might be considered ambiguous I wanted to better concretize the gathered information. When doing the study on Källemo, both the literature study and interview, the extracted information was elaborated with reflection-on-action in order to achieve a clearer picture of what was being stated. The original statements and my personal reflections can be reviewed in chapter 4.2 Källemo’s values. Reflection-in-action was also integrated when analyzing the folding beach chairs in order to generalize them, which would be necessary in order to develop concepts. The method was mainly used when conducting reversed engineering since it gave me an opportunity to reflect on the constitutional parts, how and why they are connected etc. The method was also used as a way of analyzing the product analysis for concretize the folding beach chairs. What do they have in common, what pattern can be revealed among the chairs, among other characteristics. These findings, and my own personal generalization of the folding beach chair can be reviewed in chapter 5.3.1.6 Generalizing the foldable beach chair.

4.2.3 Function analysis

A function analysis was made as a part of defining what was going to be solved. Although the project was relatively open and unrestricted, there were still some functions that had to be considered. The function analysis was however made up by myself without consultation from Källemo and can be reviewed in attachment 4.

4.3 Ideation

I will now take you through my ideation and developing process and briefly motivate my decisions. For a more detailed explanation of the reasons for choices of shape, material and colors of the final chair, I refer to chapter 6. Result.

4.3.1 Ideation and development

The implementation of the ideation process started early in the project and ended late. It’s a stage that stretched from the first initiation of an idea to the last change to the design. My process of coming up with ideas in this project differed slightly from previous project’s ideation phases. In order to come up with a chair idea, I needed some kind of initiation. This initiation could be either an idea of a folding mechanism, a specific constellation of materials, or just a small detail. When I had the initiation, the rest of the chair somehow came along by itself. The reason why I had this approach is because these features are what I value the most in a case like this, or in other words; my personal way of designing.
4.3.1.1 The first ideas

Although I began thinking of ideas as soon as the project started, the official start of the ideation phase was set to after the research was completed. When I started ideating, I sat by my desk looking at my mood board with paper and a pencil and sketched down everything that came up in my mind, either if it was a folding mechanism, a material combination or a detail. The first phase of the ideation resulted in eleven rough and very different chair ideas.

Image 7. Compilation of initial sketches

Ideas number one, seven and ten came up from an idea of how to fold a structure that could serve as a seat. They are based on traditional, simple beach chair’s structures, but modified in an interesting way. The second idea is simply an idea where I implemented the classic red and white striped beach chair fabric seat combined it with a subtle black structure. In idea three and eleven I looked into other things that are closely connected to beach chairs – parasols and inflatable toys. Idea four came up because I wanted to implement rattan, an organic material which I think has much visual connection to the beach. The fifth and eight idea came up from reflections on the compromise between seating ergonomics and the chair’s balance which is common among beach chairs. Idea number six is a version of idea number two, but where I implemented a more sophisticated padded leather seat. The ninth idea is my interpretation of on the tested beach chairs, two primitive, individual pieces that slides into each other and make up a seat. However, out of these eleven ideas, three were discarded quite quickly.

The idea sketches were pinned to a wall and new, a little bit more refined sketches were made (Image 8) that could be presented to Källemo and serve as a base for decision.
Image 8. The final idea sketches that were presented to Källemo
To better describe some of the ideas, I made simple two dimensional prototypes that showed how the folding mechanism worked and would be presented together with the sketches (Image 8). From the meeting with the company, we decided to continue with idea one, five and eight (further referred to as concept one, two and three).

4.3.1.2 Concept 1

The first concept came up from an idea of a way of folding up and down a structure which could serve as a chair. It’s based on a conventional X-shaped folding mechanism, but in an interesting way modified. Instead of folding around one rotation axis where the two parts cross each other, the two parts are connected to one rotation axis each in a separate, horizontal beam in the bottom of the chair. In one of the parts there’s a specific shape, like a stop (Image 11), and in combination with a cross beam in the other part you get a structure which can stand up by itself. It’s a relatively primitive structure, yet rough and architecture influenced. Due to the shapes, I considered wood for its structure.
As seat I wanted to have something more beach chair inspired, to enhance the connection to that kind of chair. I gave it a single piece of cloth that would be attached to the seat structure and connected it to a cross beam in the upper part of the chair, by the head. Since it’s not so nice to lay your head against a cross beam, I added a large cylindrical shaped headrest around the beam.

4.3.1.3 Concept 2

The second concept started from a reflection on a common flaw among some beach chairs. In many cases they are made from two flat structures that are connected to each other in one crossing point, like a cross (image 23). Due to seating position, the structure, which also serves as legs, is very off regarding balance. So, by elaborating the shape of the legs and feet of the structure I achieved a more sophisticated version of this kind of chair.
The design left an open space behind the seat, which I thought could be used to add value in some way. Something that doesn’t require much space, and is closely related to sitting down relaxing, is storing of a few books or magazines. In a convenient way I could design a shape of a stand that was attached between the two sides of the chair, without affecting the function of the chair. I saw this structure as being made out of steel pipes and upholstered with a leather seat and backrest. However, this design wasn’t as visually connected to the beach chair as I strived for. So, by adding a distinct structural element of the beach chair with the purpose of fixing and holding the chair upright to the design, I achieved more character and uniqueness. In a way, this design departed from being only a seating furniture, and more a multi-purpose furniture. Therefore, I added ball wheels to the rear legs, to enhance the feeling of it being something else than just a seating furniture.
4.3.1.4 Concept 3

The third concept evolved around the same reflection as concept 2. By working with only two flat structures that serves as both seating position and legs of the chair, it’s hard to find angles of the elements that satisfies both great seating position and a balanced base of the chair. What I did with this concept was to start out from the same princip but added two elements; a seat and a backrest with different inclination than the major elements of the structure.
At the same time, I wanted to make the two major elements identical, instead of just almost identical. Like in concept 2, this concept departed too much from the beach chair character, so in this concept I added the same element that fixes and holds the chair upright. I chose to work with a steel pipe structure for this chair, but I had a harder time landing on what material for the seat and backrest to apply.

4.3.1.5  **Morphology analysis**

At this moment, I conducted a morphology analysis regarding colors and materials. The reason why I made this analysis is because I quickly wanted to get an idea of how the chair could look in different color combinations. It was made by putting multiple hand sketched templates of each chair on A3 sheets, then simply rendered with marker pens to represent color and material combinations. Although a vast amount of possible solutions could be made in this analysis, I had limited the choices of each factor to those I imagined to be the most appropriate. The reason to this was because changes in color and material affects the overall character of the item, and the feeling and expression it delivers. Therefore, I only wanted materials and colors of each factor that worked well with the expression I sought after.
Image 18. Morphology of concept one

Image 19. Morphology of concept two
What I continued with for the first concept was a combination that I believe is somewhat odd and unconventional. I consider this to be closely related to long-lasting validity, that you do the unexpected and not what the big mass would have done. I gave the concept black major shapes, in combination with a distinct, black leather headrest. The skids (the bottom beams), which might be considered as a heavy element in this context, got a natural wood finish to take away some visual weight of it, yet separated from the other shapes. I wanted to visually separate the skids from the rest of the structure because I saw them as the core of the chair, and therefore don’t let them blend in with the rest. Inspired by my grandparent’s coffee table, I decided to shape the skids with a big radius in their upper corners.
For the second concept, I chose to continue with a chrome finished steel pipe frame, natural colored seat and backrest, and a dark grey PET-felt stand for magazines. I had a harder time landing on what material combination to continue with for the third concept. However, from the morphology analysis I decided to continue with a chrome finished steel pipe structure with a dark brown leather seat and backrest.
The three concept sketches (Image 21, 22 and 23) would be presented to the company in which one final concept should be picked. For this meeting I decided to make a new set of prototypes to roughly describe how the chairs would look and fold. These mockups were made out of Kapa board, a flexible yet relatively sturdy material, in scale 1:5.

After having discussed the three concepts with Källemo, we decided to continue with concept number one. At this stage, a full-scale prototype was made to get a better feeling for size and proportions. Through a 3D modeling program, and with help of a 1:10 scale profile sketch (Image 25), I could create full scale templates of the constitutional parts.
decided to make the prototype in plywood since it’s easy to work with and resembles the final material well enough. Making the plywood prototype was a crucial step in the process since it made me aware of proportions I earlier hadn’t considered.
By observing the full scale prototype I could note things I wanted to change. Changes were mainly a matter of proportions regarding visuals, but also stability of the chair. From these notes, I made a new 1:10 profile sketch which I instantly found more appealing to the eye.
The work continued by making a computer model of the chair, based on the new profile sketch. Software used in this project for modelling the parts was SolidWorks, and Autodesk Alias for making the more organic and undefined seat. Since the sketch, which was used as an underlay for making the computer model was not totally defined, I played around with the dimensions of the constitutional parts until I was satisfied. I contacted Källemo’s carpentry supplier, Strömslund, for a few questions and later sent drawings and the files of the computer model to them for producing the wooden parts.
Later, when looking up what particular stain color to use for the major arms, I found a red stain color. Somehow the idea of having a powerful color on the wooden shapes had passed me by until now. By this time, I had made a computer model of the chair, so the red color could instantly be applied to the digital model. The red color enhanced the character to the whole chair, and it delivered more of the fun and less serious attitude the beach chairs mostly have. After having discussed the choice of color with companions, I decided red was the way to go. However, it had to be a specific red color. First, the one and only standard red stain color from Herdins was tested on a proper piece of ash, since this is the material the final prototype will be made of and the stain may vary depending on what sort of wood it’s applied on. The color was very bright and intense, and not what I imagined nor wished for.

Due to personal taste and influences throughout the project, I wanted a more dull color which goes toward rust and coral red. To achieve this tone, I’d have to mix my own color. This was done by purchasing three different stain colors from Herdins which I simply imagined mixed together, in one ratio or another, would end up in a proper red color. Colors bought was Red, ‘Brunocker’ and ‘Mahogny’. I came up with nine different combinations of these colors that I imagined could be prospect colors. Each color trial was carefully marked with which amount of each color it contained.
Implementation

Image 32. Mixing different color samples

Image 33. Color samples, pine wood to the left and ash wood to the right

Image 34. Color samples in proper light
From these samples I picked sample number 1, a combination of 50% Brunocker and 50% Mahogny, which was very close to what I had imagined.

Regarding the fabric to use for the seat I always imagined it as natural and light colored with much structure, so that more focus would be put on the way it was attached instead of the color or pattern on the fabric itself. I picked one among all the fabric samples they have at Källemo, with careful consideration taken to the black leather headrest and the red stained wooden shapes.

The construction of the rotation axes was based on a discussion with Källemo. They suggested an 8-millimeter-thick threaded steel rod, and distances between the wooden arms made by steel pipes and washers. To hold the axes on place, dome nuts would be screwed to the ends of the rod, which was imagined from the beginning as a part of the design. These parts were provided by Källemo’s steel component supplier, Carlsson’s Smide & Järn.
Later, the wooden parts were finished and brought to Källemo for assembling. The prototype was going to be made mainly by me in Källemo’s own workshop, but with expertise help from them when needed.
4.4 Testing

The testing consists of two areas; comfort and visual expression. Since there are many factors which the comfort depends on, it’s impossible to make a valid evaluation of the comfort before I have a proper prototype which is close enough to a final product. This phase is also a crucial step when Källemo develop products, to actually make a prototype for testing, both regarding comfort and visual expression. Not only do they evaluate the products themselves, but by exhibit new prospect products at fairs, they can get public opinions on them as well.

By producing a final prototype, I’ll have a model which can be properly evaluated. The first evaluation will take place when the prototype is finished at Källemo. Later, the chair will be exhibited at the school’s thesis project fair, where I’ll take part of public opinions as well. At Källemo’s headquarter in Värnamo, they have a combined exhibition, office and workshop. In the exhibition hall they put everything from unique pieces of art to their best-selling armchairs. The exhibition hall is open for the public, so in other words it’s an on-going exhibition for further evaluation. The goal with the testing is to decide whether it should go to production, if some changes have to be made, or if it shall remain at a prototype level for the moment.
5 Findings and analysis

In this chapter I’m going to present the findings from my research. I have divided the results into three fields; ergonomic features, Källemo’s values and studies on beach chairs.

5.1 Ergonomic features

5.1.1 Ergonomic features

When developing a seating furniture for relaxing, there are two important conditions to consider;

- the persons weight should be adequately distributed between the seat and the backrest of the chair
- the person is using least amount of muscle tension in order to keep an up straight position

When speaking about seating for relaxation, the height of the seat should be around 3-5 cm less than the distance between the knee bend and the floor, which means that the edge of the seat won’t put pressure on the thigh and affect the blood circulation. A seat height that is too low require the user to contract which has a negative effect on the internal organs. [9]

From a study on optimal seating dimensions conducted with a selection group of 182 men and 193 women, following statistics were compiled:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Formal furniture</th>
<th>Resting furniture - low backrest</th>
<th>Resting furniture - high backrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of the front edge of the seat</td>
<td>min 420</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat width</td>
<td>min 380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of the center of lumbar backrest from seat surface</td>
<td>230–260</td>
<td>min 450</td>
<td>min 790</td>
</tr>
<tr>
<td>Backrest Height</td>
<td>min. 450</td>
<td>min. 510</td>
<td>max 220</td>
</tr>
<tr>
<td>Height of Armrests</td>
<td>max 220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat depth</td>
<td>min 450</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angle of tilt of seat surface</td>
<td>5–10°</td>
<td>5–10 (15)°</td>
<td></td>
</tr>
<tr>
<td>Angle of backrest of seat surface</td>
<td>max 95°</td>
<td>95–105°</td>
<td>95–105(110)°</td>
</tr>
<tr>
<td>Seat width for one person – armchair</td>
<td>min 530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat width for one person – sofas</td>
<td>min 560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner distance between armrests</td>
<td>min 620</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chart 1 compiling optimal seating dimensions [17]

Other information extracted from the Swedish Furniture Institution Report 50 ([18]) shows following data:
Figures shown in chart 2 are benchmarks for relaxing seating furniture in general and should not be considered as fixed. Different features affect these figures which I’ll present further down.

The report presents data that matches well with the previous collected data, shown in this chapter. Seating height ranges between 39-42 cm, depending on purpose of the chair and other features of the chair, mainly the angles of the seat and backrest. From a study they found that optimal seat height was, on average, 3,8 cm below the user’s knee bend. However, it should be mentioned that the preferred measurement varied among the participants. Regarding the seat’s depth, around 47 cm is optimal, and the width of the seat can be within a range from 45-52 cm. [18]
Features of great importance are the inclinations of the seat and the backrest, and the angle between them. These features should also be considered in relation to the height of the seat. Great variations of optimal angles have been found through different studies, but the angle between the seat and the backrest remains relatively constant, 103-110°. If the backrest angles more than 30°, the seat should have an inclination of at least 15° in order to not slide down. [18]

5.1.2 Analysis of findings

Even though this thesis is not to be seen as a study on creating the optimal ergonomic furniture, a study on ergonomic features had to be conducted in order to have something to refer the decisions of measurements to. The latter findings were taken from the furniture institutions own study. This source might be considered misplaced in this particular thesis because this institution is what Sven Lundh opposed with Källemo. I took this source with careful consideration, but they provided basic measurements and features that could be applied in any project that includes interaction with the human body. However, I made sure to not go too deep into this source since I figured that could mislead me and unnecessarily put too many ergonomic restrictions to this project. When it comes to studies on ergonomics, it is important to consider the participants the studies were conducted on. The results obviously depend heavily on the participants and their characteristics; a study on taller people will end up with different results from a study made on shorter people. From my findings I found that all measurements are within a range, minimum or maximum. When it comes down to relatively small ranges, it’s a matter of individuality and own preferences and therefore hard to say one specific measurement is better than the other.

5.2 Källemo’s values

This chapter will go through the underlying values in Källemo’s brand that were collected thorough literature studies and an interview with the company’s CEO Erik Lundh. Since this data deals with much qualitative information that is hard to measure, I’ve applied reflection-on-action in order to get a clearer picture of what is being extracted. A greater explanation of the brand Källemo and their operation can be studied in chapter 2.7 Källemo AB.

5.2.1 The Furniture Institution

In order to describe Källemo’s values, one have to know some things about what was going on in the furniture business in Sweden in the end of the sixties. By this time, and during the past couple of decades, the functionalism was flourishing. Socialistic representatives wanted to create functional, affordable furniture for the big mass. There raised a need to make thorough investigations on living circumstances and how to optimize furniture. From this need, Möbelinstitutet (The Furniture Institution) was established in 1967. The institution made agreements with doctors, technicians,
ergonomic and material specialists with the purpose of conducting these studies on living situations in Sweden.

The Furniture Institution’s investigation led to new ways of looking at furniture. Previously, furniture was designed by the free artists and designers with aesthetic features. In the end of the sixties, aesthetics was considered as excessive cosmetics. Furniture should be simple and cheap, and rather than being seen as something that will last, it was considered as a product to consume. The role of the designer was radically changed during this time. He was now limited by working under restrictions that would satisfy the consumer as well as the producer. It was these new ideologies that Sven Lundh reacted on. [8]

5.2.2 Sven Lundh

When Sven took over Källemo in 1971, he had already been involved in the furniture business in different ways. He had been working with sales and marketing with the local furniture designers Bruno Mathsson and Yngve Ekström, he had also gotten to know some Danish designers. Before that period in his life, he worked in a clothing store in Värnamo and even tried out his own artistic abilities, which he eventually found out to be limited. However, the aesthetic and artistic approach was clearly important to him. As the Furniture Institution forced producers to develop simple, functional furniture, Sven felt an urge to oppose with furniture designed by artists and designers, free from restrictions. While the Furniture Institution talked about quality in terms of strength in joints and ergonomic features, Sven was more interested in visual quality, something that came to incuse Källemo AB’s ideology. Källemo was going to be the artist’s source out to the market. [8]
5.2.3 Visual quality

“It shall stand the wear of the eye”, as Sven used to say about the furniture he produced. This quote resembles Källemo’s idea of visual quality very well. Sven said that there are three key aspects that have to be present in order for something to deliver the visual quality he strived for; interesting, meaningful and expression. These aspects are made up by features and characteristics in the product. However, these words are based on subjectivity and may be considered ambiguous. Further he explained that there is a sort of measurement that can be applied, which he refers to as generality, that a table clearly is a table and a chair clearly is a chair etc. The features and characteristics, in combination with generality, makes up the visual quality Källemo works around. [8]

Own reflections: When I elaborate the words interesting, meaningful and expression and try to concretize them, I interpret them as the factors that makes up what the artist or designer delivers in the product. I think of the word interesting as the factor that makes you want to approach the furniture to give it a closer look. It might be details, or that the observer wants to explore other views and perspectives. Also, I see the word as the furniture is open for interpretation. Different observers may have different visual experiences of the observation which can lead to interesting discussions. At the same time can similar experiences also lead to fruitful conversations. Meaningful is to me the aspect that delivers value and joy to the individual observer. Also, it contributes to the newsworthiness, that the furniture fills an emptiness both regarding visuals as well as feelings it delivers. Lastly, expression is to me the solitaire aura the furniture has. It is powerful, independent and catch attention from a distance, or in a setting with other items.

It’s important to note that there are different ways to approach these aspects, which derives from the artist’s inner, personal and subjective way of designing. The personal way of designing is however nothing you choose or change between projects, it has grown along as you grew as a designer. It’s also a part of the designer’s identification and what distinguishes him or her from the others. Without this personal approach, there wouldn’t be any diversity among furniture. I believe furniture is the product range in which the individual designer’s personal preferences are best expressed. The clearly subjective approach is also the biggest factor that distinguishes these products from the more formal industrial design objects.

Image 42. Källemo’s head quarter
Sven said he knew what value art had to people, and that some items last and are appreciated throughout the years more than other. What makes these items last is something else than technical quality, it’s about the item’s visual quality. [8] This sort of quality means long-lasting validity. [19]

**Own reflections:** Visual quality is something that is being experienced when observing the item, so in one sense the quality is moved from the product itself, to when the furniture is being exposed to an observer. The notion of quality is moved from technical factors, to being experienced as in the artistic world. However, that doesn’t necessarily mean the item has low technical quality. The interesting part is that Källemo deals with, to some extent, technical products and put them in an artistic context. I think most of us can relate to items we have collected, those that we have grown tired of throughout the years, but also those that we never seem to get tired of. The latter category of items has the features and characteristics that were mentioned earlier, which builds upon interesting, meaningful and expressive aspects.

From my own personal experience of observing some of Källemo’s items, I’ve found a common theory among many of the products which I think holds visual quality. The generalizing theory evolves around how long-lasting validity is related to the relation between time and how much one appreciates the item. Something you see for the first time and instantly find very appealing will, according to my theory, not be so visually sustainable. On the contrary, items that are harder to appreciate at first sight have some aspects which makes them visually sustainable. Similar connections, and maybe even more clear, can be made to other fields of art such as movies or music. A song you hear and instantly enjoy, might have lost much of its qualities after a month of listening, while other songs have some features that makes them last a lifetime. Or when you listen to a new music album, the most long-lasting songs are the ones that does not get stuck on your mind after the first rounds of listenings.
Källemo is not interested in trends, which might be revealed from their ideology of long-lasting validity. The latest trends will always be succeeded by other trends in the upcoming catalogue. They strive to collaborate with artists and designers who have the same standpoint and understands Källemo’s idea of quality. [19] In an interview with Källemo’s CEO Erik Lundh, Sven’s son, I asked if there is a certain “Källemo-style”. He responded that some customers say there is, and that it is something that has grown along the way. Regarding this, I also asked whether they try to keep a red thread throughout their product range. Indeed, they do, the reasoning comes back to a product’s expression, and how that aspect has come to distinguish their products from the rest.

Speaking more concrete about choice of materials in the furniture, he says they don’t have any distinct limitations. Leather, steel and wood constitutes a great share of the range, but you’ll also find more uncommon materials. One chair is finished with gold leaf and another chair with an iron core completely covered with rubber has made a great success. He continues by saying they are open to innovation regarding materials and production methods. It’s not like there’s a deficit of furniture in the world, so by being innovative it’s easier to stand out, he argues.

**Own reflections:** As Erik said, the red thread is mainly about that the individual items delivers great expression, which connects back to the visual quality. What separates Källemo’s furniture from many of their competitors, more concrete, is their extent of boldness and unconventional designs. These factors go hand in hand with visual quality. By being a bit bold and unconventional, the products can hold the interesting, meaningful and expressive factors. But at the same time there must be a delicate line between a product possessing the visual quality and being “too much”. When looking through Källemo’s product range, you find a variety of different styles and expressions. Because they work with independent artists and designers, they don’t risk narrowing their range of variety but instead keeping up delivering long-lasting furniture with expression and visual quality.

### 5.2.4 Analysis of Källemo’s values

What Källemo’s business evolves around might seem dull and ambiguous. How can one say something is good if it can’t be measured and proven to be good, some might argue? It’s a valid question, but at the same time what initiated Källemo, to get away from evaluating quality in the way the Furniture Institution did. Instead, what matters is the visual quality. I think we can all agree on that the appearance of a product has great influence on the decision base when we are shopping furniture, for example. Whether we enjoy the appearance or not depends on what we experience from the product’s expression. Further I believe aesthetical factors often have the last saying, and aesthetical factors generally plays a big role in most of our lives. The conclusion is that it is easy to advocate the importance of visual quality, because of course we want to continue experiencing the emotions when we are exposed to the item.

There’s a great portion of subjectivity in this field however, as earlier argued. Even though Sven said there’s a sort of measurement he applied, generality, it’s hard to get away from the fact that he decided what to be produced (now it’s his son Erik and daughter Karin instead) and I therefore believe much was based on what Sven himself found interesting.
and decided to produce. It should be added that there’s nothing wrong with that however, that’s the case in all companies.

5.3 Studies on folding beach chairs

5.3.1 Product analysis

For the study, I picked four different versions of foldable beach chairs to better be able to judge good and bad elements of the individual chairs. First, I collected information about each chair that I found to be valuable for analyzing, these compilations can be studied in the following parts. Later I made a closer examination of one of the chairs to investigate the individual components that the chair is made up from. The four chairs were also used in a user study which can be reviewed in chapter 4.3.2 User study.

5.3.1.1 Biltema beach chair

Price:
149 SEK

Materials:
22mm steel pipe frame, polyester seat and backrest including padding

Design:
Two U-shaped steel pipe frames which forms an X when folded out. The unified seat and backrest is lightly padded.

Measurements:
Seat height 30 cm, seat depth approximately 40 cm, seat width 40 cm, height of backrest approximately 55 cm

When folded together: 99 x 47 x 10 cm

Weight:
2,9 kg

Mechanics:
Rotatable pivot in the back of the seat, where the two frames cross. A rail connected between the legs controls the angle of set up and stops legs in right position.

Pros:
Simple set up

Cons:
Relatively big, even when folded together
5.3.1.2 Wooden beach chair

Price:
200 SEK

Materials:
Pine

Design:
Two separate, similar parts, one seat and one backrest. The seat part is stuck in between a slot in the backrest part, and the chair is up.

Measurements:
seat height 28 cm, seat depth approximately 26 cm, seat width 25 cm, height of backrest 50,5 cm

When folded together: 70 x 30 x 7,5 cm

Weight:
2,0 kg

Mechanics:
The chair uses natural laws, more specifically leverage and gravity for staying upright.

Pros:
Light weight

Cons:
Unstable

5.3.1.3 Clas Ohlson beach chair

Price:
119 SEK

Materials:
16mm steel pipe frame, polyester seat and backrest

Design:
A more complex construction of steel pipe frames, including an armrest. The polyester fabric stretches from the top of the backrest all the way to the front of the seat, with a distinct separation between seat and backrest. The chair offers two different angles of the backrest – one more upright, and one more slanted.
Findings and analysis

Measurements:
Seat height 26 cm, seat depth approximately 40 cm, seat width 34 cm, height of backrest 71 cm

When folded together: 81 x 52 x 6 cm

Weight:
3,4 kg

Mechanics:
Seven pivot points; on seat, backrest, legs and close to the armrest which all work together when folding up and together.

Pros:
Price
Two different seating positions

Cons:
Heavy

5.3.1.4 Brafab beach chair

Price:
175 SEK

Materials:
19mm steel pipe frame, polyester seat and backrest

Design:
A u-shaped backrest and another u-shaped seat connected to each other in a pivot point in the corner where they meet. The two legs are also u-shaped, the front leg has its own pivot point in the front, and the back leg is connected in the same pivot point as the backrest and the seat. A polyester fabric is stretched between the seat and backrest frame. The chair also includes a handle for carrying.

Measurements:
seat height 20 cm, seat depth approximately 40 cm, seat width 49 cm, height of backrest approximately 50 cm

When folded together: 52 x 50 x 8 cm
Findings and analysis

**Weight:**
2,4 kg

**Mechanics:**
Two pivot points; one in the back that connects the backrest, the seat and the back leg, and one in the front for the front leg. Back leg folds out “automatically” as the back rest is being folded out.

**Pros:**
Handle and shoulder strap for carrying

**Cons:**
Very low seat

### 5.3.1.5 Examination of Brafab beach chair

Primarily interesting was for me the rivet pin that worked as a pivot point and connected steel pipes, since that component was used in three of the chairs used in this study. The two legs were similar to each other, but not identical. The front leg is approximately 10 mm taller than the back leg, other than that the holes for screws and rivets were placed differently.

Regarding the other two U shaped steel pipes that holds up the seat and backrest, they were also similar but not identical, a few millimeters difference in total height. Whether that is a matter of tolerances, considering the relatively low price, or intentional I don’t know. On these parts the holes for screws and rivets were also different.

*Image 48. All constitutional parts of the Brafab beach chair*
The joint that connected the backrest, seat and back leg consisted of eight components. It’s primitive but smart solution that makes the back leg unfold as the back rest is being unfolded.

Lastly, the polyester piece that constitutes the seat and backrest was simply sewn around the two larger U-shaped steel pipes on each side.

5.3.1.6 Generalizing the folding beach chair

In order to generate concepts for this project it was important to know what elements constitutes a foldable beach chair. This summary is based on my own analysis and reflections of the previous presented data, a closer examination of the Brafab chair, as well as an informal online scan of different foldable beach chairs.

Foldable beach chairs are in general seating furniture within a cheaper price range that can be bought in department stores, camping stores, gas stations etc. The appearance is often a result of the price, and therefore a matter of production. An example of this are the tolerances. They are in most cases rough and somehow a characteristic of these kind of chairs. Transparent, uncovered mechanical solutions characterizes the foldable beach chair, so does the primitiveness of the construction and the including components. It is stripped down to only include what’s necessary for offering an adequate seat and backrest. The chairs usually lack great comfort and ergonomic features. Foldable beach chairs are in almost all cases folded in the plane seen from the side of the chair. Interesting here is to compare the deckchair (a kind of foldable beach chair) with the “director’s chair”, which builds on a similar folding principle, but folds in the plane seen from the front/back of the chair. The frame of the foldable beach chair is in most cases made out of wood or steel pipes and fronted with a polyester cloth which makes up the seat and backrest, due to its water-resistant properties.

5.3.2 User study

The user study was based on an observation of a brief process with complimentary questionnaire. To read more about the structure of the test, I refer to chapter 4.1.3 Observation and 4.1.4 Questionnaire. The results from this user study, which can be reviewed in detail in attachment 5, created a good base for further work with implementing design features from foldable beach chairs into this project. Measured aspects in the test were portability, ease of set up, comfort and overall design of each individual chair. When transferring these aspects into this specific project’s solution, I considered them to be about equivalently important. Thereof, the most valuable factor from the study was which one of the studied foldable beach chairs was the overall preferred among the participants. The study consisted of ten individual tests, one test per participant. Each chair could achieve between 1-5 (poor – excellent) points per aspect (four), which means between 4-20 points per chair and test. Considering the ten tests, a chair’s total points in this study ranged between 40 and 200 points.
Findings and analysis

5.3.2.1 Results
The chair with the highest total score (122.5) was Biltema’s chair. In all tests except three it achieved the highest scores. Notable deviation was one test with a 160 cm tall female participant, in which the chair got lower scores on portability and comfort. Similar results were found in another test with a 168 cm tall female, where the Biltema chair lost points on portability and ease of set up.

The second most preferred chair was the one from Clas Ohlson with a total score of 108 points. Two cases of notable deviation are found. In one test, with a 186 cm tall male, it got least amount of points, where the points were evenly spread among the aspects. In the other case, when tested on a 170 cm tall male, the chair scored low on portability, comfort, and overall design.

On third place comes the chair from Brafab, with a total score of 96 points without any notable deviation. Lastly, with a total score of 62 points comes the wooden chair. It ended up at last place in every individual test except one with a 186 cm tall male, in which it reached the second place. Reason to this is a high score on portability, and overall similar scores as the competitors in the test.

5.3.2.2 Complimentary comments
Complimentary comments and arguments on different aspects were valuable inputs to the tests. Regarding the Biltema chair, participants considered the seat to cause the body to slide down. Other than that, they thought it gave a stable impression and overall simple and good product. The wooden chair had some complaints on different aspects; it was low and unstable and did not offer good comfort. Some also complained about it having sharp edges that made it uncomfortable to carry. On the other hand, it was the chair that got most positive feedback on appearance. The Clas Ohlson chair got some negative comments on the pinching risk and the horizontal steel bar underneath the thighs. Some complained about a too complex structure, but many enjoyed the comfort. Lastly, the Brafab got complaints on being too low and uncomfortable but got many positive responses for offering handle for carrying.

5.3.2.3 Observations
Observations were noted throughout the tests as a part of understanding how the participants interact with, and how they felt about the chair by studying their body language. The first observation was the way the participants carried the chair. Some were struggling to carry the Biltema chair. It appeared to be too big and inconvenient to carry in a comfortable manner, mainly for the shorter participants. Another reason to the inconvenience was that the Biltema chair did not offer any proper place for gripping while carrying.

An issue most of the participants had was the unfolding process of the Brafab chair; they all seemed to miss that they would have to unfold the front legs, which I eventually pointed out to them. Two participants considered the handle and shoulder straps on the Brafab chair to be excessive, one of them didn’t even took advantage of them when carrying the chair but instead held it in the steel pipe structure.
Regarding the wooden chair, everyone seemed to carry it without any issues, other than the sharp edges which some commented on. Not that surprisingly, many were struggling with putting together (unfolding) the chair, although they eventually succeeded, in some cases I had to cut in and help them. One thing I observed in most tests with the wooden chair was the way the participants behaved while seating, sitting and raising from it. They all seemed to be very unrelaxed during this whole process and didn’t make any bigger moves while sitting. The instability, which they only judged by their vision before seating, probably played a big role in this case.

The Clas Ohlson chair, which interestingly all Swedish participants had had great experience with but none of the other nationalities, was handled with great confidence among the Swedish participants. Despite the relative complexity of this chair, no participants had any issues unfolding or handling it.

5.3.2.4 Analysis, validity and reliability

When combining all information from the study it comes clear that all studied foldable beach chairs have flaws, some more, some less. None of the chairs were considered to be better than good. When dividing the total score with total amount of tested aspects, the BILtema chair got an average score of 3 points per aspect, which equals to “good” in this test. The Clas Ohlson and Brafab average 2,7 respectively 2,4 points, which commensurate to between fair and good, and the wooden chair gets an average of 1,55 which is between poor and fair. As I said in the introduction of this part, this study was about finding out which of the chairs was the most preferred among the participants. I believe the simplicity and comfort of the BILtema chair, in relation to the other studied chairs, made it to the winner of the test. The deck chair, one of the most common version of foldable beach chairs, could unfortunately not be used in the study due to availability.

Some things should be said about the internal and external validity of the user study in general. The internal validity evolves around how well the result is an outcome from the investigated factors, and not any other surrounding factors [11]. Regarding the internal validity, I was before the test hesitant whether I should explain to the participants how to set up each chair. This reasoning was based on the theory of learning by doing; we might not know how something works the first time we interact with it, but after one or a few times, we do. So, this broke down to a matter of if the test should be seen as first-time users or users with experience. I figured that it might be more relevant to test as first-time users, as it would be when shopping a new beach chair where the first impression plays a big role. However, earlier experience was present in some cases, and inevitably biased some of the participants.

Another issue was the rating. The scale went from poor to excellent for each aspect, but how poor is poor, and how excellent is excellent? It’s a matter of judging in relation to something earlier experienced. It must have been easier to judge the last chair than the first since the participants then had more to compare with and therefore created a better base for what poor and excellent constitutes. An option here could have been to let the participants test each chair before judging, in order to establish their own level of judgement.
The external validity of this study, that is how well this result can be adapted to other groups of individuals [11], can be considered high to some extent. The study was conducted on a group consisting of four different nationalities (Sweden, Spain, China and Iran) so the cultural variety is wide. However, the age span only ranged from 24 to 33, so the test lacks opinions from elderly people that might suffer from physical limitations. On the other hand, the length span was between 160 cm to 193 cm, which I considered to be a crucial factor. Reliability is another term that should be analyzed after a test. It concerns the consistency of the results, how well they are reproduced from the individual tests [11]. The study consisted of ten tests, which I considered to be enough to achieve a reliable result. When looking through the results of this study, one can draw the conclusion that the individual tests has high reliability since the results has few deviations.
6 Result

6.1 Material, shape and colors

There are many different aspects that have contributed to the result. Two of my favorite furniture designers, Mats Theselius and Jean Prouvé, have been great sources of inspiration. I strived to make something timeless, so I didn’t give in for contemporary finishes or shapes, but instead tried to create something unique that has the potential to grow on people throughout the time. It was important to me that the characteristics of beach chairs were well represented in the result, without making it too obvious. I chose to name the chair Carinteria. It is the name of a small coastal town south of Santa Barbara where I lived for one year. The town has a popular beach and a large surf community and has been a huge inspiration source to me throughout the whole project. Also, carpintería is Spanish for carpentry, which is what Källemo was from the beginning. By taking inspiration from beach chairs, I could more easily come up with a unique chair and at the same time fill a relatively empty space regarding furniture expression. Both these aspects are closely related to Källemo’s values. From the generalization of the beach chairs, I brought with me the primitiveness of their structure, choices of materials and the overall feeling you get when you observe a beach chair.

Image 49. Back of the chair

The starting point of the final design was the way the chair folds up and down, and from that I let the inspiration take it further. It is based on a classic x-shaped folding method,
but a bit tweaked. Instead of rotating around one single axis in the point where the two arms cross, the legs rotate around one axis each, and are individually independent. This particular folding mechanism required six structural elements; two seat arms, two backrest arms and two skids. These parts are connected to each other as a chain built up of three links. With the help of a cross beam between the backrest arms, a certain shape in the seat arms and natural laws, the chair would be able to stand up by itself. As soon as I came up with this idea, I saw it as a structure made out of wood. It’s a beautiful material with much character and uniqueness. When I had this idea set, I started shaping the constitutional parts.

6.1.1 The skids

The skids are the element that constitutes the stand of the chair. Their task is to fix one point on the seat arms respectively the backrest arms at a certain distance from each other. When everything comes around, the skids are the core of the chair and the reason why it looks like it does. In order to enhance the importance of the skids, I wanted to visually separate them from the rest of the chair. My plan was to make both the skids and the arms in ash, a hard and strong wood commonly used in furniture, so in order to visually separate them I would have to play around with color combinations. I wanted to keep either the arms or the skids uncolored, and I considered it to be too conventional to leave the major elements, the arms, uncolored. Therefore, I chose to leave the skids treated only with hard wax oil and let the beauty of the pure wood speak for itself. Due to
practical and aesthetical reasons I raised the skids from the floor with seven millimeters by attaching elegant, polished steel feet to the skids.

Image 51. The skids

Image 52. The skids

6.1.2 The seat and backrest arms

As earlier stated, these elements are also made out of ash, but treated with a red stain finish. The reason for choosing this finish is because the red color, in combination with the shape of the parts, enhances the character and gives the whole chair a playful and bold, yet nice expression. Since I’m a big fan of wood, I didn’t want to completely cover the material with a layer of paint, but instead use a stain to keep the character of the wood. They have beautiful swoosh shapes that makes up most of the character in the chair and represent the dynamic of the ocean waves.

The two seat arms are connected to each other with two round cross beams for additional rigidity. The cross beams that connects the two backrest arms are both highly crucial to the structure and function of the chair. One holds up the seat, and the other holds up the headrest which in turn holds up the backrest.
6.1.3 The seat

A characteristic of the beach chair is the primitive seat. In most cases it’s made out of a polyester fabric and can be seen as a sail, or beach towel. I wanted to implement this kind of seat into my chair as well, since it would add to the feeling of beach chairs. The seat is sewn as one piece with a large pocket which is pulled onto and attached to the seat arms, the fabric then narrows down slightly and continues up and attaches to the headrest. This construction of the seat provides the lightness and sail-like feeling I targeted.

I picked a natural colored linen fabric with much structure. The choice was based mainly on the color and material constellation of the chair as a whole. I let the simplicity of the seat speak for itself instead of giving it a distinct color that would take all the attention, and by doing so put more focus on the other, more characteristic parts of the chair. For aesthetical reasons, I decided to let the seat continue twelve centimeters below the headrest on the back of the chair, to give it a more elegant and elaborated ending.
6.1.4 The headrest

The headrest came along as I realized I would need a cross beam in the height of the head between the backrest arms. By adding a cylinder-shaped headrest, I didn’t only solve the issue of covering the beam with padding, but also added an aesthetical feature to the design which came to increase the character of the chair. I chose to upholster the headrest with black leather to give it much visual weight which goes well with the rest of the chair.

The seat is simply attached to the headrest. However, because of the way the chair folds together, the seat would prevent the chair from being able to unfold. So, in order to fold the chair together, one has to temporarily loosen the headrest, and therefore also seat, from the beam it covers. This was solved by designing the headrest as a hook which you can hook and unhook from the crossing beam. It might be a compromise, but at the same time it resembles much characteristics from the beach chairs; the primitiveness of the beach chair’s construction, and the sail-like inspired seat becomes even more obvious when one has to physically interact with it.

The headrest is made out of a plywood structure in order for it to hold up for the forces it is exposed to. To add comfort, the structure is covered with cushioning foam, and wrapped with black leather. The seat is attached to the headrest after the whole pillow is finished, for a more convenient production method. A wooden strip is stapled to the seat at a certain place. The strip is then screwed to the plywood structure on the inside of the hook of the headrest.
6.1.5 The steel parts

The rotation axes are crucial to the function of the chair. Not only do they fulfill their purpose, but they also introduce a new material to the chair; polished steel. The steel bars and dome nuts in this material constellation with wood and fabric creates a feeling of mechanical solution, and something that actually requires steel. Since the other steel element in the chair, the feet, had a polished finish directly from the factory, the rotation axes should have the same finish. The polished steel parts enhance the exclusivity of the chair, and together with the primitiveness and resemblance of the beach chair, I created an interesting mix of materials and feelings.

6.2 Folding solution

The essence of the chair is that it’s based on a commonly used mechanism among folding chairs but tweaked. It has a more primitive solution, which is something I personally like. This chair can be seen as a chair you buy for putting up when you need more space to sit on. But I’d rather see it as a chair you put away when you need the space for other activities. No matter what reason you buy it, I considered the way it looks when it is folded together and put away. Then I asked myself if it should be hanging on the wall or put in a dedicated stand. I settled with neither of them. A wall hook or a nice stand could be sold as an accessory, but for the moment, I left it out. Instead, you simply fold it together and let it stand on the tips of the backrest arms up against the wall. Since ash is such a hard material, it will resist wear marks well when it stands folded together. Also, since the stain is a kind of finish that goes deep into the wood, there’s no layer of paint that risk being scratched away. In order for the seat to not flip down in this position,
there’s a strip of fabric with a button underneath the seat which you attach around the axis in the front of the chair.

In this position, the backrest and headrest are simply hanging free and creates a nice-looking drape on the wall, with a black lump swinging right above the floor. Together with the red swooshing arms it creates an aesthetical value even when it is folded together. Other directions to put the folded chair wouldn’t work so well due to the loose backrest and headrest, except flat on the floor. This would however require that you store it underneath a bed or similar, and in that place, you won’t get any value out from it.

Image 56. Final prototype outside Källsön’s head quarter
7 Conclusion and discussion

The achieved outcome in this project is the result of an open-ended process. Since the project is highly influenced by subjective ideas, there’s an infinite amount of ways to approach this project, and also an infinite amount of results to it. One has to see this as the result of this particular project, with this process, influences, inspiration and most of all, personal way of designing. But even if me myself would have done the same project, let’s say one year earlier or later, I’m confident I’d had come up with a totally different result.

I have to start with saying I’m truly happy with the final design. Initially, I never imagined it would turn out as it did. What I wanted with this project, after all, was to make a seating furniture that was clearly inspired by beach chairs. The reason to this is because first, I find it to be an under-represented source of inspiration among the chairs one sees today. Secondly, the beach chair is something I personally find very interesting in the way that you can instantly point them out, and they have a slight comic aura. So, what intrigued me was the implementation of the cheap, simple beach chair into the exclusive furniture world where visual quality is highest priority.

7.1 Implementation

What I’m happy with is partly how well I’ve succeeded in implementing inspiration and features, on different levels, of the beach chairs to the design, without making it look like something you’re supposed to take to the beach. Both concrete features as well as more philosophical features have been implemented throughout the process. Concrete features are for example the X-shaped structure made up of wooden elements, which has similar dimensions as the ones you find in some beach chairs. Some philosophical features are the red color of the structure which symbolizes the playful and a warm aura, and the primitiveness of the seat which is revealed when one has to interact with hooking and unhooking it.

Regarding implementation of Källemo’s values, I think I’ve done a good job by making something that comes from me and the process, instead of looking into their products and try to make something that fits in among them. However, when letting the design come from yourself it’s important that you share Källemo’s values and approach. It should be said that I do share their idea of visual quality and long-lasting validity, even long before the project started, and that I in general really enjoy much of what they produce. Also, after having had five weeks of internship, followed up by some consulting work for them, I’ve learnt even more about how they work and the idea of the company. I think this made the project quite biased, but more natural, and after all that’s the reason why they work with the specific designers they do. What happened during the process was that I started with an idea which I improved according to my personal likings into the final design, instead of trying to make it fit in with Källemo’s values. As earlier stated, there’s no particular visual red thread throughout their product range, it’s more about the individual pieces character and expression. I think I’ve succeeded well in creating a characteristic, unique, solitaire chair.
7.2 Further work
Since the chair is a full scale, properly made prototype, it’s in the stage of being evaluated for the market and whether or not it shall be put into production. However, the chair will now be taken to Källemo’s head quarter to be put among all their other works in the exhibition area. By doing so they can let it grow with time, and also let visitors and customers leave feedback.
8 References


9 Attachments

Attachment 1. Questions for the interview with Källemo’s CEO Erik Lundh

Intervju med Källemo’s VD Erik Lundh

Sven sammanfattade kvalitet med de tre orden INTERESSANT, MENINGSFULLT, UTTRYCK, lever ni fortfarande efter de här orden?

Som han själv sa är detta subjektivt, kan man säga att det finns en ”Källemo-stil”?

Har Källemos värderingar förändrats något genom decennierna?

Samarbeten är ofta rätt lösa och varierar mycket mellan olika formgivare och konstnärer, hur mycket har ni att säga till om i processen?

Vad baserar ni era efterfrågor om nya designs från formgivarna på?

Hur arbetar ni med materialval? Finns det riktlinjer eller material ni undviker?

Hur ser ni på innovation, nya material och produktionsmetoder?

Ser ni mässan främst som ett tillfälle att ”räkna” uppskattning av de nya produktarna?
Attachment 2. Questionnaire used in the user study

Folding beach chair questionnaire

<table>
<thead>
<tr>
<th>Portability</th>
<th>Gender: M / F</th>
<th>Length:</th>
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</thead>
</table>

What was your experience of carrying the chair?

<table>
<thead>
<tr>
<th>Chair</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very good</th>
<th>Excellent</th>
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Comment:

Ease of set up

What was your experience of setting up the chair?

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Comment:

Comfort

What was your experience of the comfort of the chair?

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<th>Good</th>
<th>Very good</th>
<th>Excellent</th>
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Comment:

Overall design

What is your opinion on the overall design of the chair?

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<th>Chair</th>
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<th>Good</th>
<th>Very good</th>
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Comment:
**Attachment 3.** Mood boards
## Attachment 4. Function analysis

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<tr>
<th>What</th>
<th>Function</th>
<th>Importance</th>
</tr>
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<tbody>
<tr>
<td>Offer seat and backrest</td>
<td>Main function</td>
<td>Necessary</td>
</tr>
<tr>
<td>Offer collapsibility</td>
<td>Main function</td>
<td>Necessary</td>
</tr>
<tr>
<td>Possess Kållemo’s values</td>
<td>Main function</td>
<td>Necessary</td>
</tr>
<tr>
<td>Resist normal wear and tear</td>
<td>Sub-function</td>
<td>Necessary</td>
</tr>
<tr>
<td>Tolerate 110 kg load</td>
<td>Sub-function</td>
<td>Necessary</td>
</tr>
<tr>
<td>Offer convenient portability</td>
<td>Sub-function</td>
<td>Necessary</td>
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<tr>
<td>Offer convenient set up</td>
<td>Support function</td>
<td>Necessary</td>
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<tr>
<td>Offer storage opportunity</td>
<td>Support function</td>
<td>Desirable</td>
</tr>
<tr>
<td>Offer great comfort</td>
<td>Support function</td>
<td>Desirable</td>
</tr>
<tr>
<td>Offer relaxing seating position</td>
<td>Support function</td>
<td>Desirable</td>
</tr>
<tr>
<td>Resist UV radiation</td>
<td>Support function</td>
<td>Desirable</td>
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<td>Offer armrest</td>
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### Attachment 5. Results from the user study

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**Total:** 96 108 62 122.5

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*Note:* The table above summarizes the results from a user study, with rankings for various test conditions and criteria such as portability, ease of set up, comfort, and overall design. The study was conducted with different test conditions, including M, 180cm, M, 185cm, M, 182cm, M, 170cm, M, 181cm, F, 162cm, F, 160cm, M, 193cm, and F, 168cm, with the criteria scored on a scale from 1 to 5, with 5 being the highest rating.