Nordkraft

Product report

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Liv Bangshaab

Maria Risgaard Sinding

Paz Ripoll Viladomiu

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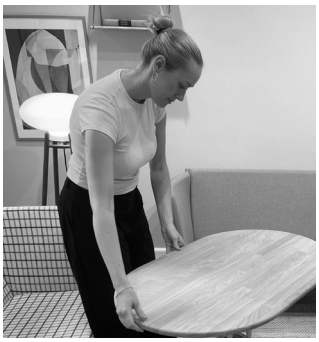

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Abstract

A shift has been seen in the office culture in Denmark; employees tend to work from home rather than at the office. This has led companies to make efforts to encourage employees to work from the office. An observed approach to this is that companies create soft spaces with lounge furniture to provide a homely and cozy atmosphere at offices. However, the furniture in these soft spaces are not designed for its intended use and is often discarded.

Nordkraft is a flexible coffee table that, unlike current coffee tables for offices, is designed with the user in focus. With its adjustability, Nordkraft accommodates multiple types of work and supports various kinds of users. In addition, the coffee table takes furniture waste, repairability and lifetime into consideration in order to meet upcoming EU regulations and influence its users against replacement culture.

Table of contents

Introduction

Since Covid-19, a shift has been seen in the office culture in Denmark; employees value to work in homely and cozy soft spaces. However, furniture for soft spaces is not designed for working.

Nordkraft is a flexible coffee table specifically designed to facilitate ergonomically correct work in soft spaces. With its adjustability, Nordkraft accommodates multiple types of work and supports various kinds of users. In addition, the coffee table takes furniture waste, repairability and lifetime into consideration in order to meet upcoming EU regulations and influence its users against replacement culture.

This product report presents Nordkraft and its business opportunities for FDB Møbler, who was the initial collaborator of this project.

Design brief

In modern offices an increased focus has been on developing soft spaces. Soft spaces have become an essential component in modern offices, as companies have heightened their focus on employees' well-being. Employees value working in a homely atmosphere, but since the furniture in the cozy and homely soft spaces is not ergonomically suited for working, employees tend to rather work from home.

As a result of missing ergonomically designed solutions for soft spaces, companies are forced to purchase desks which fit with office work requirements. However, the issue occurs when companies experience a lack of space. Then they discard soft spaces to make room for more desks.

The discarded furniture is offered to employees, however the appearance of office furniture is not appealing to employees resulting in a lot of furniture being recycled.

The mission behind Name has therefore been to avoid furniture discarding and recycling by designing for the employees' needs for alternative workstations in soft spaces and aim to give the product a second life.

01 Product proposal

Playful and functional

This section analyses the market Nordkraft is going to operate in, as well as the users and segments the product targets. The aim is to provide a deeper understanding of both the business potential and the needs that exist in this market.

"I never imagined I would describe a table as cute, but this one really is, because it is so playful and fun."

- Testing participant

"Normally, I would not bother adjusting the height of a table because it is a hassle, but this one I would definitely interact with— it is just so accessible."

- Testing participant

Aesthetics

Nordkraft's floating tabletop allows free movement under the table as well as easy interaction with the tabletop's rotation option. The dominant thread contributes to a perception of stability and makes the design language of the coffee table naive and easily readable.

Form

Nordkraft's elegant oval shaped tabletop in solid wood contributes with a homely and living feeling to office environments and private homes. Its rounded edges provide tactility and softness and invites users to interact with the table.

Function

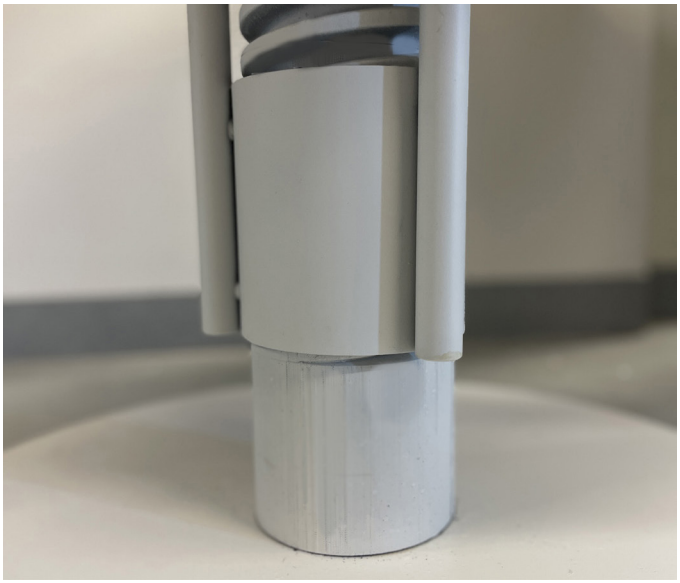
Nordkraft features a thread enabling the tabletop to have various positions while the table can be height adjusted. This element allows for playful interaction and ensures an ergonomically correct seating position for all users in 121 meetings, online meeting and focus work for two people at once.

Height adjustable

With only five revolutions, the table can be height adjusted from 50 cm to 72 cm. This interaction allows you to remain seated adjusting.

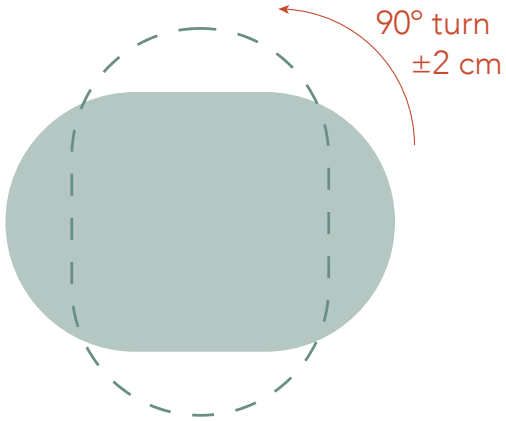
Stopping mechanisms

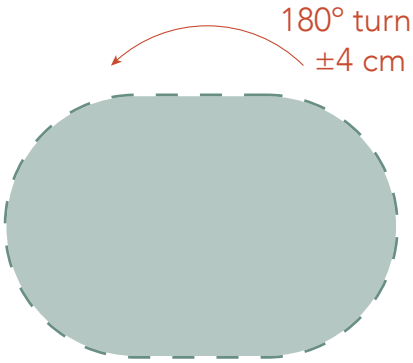
The coffee table is designed with a specific type of thread which geometry ensures that the table stays in place during use. Furthermore, it features a stopping mechanism in the bottom and in the top, ensuring a safe use.



Extendable

The tabletop extends when placed in various positions.





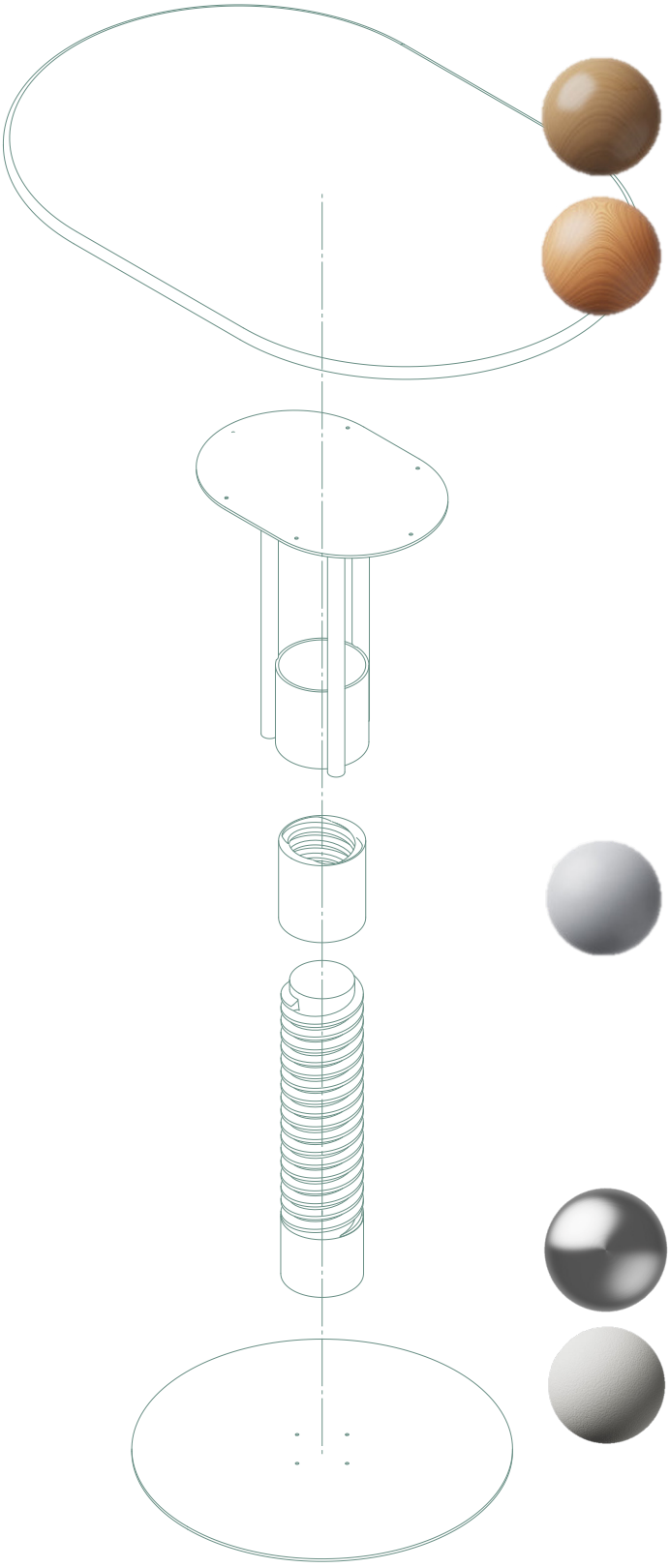
02 Proposed product

Product specifications

Information

Launching year	2025
Materials	
Tabletop	Solid oak
Maintainance	Lacquered/oiled
Frame/base	Stainless steel
Treatment	Powdercoated
Dimensions	
Height assembled	50 - 72 cm
Depth assembled	60 cm
Width assembled	90 cm
Package dimensions	L95 x B30 x H65
Specifications	
Guarantee	10 years
Test and certifications	
En 15372	L2 general use
FSC certified	Yes

Assembly



Materials

Solid oak and beech are natural materials valued for their strength, warmth, and visual appeal. These types are options for Nordkraft's tabletop, due to their strength, resistance to wear, and natural grain. Oak and beech are living materials, meaning they respond to their environment and develop patinas over time. To ensure longevity, solid wood needs care and maintenance, and if treated properly, it can retain its beauty and durability for decades.

POM

POM has good functional properties; it is self-lubricating, which ensures smooth operation over time, and it protects the external thread from wear. Using POM for the nut contributes to both the product's longevity and user experience, offering maintenance-free performance with a precise feel during adjustment.

Powder coated steel

Powdercoated steel has strong mechanical properties and impact resistance, making it ideal for this purpose. It is hygienic and easy to clean, which is especially beneficial in commercial settings. Additionally, it is 100% recyclable, making it an environmentally friendly choice for furniture design.

Customization for contract clients

Customize your Nordkraft by choosing between the following options.

Powdercoating

Dust & Bones

Roots

Signal Grey

Jet Black

Coral Red

Bottle Green

Solid wood

Oak

Beech

Surface treatment

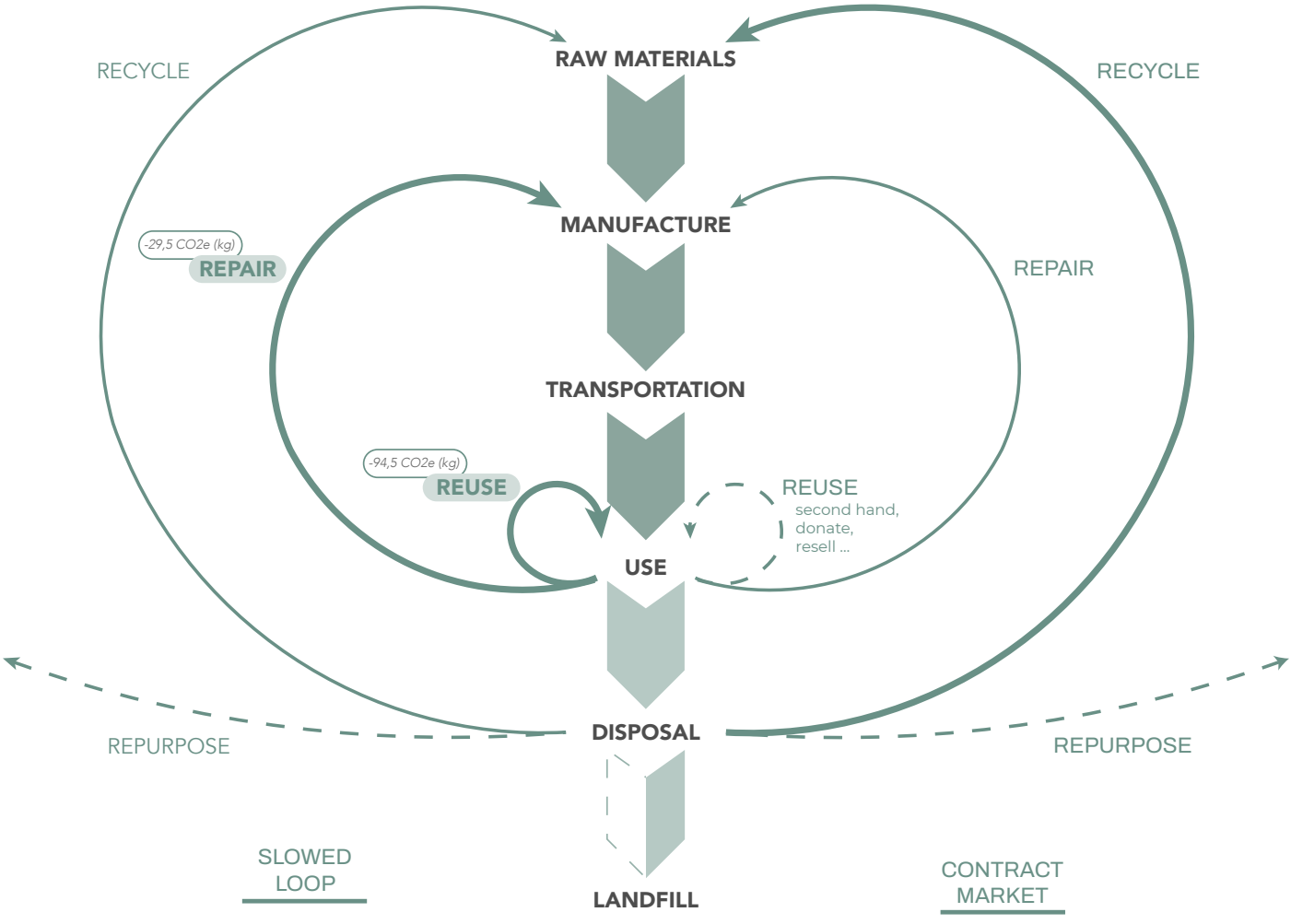
Oiled

Lacquered


TJEK IND
TJEK UD

LCA

Phase	Description	Estimate CO_2e (kg)
1. Raw forest production	Forestry, mining, plastic feedstock extraction	10-15
2. Material processing	Steelmaking, galvanizing, drying wood, plastic compounding	35-50
3. Manufacturing	CNC milling, welding, laser cutting, drilling (metal & plastic), threading, powder coating	14,5-24,5
4. Shipping (material + final)	Upstream shipping + China to Denmark via sea freight	3-5
5. Use phase	Passive use — no emissions	0
6. End-of-life treatment	Recycling, incineration, landfill	5-15



03 Business

Business model canvas

The following business model canvas illustrates a standard business model structure of a furniture company. The points marked in green are important key points related to Nordkraft.

Key partnerships

- Manufacturers
- Logistics partners
- E-commerce tech provider
- Wholesale partners
- Contract partners

Key activities

- Inventory management
- Store design and maintenance
- Sales and marketing
- Customer service
- Contract management systems

Key Resources

- Physical: Warehouses, Inventory, stores, Inventory of spare parts, Customizable products
- Intellectual: Product designs, Brand reputation, C2B catalogs, B2B catalogs
- Human: Sales consultants, Support staff
- Financial: Working capital, Investment capacity

Value Propostions

- Medium priced design furniture
- FSC, Oeko-Tex, BSCI, Nordic Swan Ecolabel, and EU Ecolabel.
- High quality materials
- Home-like appearance
- Scandinavian design
- After-sales service or maintenance agreement

Customer Relationships

- Personalized customer support (e-mail, call)
- Storytelling and offers through newsletters and social media
- Member prices
- Contract prices
- Establishing long-term partnerships

Channels

- E-commerce websites
- Social Media (Instagram, Facebook, etc.)
- Furniture dealers (Holmris B8, etc.)
- B2B website or landing page

Customer Segments

- Homeowners
- Businesses
- Interior designers/ Architects
- Contract clients

Cost structure

- Product development
- Payment to manufacturers
- Platform/website maintenance
- Warehousing and shipping logistics
- Royalty payments to designers
- Marketing and advertising spend
- Storefront expenses

Revenue Streams

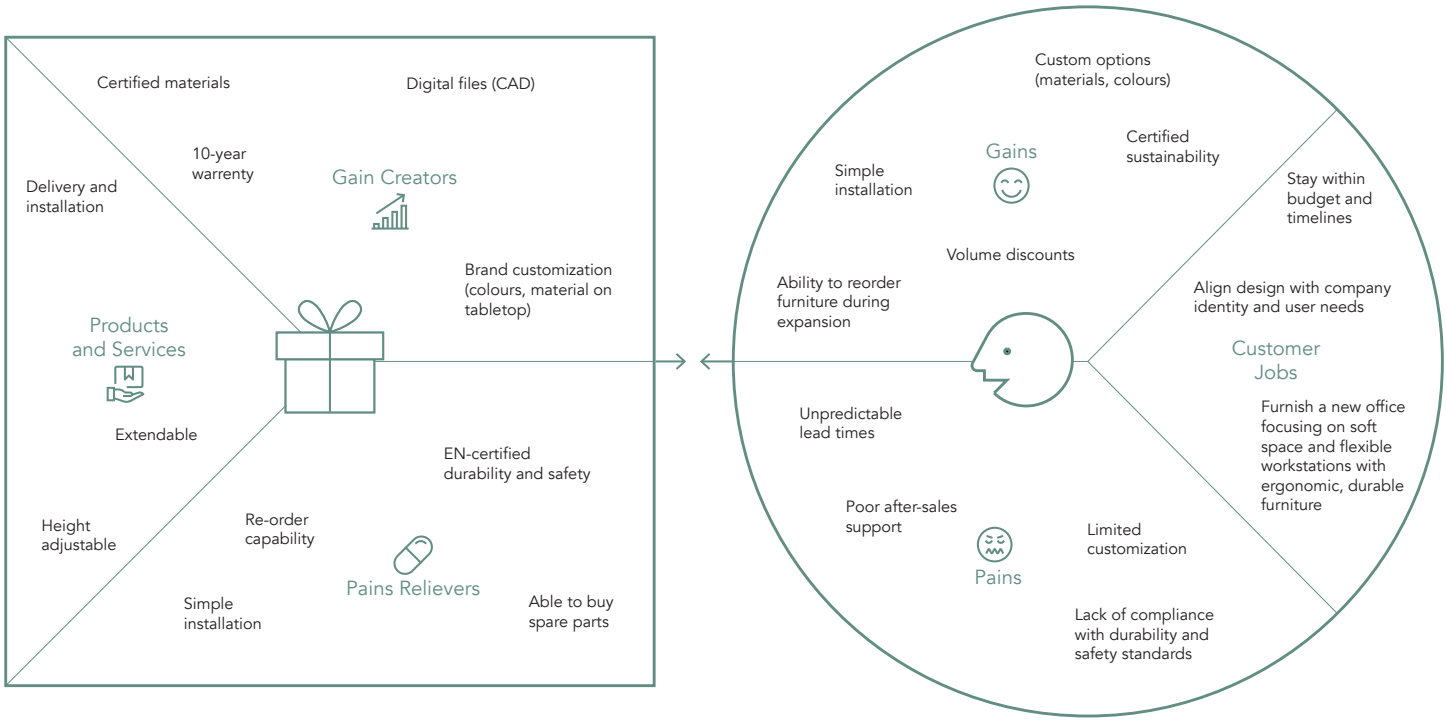
- Direct sales via webshop
- Delivery fees
- Agents
- Physical stores
- B2B wholesale sales
- Contract manager

Value proposition canvas

This value proposition canvas outlines the core values Nordkraft delivers to decision makers responsible for furnishing modern office environments. By addressing their key priorities such as lead time, flexibility and customization, the coffee table provides a strategic solution that supports flexible work settings, reduces the need for multiple furniture types and aligns with sustainability goals.

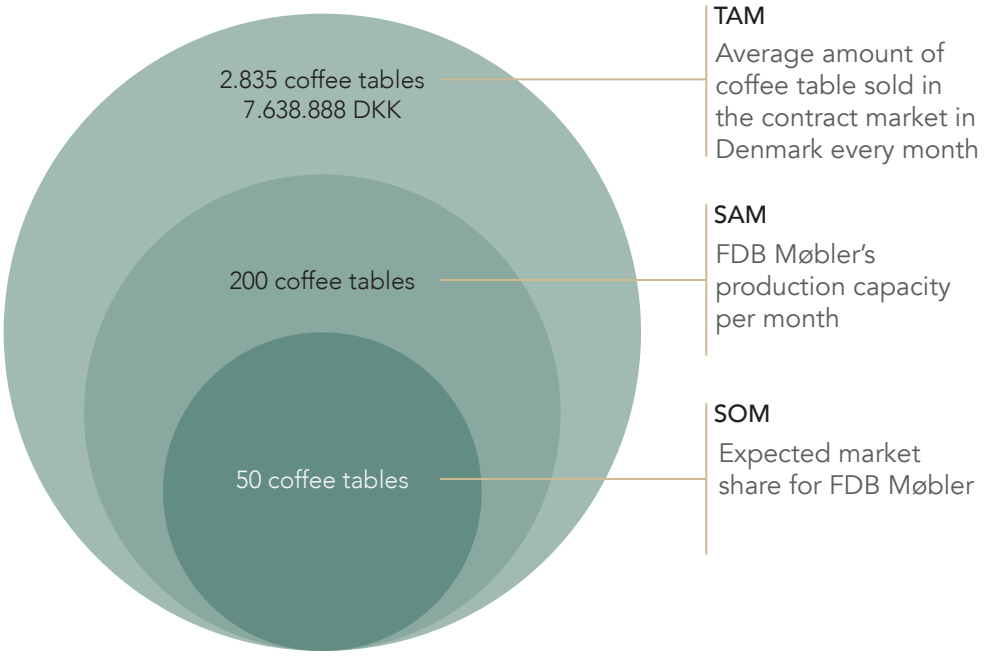
Value Proposition Transformable coffee table

Customer Segment Facility manager, architect or interior designers etc. designing for office companies with hotdesking.



04 Market and user

Market size analysis



Nordkraft will represent a small share of the market, but this should not be seen as a disadvantage – on the contrary. This is a realistic strategy for a small company entering a new market, as it allows for growth, build credibility and recognition, and easier adaptation to market needs. Furthermore, the product's function has potential to reach a broader audience as it can be used for multiple purposes.

Competitor analysis

Within the coffee table category, preferably with functionality, the competitors are Muuto, Mater, Audo Copenhagen, Fredericia Furniture and Fritz Hansen.

Across these competitors, a common feature in coffee tables is static designs, single-purpose use, either purely aesthetic or minimal added functionality.

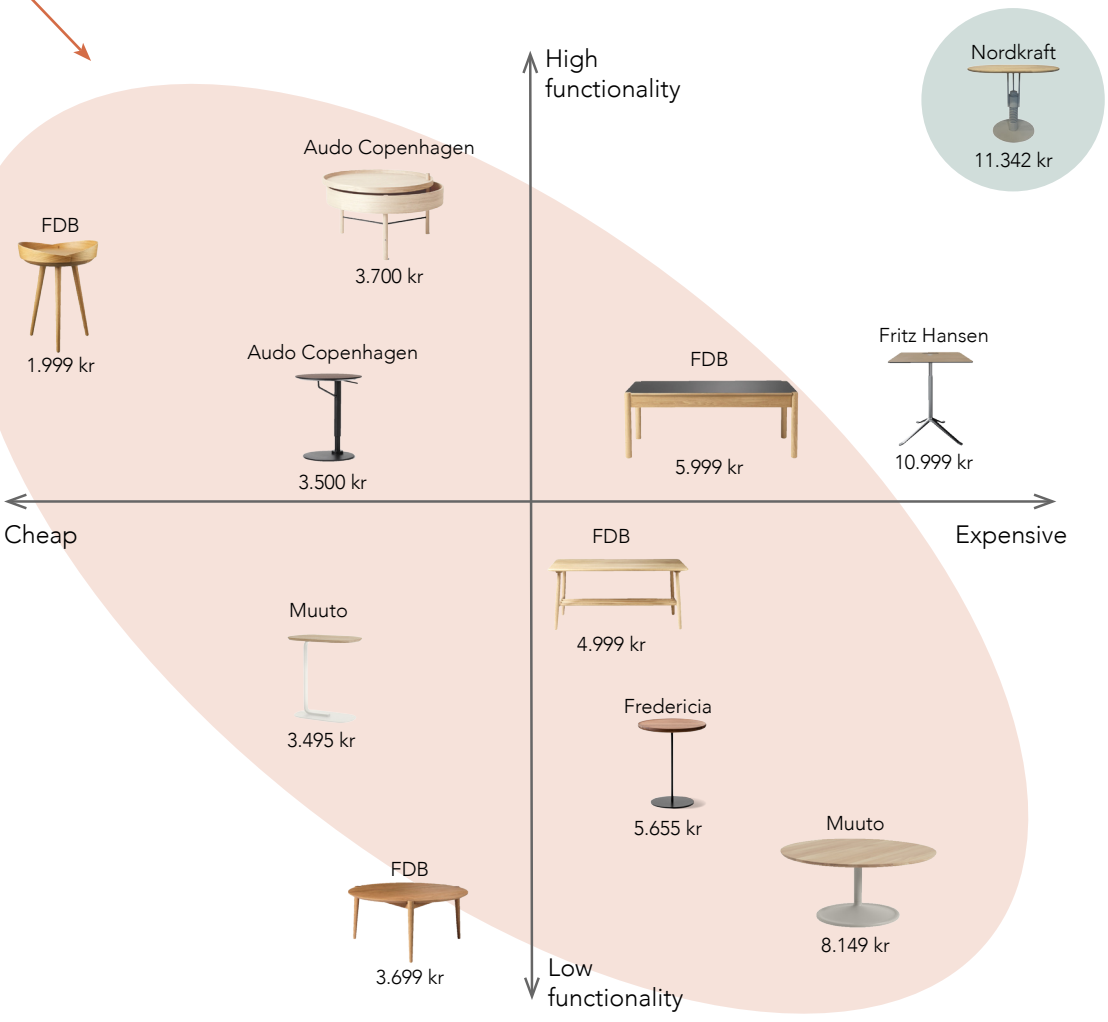
Competitor's strengths	Competitor's weaknesses
Strong brand identity and consistency	Limited flexibility or adaptability to multiple work modes
Appealing and well-crafted designs	Few solutions for dynamic or multifunctional spaces
Recognizability and established presence in both private- and contract segments	Lack of innovation in combining lounge aesthetics with workspace functionality

Nordkraft distinguishes by bridging the gap between visual softness and practical adaptability, offering a hybrid solution not currently represented in the market. This opens potential for category differentiation and strengthens the product owner's position within the contract segment.

Benchmarking

No current product offers what Nordkraft does, highlighting the product's unique market potential.

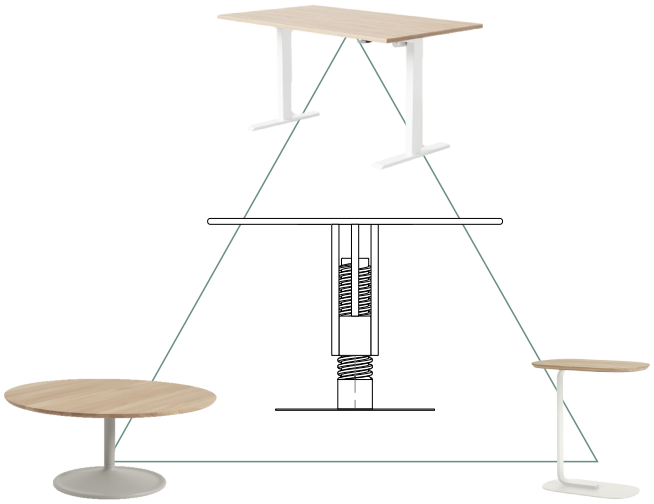
However, Nordkraft is positioned at a higher price point compared to the others. That said, it is challenging to place Nordkraft firmly within a single category, as its design allows it to be used for multiple purposes and contexts; such as a coffee table, temporary desk, or even an informal meeting table. From this perspective, the price point is more justifiable and aligns with the product's versatility and added value.



Market positioning

The product stands out by addressing the evolving needs for spaces that can easily shift from being a casual lounge to a temporary workstation, where functionality, design, and comfort go hand in hand. Its unique features, combined with practical advantages such as short lead time and customization options, make it an attractive choice for both the decision makers, users and end-users.

As a result, Nordkraft differentiates by being neither a regular coffee table, a side table nor a deks. Nordkraft is positioned as a flexible solution.



Target group

Primary target group: Decision makers

Interior designers

Architects

Facility Managers

Contract clients

Values:

- Functionality
- Short lead time
- Ergonomic qualities
- Customizable solutions

Secondary target group: Users

Employees in offices

Values:

- Homely atmosphere
- Adaptability
- Comfort
- Interaction

Third target group: End-user

Employees in private homes

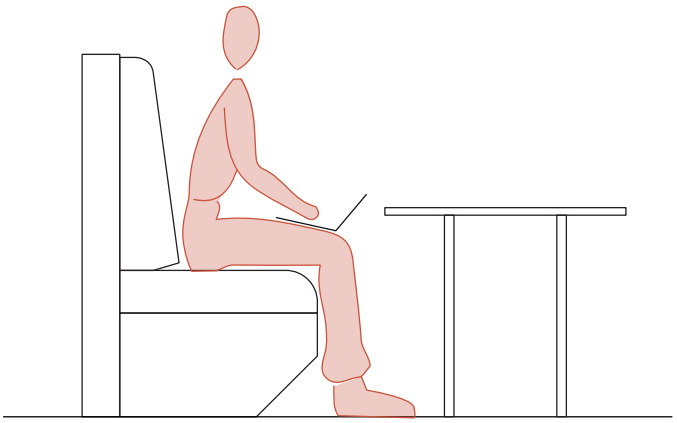
Values:

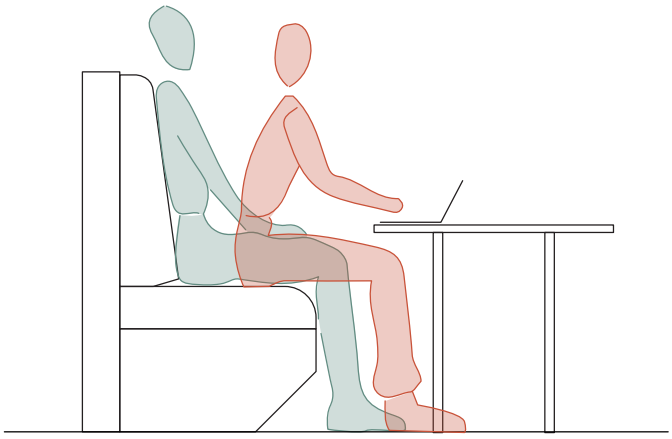
- Design
- Interaction

Scenarios

Offices

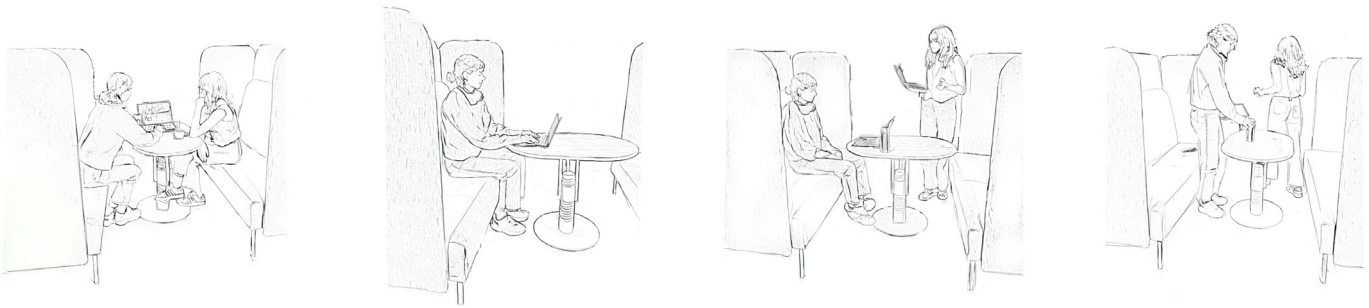
Unlike current soft space furniture, Nordkraft is designed to fit three different types of work in an office; 121 meetings, online meetings and individual focus work for two people at once.





Private homes

Nordkraft can furthermore adapt to different use in private homes. Nowadays, people are using their coffee tables for more than just a coffee table; they eat, they work, they play games on their coffee tables.



05 Business Case and Financials

Business case

This following business case reflects working with a company, who are entering the contract market. It evaluates potentials of the product, considering both the strategic and financial benefits and key risks and uncertainties involved.

Potential challenges

New market: The company's products are primarily designed for private consumers. Therefore, it is difficult to assess how successful they will be in this market, as well as the actual level of demand.

New manufacturer: Adopting a new production technique for making the large thread may require finding a new manufacturer with knowledge about this or need multiple prototypes before succeeding for a current manufacture company.

Category misalignment: Introducing an innovative product without existing contract market connections can be difficult, especially when the product does not compete on price in its current category. Gaining trust and access may take time and strategic effort.

Opportunities and benefits

Expanding customer base: When demand declines in the private market, the company will have income from the contract market as an alternative revenue stream.

Enhanced brand image: By embracing evolving needs and moving from a traditional and classic coffee table to a more modern and functional design the company is able to strengthen and refresh its brand image.

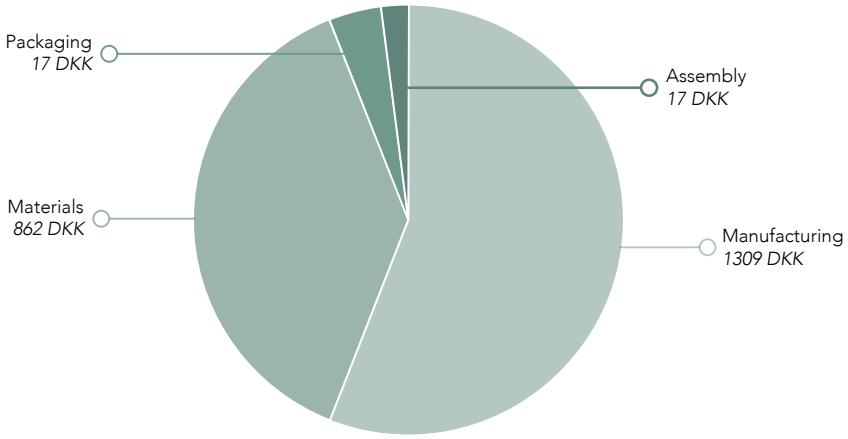
Increased sales potential: By choosing this unique product, customers are not only investing in something exclusive but also increasing the likelihood of purchasing additional settings and accessories to complement it.

The launch of the transformable coffee table presents unique opportunities for the company to stand out in a new market. By executing targeted marketing and effective communication, the company can successfully introduce this innovative product. However, the risks remain high due to the lack of similar products on the market and the challenges of entering an untested market.

Cost estimation

The cost- and selling price are based on early-stage estimations of a manufacturing process based in Latvia.

Total cost estimate for one unit	2,268.5 DKK excl. VAT



Estimated selling price

Price estimation	
Cost price	2,268.5 DKK
Profit margin	6,805.5 DKK
Selling price without TAX	9,073.9 DKK
+25% TAX	2,268.5 DKK
Selling price including TAX	**11,342.4 DKK**

The estimated selling price excl. VAT was 9,073,9 DKK. Compared to the benchmarking this price is relatively high. However, since it was designed to act as a flexible workstation, it was viewed in the context of the desktop table category. This suggests that while the product may appear expensive within its immediate segment, it remains competitively positioned when evaluated across another relevant market. This raises the question of whether the coffee table's multifunctionality adds enough value for the user to justify the cost price.

Strategic durability

Long-lasting product-market fit

Nordkraft aligns well with the increasing market demand for homely furniture for office environments, which can support companies' aim to invite employees to work from the office while being adaptable for hot desking.

Nordkraft's clear orientation toward the contract market sets it apart within the portfolio, offering strong potential for market differentiation and business growth. As there are currently no directly comparable products combining adjustability and casual table use, Nordkraft may act as a category-defining piece, potentially paving the way for a new product segment within the brand's professional offering.

Long-lasting product-user fit

Nordkraft is, unlike other coffee tables, specifically designed to fit user needs in soft spaces. Its dimensions and adjustability are based on the human body, ensuring an ergonomically correct seating position no matter the work. Nordkraft aligns with observed demands for flexible furniture solutions that can support modern ways of working in offices.

Long-lasting product-company fit

The product represents a bold and innovative addition to the company's portfolio toward the contract market, while still aligning with the brand's core design identity, combining a functional concept with a soft, naive language that characterises many of company's existing products.

Although the price point is significantly higher than the brand's current coffee tables, it closely matches the pricing of its desks, reflecting the product's hybrid nature and multi-functionality. This positioning helps minimise the risk of internal cannibalisation, as it does not directly compete with existing lower-priced lounge tables.

Nordkraft

Process report
MSc04-ID
May 2025
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Title page

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Apendix	241

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Abstract

Nordkraft is a master thesis project presenting a new take on traditional coffee table at offices. Since Covid-19, a shift has been seen in the office culture in Denmark. Employees tend to work from home rather than at the office. This has led companies to make efforts to encourage employees to work from the office. An observed approach to this is that companies create soft spaces with lounge furniture to provide a homely and cozy atmosphere at offices. However, due to company growth, the furniture in soft spaces is often discarded to make room for more traditional workstations: desks. Observations however show that there is no need for more desks. There is a need for flexible workstations that can adapt to various types of work.

Through an iterative process and a collaboration with FDB Møbler, the flexible workstation, Nordkraft, was developed. Nordkraft is a flexible coffee table that, unlike current coffee tables for offices, is designed with the user in focus. With its adjustability, Nordkraft accommodates multiple types of work and supports various kinds of users. In addition, the coffee table takes furniture waste, repairability and lifetime into consideration in order to meet upcoming EU regulations and influence its users against replacement culture.

Acknowledgement

With appreciation, we thank our main supervisor, Linda Nhu Laursen, who has not only challenged us, but also contributed with great support, knowledge and motivation. Also, a sincere thanks to our technical supervisor, Matin Afshar, for his close collaboration in helping us source materials for the development of the technical aspects and for always being available when we needed support.

A huge thanks also goes to Katrine Sander, the Product Manager of FDB Møbler, who has contributed with great feedback, important knowledge and valuable insights. Furthermore, we thank the entire team at FDB Møbler for spending time helping us throughout the project.

Likewise, we thank Lotte Kjær from PwC and Tina Thorup from Spar Nord, who welcomed us into their workplaces and played a key role in the foundation of the project.

Lastly, we extend our gratitude to the following companies, who have spent time providing expert knowledge throughout the project:

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- CNC Team Horsens
- Fe Støberiet A/S
- RJH Design
- Kvist Industries A/S

Reading guide

This project is reported in five parts: a product report, a process report, technical drawings, appendix and a user manual and repairability guide.

This report divides the process into nine phases. All phases begin with an introduction and conclude key takeaways, demands and wishes in a wrap-up. New demands and wishes will be marked in bold, while demands and wishes coming from a previous phase will be marked with regular font.

Descriptions of unfamiliar words are marked with *. Explanations occur on the same page and are also marked with *.

The Harvard method is used for references and references are listed at the end of this process report. Illustrations are marked with a reference number and listed at the end of this process report. Own illustrations are not listed in the references.

During the process demands and wishes are identified. These are marked with:

Demand

Wish

Deleted demands are marked ~~deletion~~

The reassesed are marked with a →

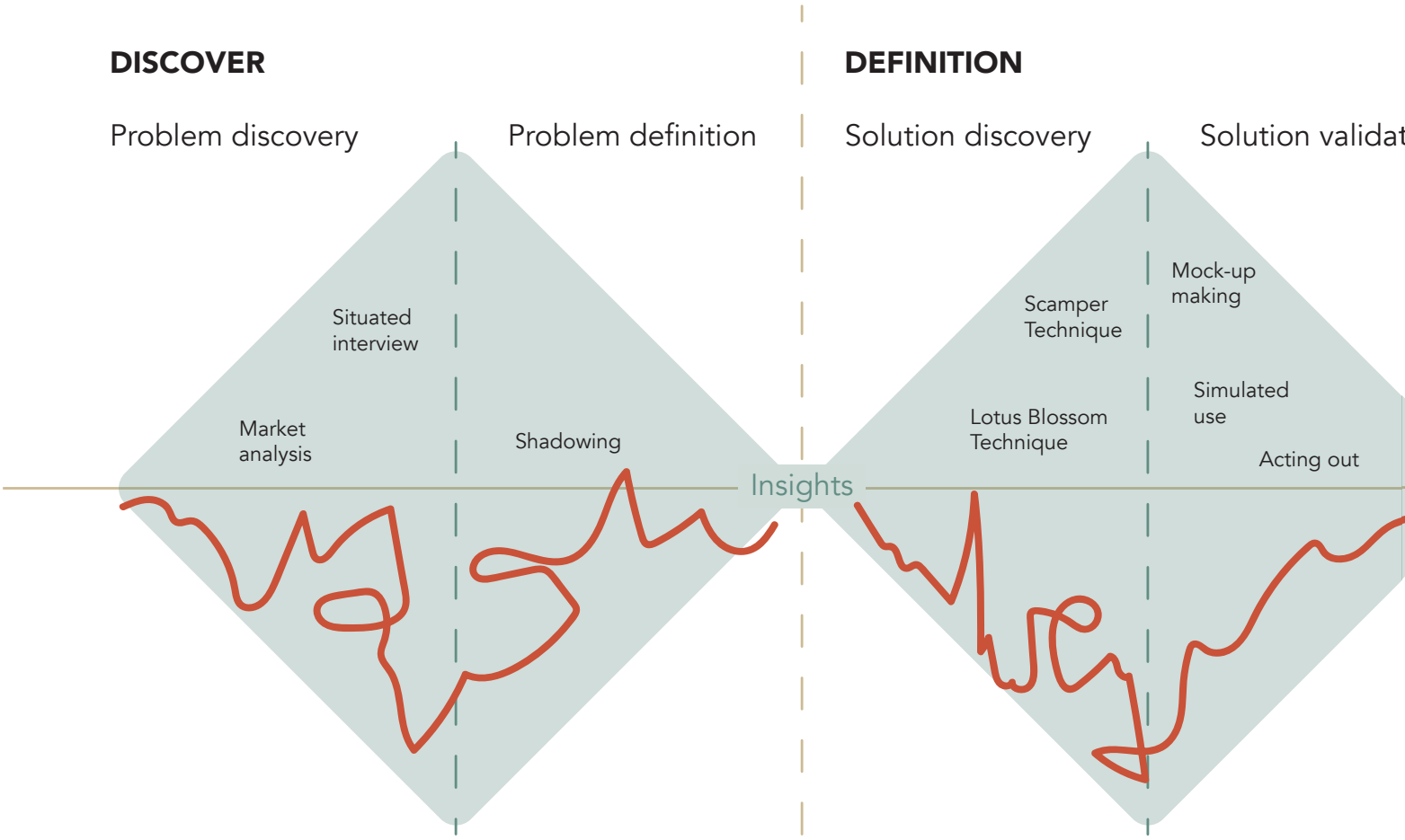
Content

00 Prologue

Methods

Double Diamond

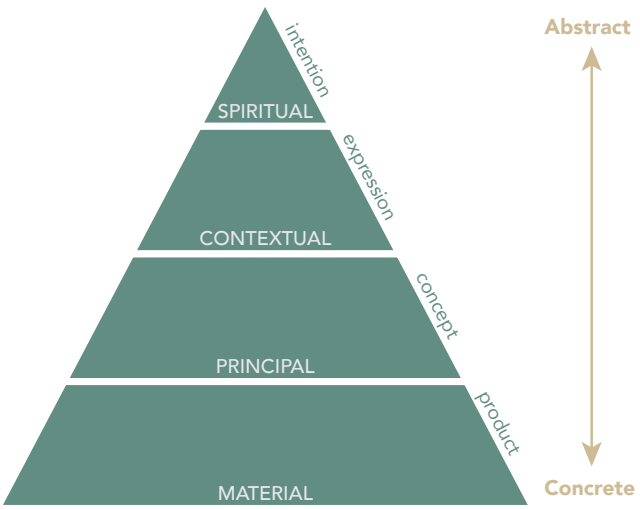
The iterative process is characterized by moving back and forth between exploring (divergent) and defining (convergent) (Brown, 2008). A framework for working divergent and convergent is the Double Diamond method. This method is roughly divided into four phases; discover, define, develop and deliver (Design Council, 2019). In these phases, other methods and techniques were used to select and deselect ideas in order to develop a strong concept. While the process appears linear in this report, please note that shifting between working divergent and convergent includes many iterations and changes of direction.



ill. 1

The Vision-Based Model

Lerdahl's Vision-Based Model describes a framework for a design process that focusses on how a design evolves from an abstract intention to a concrete outcome. The model is relevant for navigating in the search for product solutions. It describes four levels of abstraction: the spiritual level is the most abstract level and covers the intention with the product. The contextual level is where the intention takes shape into concepts. The principal level connects the concept with reality through functional and technical principles. The material level is the most concrete level and relates to the final product development (Lerdahl, 2001).



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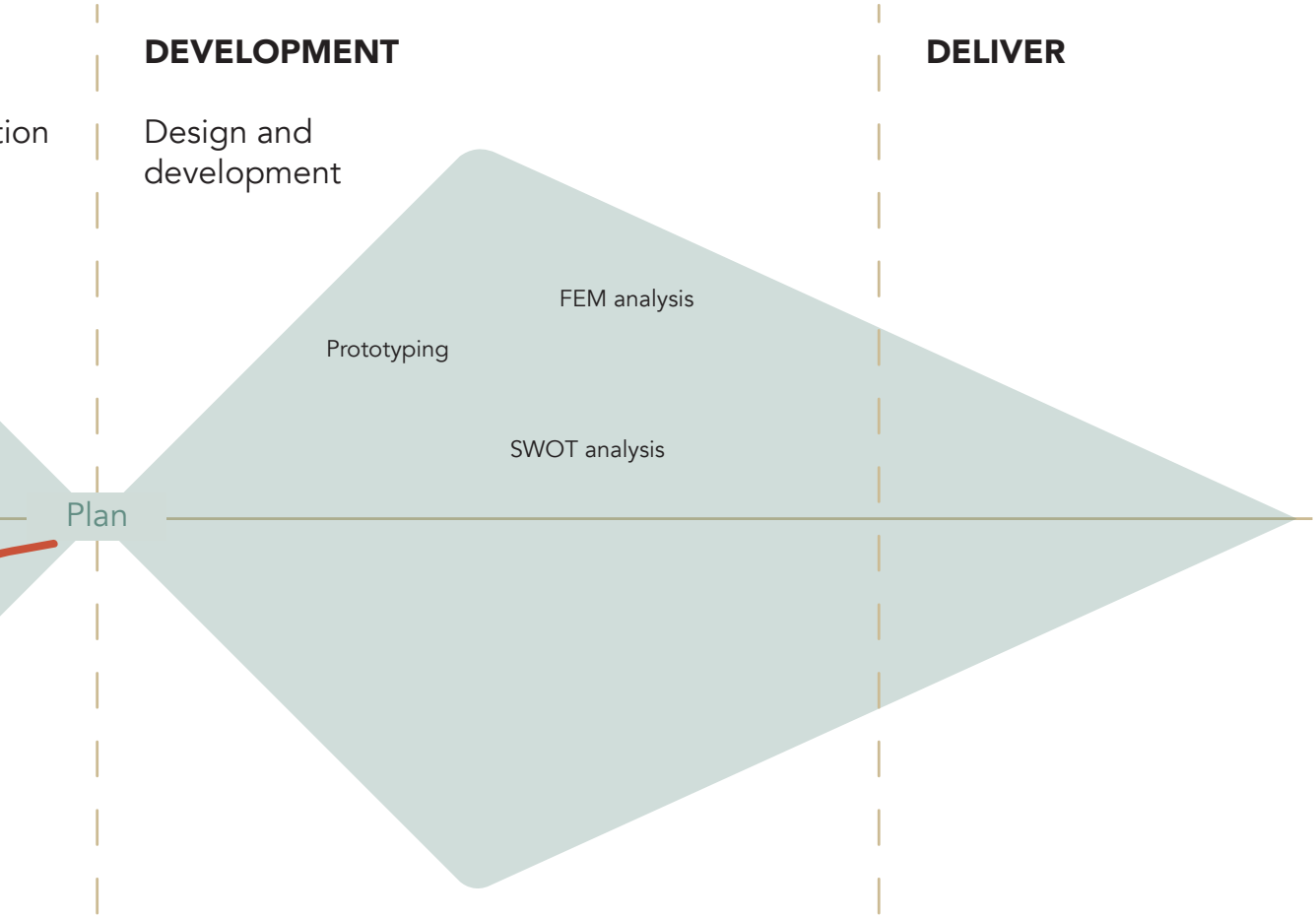


Strategic durability

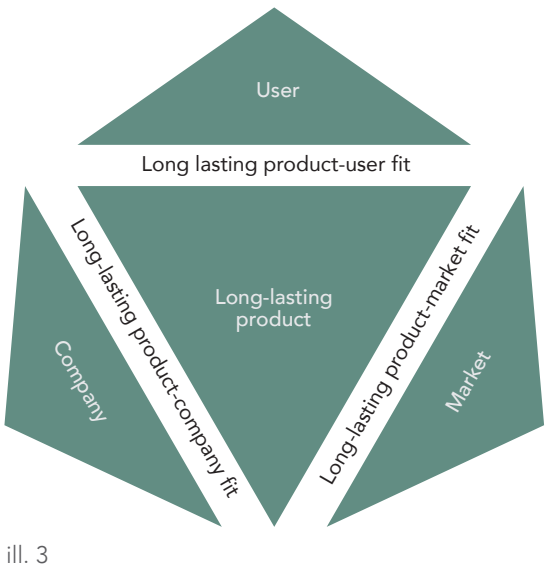
Strategic durability represents a strategy for designing products that does not only last long physically, but ensuring they remain relevant over time. To ensure this, Haase and Laursen (2023) represents three fits:

Product-user fit: The product must solve meaningful user needs.

Product-market fit: The product must align with market demands.

Product-company fit: The product must make sense for a company in terms of business opportunities and values.

The development of each phase of the process report has been driven by one or more of the three fits. The project aims to address the key elements necessary to achieve a strong strategic alignment between the user, the market, and the company (Haase & Laursen, 2023).



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Introduction

Børge Mogensen, designer of several FDB Møbler products, once said:

"Furniture should serve the human being."

However, the culture of human beings changes with time. As a result, designers are responsible of following this change to develop furniture, that serves the human being. In modern Danish offices, furniture, that is not designed for its users, often ends up being discarded which contributes to negative statistics about furniture waste.

This thesis presents a new take on the traditional workstation; the desk. Because, the needs for workstations in offices have changed and so must the furniture.

01 Framing

The following phase presents the project's mission and how it formed the foundation for the project framing and the initial problem statement.

EU furniture waste

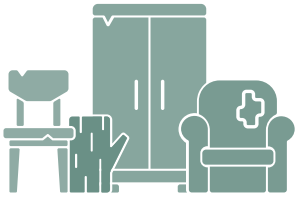
Estimates indicate that the annual furniture consumption within the European Union (EU) reaches 8.6 million tons of private market furniture and 1.9 million tons of contract market furniture. Conversely, 10.78 million tons of furniture are yearly discarded within the EU, reflecting a continuous cycle of new furniture replacing discarded items. Furniture waste constitutes nearly 4% of the total waste in the EU. There is however limited information on how this furniture is managed at the end of its life. Still, evidence suggests that 80% to 90% of discarded furniture is either incinerated or sent to landfills, with only about 10% being recycled. (European Furniture Industries Confederation, 2024)

Despite its high impact, the furniture industry has great potential to transform and contribute to the European Union's goals for a sustainable and circular economy (Nutcreatives & AMBIT, 2025).

ill. 4

10.78 million tons

of furniture yearly discarded within the EU



80% to 90% is either **incerated or sent to landfills**

Only about 10% is being recycled

ill. 5

EU regulations

The European Commission has established The Ecodesign for Sustainable Product Regulation (ESPR) or Regulation (EU) 2024/1781, expanding on the Ecodesign Directive 2009/125/EC, which had previously only applied to energy-related products. This new regulation broadens the scope to include various product groups, focusing on reducing resource consumption and strengthening circular economy. It aims to enhance product efficiency, extend durability, and improve access to sustainability-related information for consumers, businesses, and authorities (European Commission, 2022).

On June 28, 2024, the ESPR was officially published in the Official Journal of The European Union, establishing a framework for defining eco-design standards for sustainable products. These requirements are expected to be implemented by manufacturers between 2027 and 2028 (European Commission, 2022).

The ESPR enables the setting of performance and information rules, which are called Ecodesign Requirements. The Ecodesign Requirements are:

- Improving product durability, reusability, upgradability, and reparability
- Enhancing the possibility of product maintenance and refurbishment
- Making products more energy and resource-efficient
- Addressing the presence of substances that inhibit circularity
- Increasing recycled content
- Making products easier to remanufacture and recycle
- Setting rules on carbon and environmental footprints
- Limiting the generation of waste
- Improving the availability of information on product sustainability

(European Commission, 2024).

Mission

Due to the significant amount of furniture wasted in the EU each year and the considerable opportunity to transform the furniture industry, the mission of this project is to research the reasoning for discarding furniture and design a piece of furniture that aims to slow down the current waste loop. This piece of furniture must also align with the ESPR (European Furniture Industries Confederation, 2024). The project aims to meet the following Ecodesign Requirement:

- Improving product durability, reusability, upgradability, and reparability
(European Commission, 2024)

Limiting the generation of waste

Improving product durability, reusability, upgradability and reparability

Circular economy and circular stretegies

From the Linear Model to the Circular One

The circular economy represents a shift from the conventional linear model of production and consumption toward a system designed to maximize resource efficiency. Unlike traditional methods that lead to waste accumulation, this approach ensures that materials, components, and products circulate within the value chain for as long as possible, minimizing environmental impact and enhancing sustainability (Nutcreatives & AMBIT, 2025).

One of the key principles of the circular economy is extending product life cycles, which helps to significantly reduce pollution in air, soil, and water caused by waste disposal methods such as incineration or landfilling. This model challenges the outdated notion of an 'end-of-life' for products by integrating processes like maintenance, refurbishment, remanufacturing, and recycling into the production system (Hollander et al., 2017). Stahel (1994) introduced the slowed-loop concept, emphasizing that prolonging a product's usability helps conserve raw materials.

"Do not repair what is not broken, do not remanufacture something that can be repaired, do not recycle a product that can be remanufactured. "

(Stahel 2010, 195).

In terms of product design, the move towards a circular economy is driven by two types of strategies: slowing and closing resource loops (Bocken et al. 2016). This project will focus on the first one. Researchers have identified three key strategies for slowing resource loops:

Desing strategies for slowing resource loops		
Resisting obsolescence Design strategies for long use	Postponing obsolescence Design strategies for extended use	Reversing obsolescence Design strategies for recovery
Design for durability and reliability	Design for ease of maintance and reuse	Desing for recontextualization
Desing for emotional durability, attachment and trust	Design for upgradability and flexibility	Design fo repair
	Design for standarization	Design for refurbishment
		Design for remanufacture
		Design for dis- and reassembly

ill. 6

Design for maintenance

Maintenance involves regular check-ups and small fixes to keep a product working well. It helps avoid the cost and waste of major repairs or replacements. Durable products should be designed to make maintenance easy. According to Vezzoli et al. (2008) the next guidelines can facilitate maintenance:

- Simplify access to and disassembly of components to be maintained
- Avoid narrow slits and holes to facilitate access for cleaning
- Pre-arrange and facilitate the substitution of short-lived components
- Equip the product with easily usable tools for maintenance
- Design products for easy onsite maintenance
- Design complementary maintenance tools and documentation
- Design products that need less maintenance

Design for repair

For long-lasting products, repairability is essential. Products should be designed so repairs are simple and clear, with consideration of who will do them and how. Using standard, interchangeable parts makes repairs and spare part supply easier, while special parts can increase cost and complexity. Vezzoli et al. (2008) defined the following guidelines for facilitating reparation:

- Arrange and facilitate disassembly and reattachment of easily damageable components
- Design components according to standards to facilitate substitution of damaged parts
- Design products for facilitated on-site reparation
- Design complementary repair tools, materials and documentation.

Design for recontextualization and re-use

Recontextualizing means using an obsolete product (or its components) in a different context than originally intended, without any remedial action (den Hollander et al., 2017). However, this project will focus on extending the product lifetime by having multiple life cycles, by re-using. Re-use means using a product or its parts again after it's no longer needed by the first user. Continuing with Vezzoli et al. (2008) guidelines on re-use:

- Increase the resistance of easily damaged and expendable components
- Arrange and facilitate access to and removal of retrievable components
- Design modular and replaceable components
- Design components according to standards to facilitate substitution
- Design reusable auxiliary parts
- Design refillable and re-usable packaging
- Design products for secondary use

Collaboration with FDB Møbler

This project is made in collaboration with FDB Møbler, a Danish furniture and design company. The aim has been to develop a piece of furniture for their product portfolio that not only aligns with their brand but also addresses evolving needs of users and pushes the boundaries for the future of the company. The intention behind this is to encourage FDB Møbler to evolve and embrace innovation to remain relevant and competitive in the furniture market.

This approach has involved identifying key challenges, developing product proposals, and integrating business considerations to ensure the product aligns with future requirements and FDB Møbler's legacy and vision. In the aim for this, the project has contained frequent meetings and correspondences with the Product Manager at FDB Møbler.

Company profile

FDB Møbler is a Danish furniture company founded in 1942 as a part of a Danish Consumer Cooperative Society, which is today known as Coop (WS 01). The company was established with the vision of creating high-quality, affordable furniture for everyone, and FDB Møbler continues to uphold this legacy by reviving old classic designs while integrating new furniture to the meet evolving needs.

FDB Møbler strives to follow furniture architect Børge Mogensen's philosophy, "Furniture is made to serve the people.". With this in mind, the brand focuses on designing furniture that emphasizes practicality, functionality, and usability. FDB Møbler offers simple solutions that meet everyday needs, with designs free from unnecessary complexity, ensuring they remain relevant over time. Furthermore, the company prioritizes longevity and sustainability by focusing on durable designs with honest construction and certified materials* most often made from solid wood.

FDB Møbler's product portfolio includes a wide range of furniture for the private market, with only a few pieces suited for the contract market.

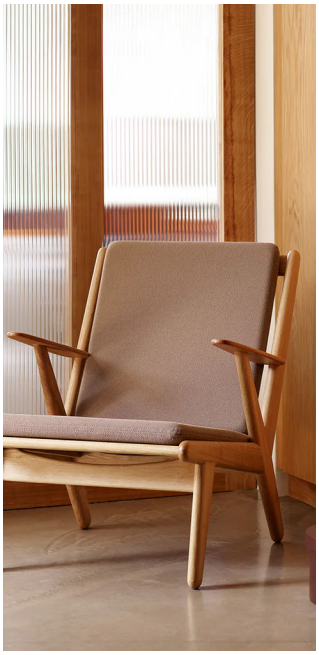
Focusing mainly on the private market, FDB Møbler faces a potential risk. While they pride themselves on delivering high-quality products for everyone in the private market, their medium price point might only align with established mid- and upper-class consumers. To stay relevant and remain competitive in a changing market, FDB could diversify their offerings and attract a broader audience.

* The certifications FDB use:

FSC, Oeko-Tex, BSCI, Nordic Swan Ecolabel, and EU Ecolabel.

◯ The solution should be made from solid wood

ill. 7



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FDB Møbler's target groups

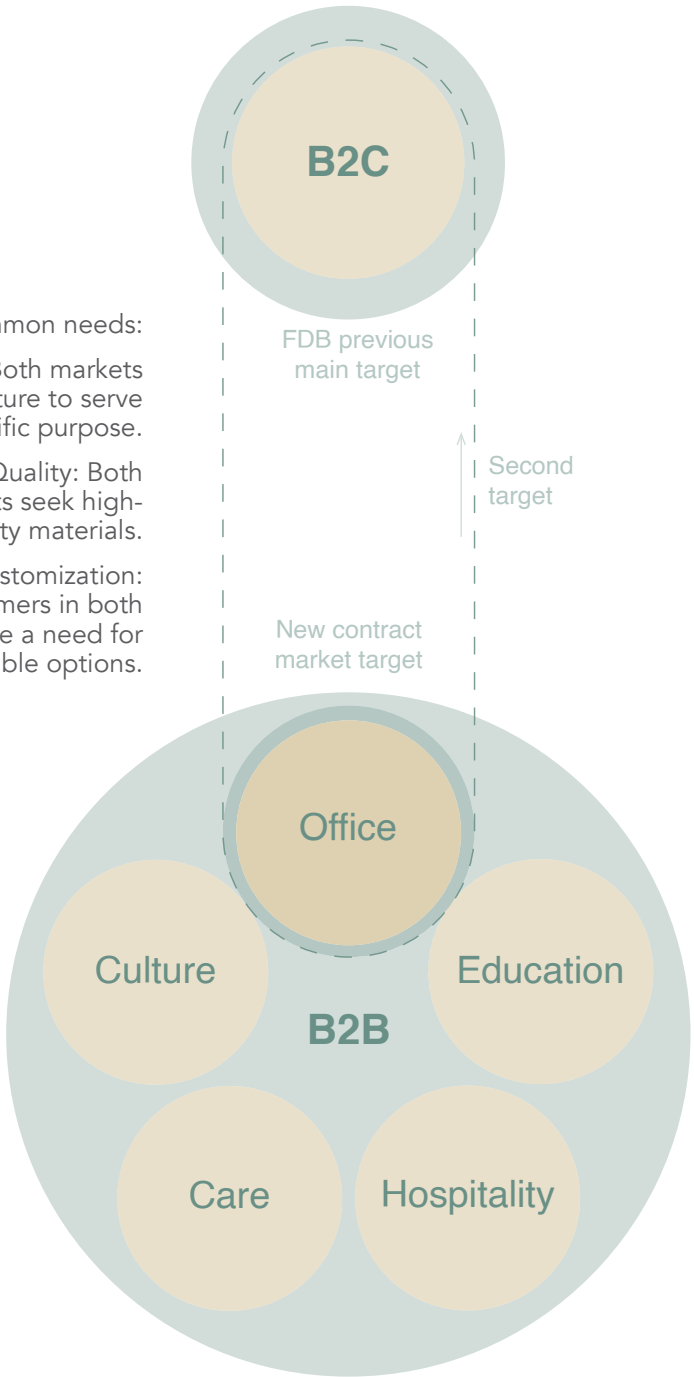
As mentioned, FDB Møbler is targeting private consumers (B2C) to a great extend and the contract market (B2B) to a lesser extent. FDB Møbler's entrance into the contract market over the past years is based on a shifting consumption pattern according to the Product Manager (WS 02). While the spending level of private consumers in the retail industry has been declining, a growing demand has been experienced from the contract market referring to for example offices, hotels and restaurants. To know the differences and commonalities of these two target groups, main needs have been listed (WS 03):

Common needs:

Purpose: Both markets need furniture to serve a specific purpose.

Quality: Both markets seek high-quality materials.

Customization: Consumers in both markets have a need for customizable options.



ill. 11

Private market needs:

Aesthetics: Private consumers in general have a need for furniture that matches their home and prioritize design and trends.

Comfort: Comfort mainly in sofas, beds, and chairs is important to private consumers.

Affordability: Private consumers are to a greater extent than the contract market price sensitive and have a need for affordable options.

Assembly: Many private consumers have a need for ready-to-assemble (RTA) furniture.

Space: Private consumers more often have a need for space efficient furniture.

Contract market needs:

Durability: Businesses have a need for furniture that can withstand heavy use over time.

Large purchases: Costumers of the contract market needs to be able to purchase in large quantities.

Functionality: Offices have a need for furniture designed for productivity.

Compliance: Furniture for the contract market must meet industry regulations.

Cleaning: The contract market have a need for cleanable products.

(Cronk, 2024), (Benhar, 2025).

Who are the discarders?

1st approach: private market

To research the reasoning for furniture discarding, it is essential to identify who the discarders are. In a situated interview with the Product Manager of FDB Møbler, she states that FDB Møbler is aiming to target the young generation (Sperschneider & Bagger, 2003):

"(...) there is also a need for us to keep up with the times and appeal to younger audiences (...)"

(WS 02).

Additionally, as indicated in the previous sections, FDB Møbler primarily targets the private market. This focus prompted research into the amount of waste generated when young private consumers move.

After conducting 15 interviews with young people aged 22 to 28 who have moved within the last five years, it was concluded that this group is effective at donating or reselling their furniture when they no longer need it. The interviewees stated that donating or reselling furniture is more efficient because it offers an opportunity to earn money, and going to a recycling station with furniture can be impractical without a car (WS 04).

With this concluded, it was evident that there was a need to explore another target group to investigate who participates in the large-scale disposal of furniture.

2nd approach: contract market

An investigation into the contract market began based on the assumption that large-scale companies discard a significant amount of furniture (WS 05). Eight different companies were contacted, and situated interviews were conducted with the furniture purchasers from the following five companies (Sperschneider & Bagger, 2003):

Company	Sector	Interviewed
Nordlux	Small private company	CFO
Aalborg University	Public institution	Interior designer
Pwc	Large private company	Interior designer
Spar Nord	Large private company	Interior designer consultant
Arp-Hansen & Interior Gruppen	Hotels	CEO

ill. 12

Key insights from these interviews revealed that large private companies such as PwC and Spar Nord, and institutions like Aalborg University have employed purchasing departments responsible for furniture purchases. A small company like Nordlux base their furniture purchases on current trends from larger companies, and hotels pay external companies to manage their furnishing.

An interesting tendency discovered at both PwC, Spar Nord and Aalborg University was that they often discard soft seating furniture found in soft spaces*[1] as they expand and require more hard-surfaced areas*[2] with workstations. This is a shame, according to the purchasing departments, because the soft spaces are made to provide a home like feeling at the offices, which should offer a more inviting environment, enticing the employees to work from the office rather than at home. However, workstations are also disposed of if they become scratched. To manage this discarded furniture, external services are employed to focus on donating, reselling, and recycling. This approach helps the companies promote a green image to their clients.

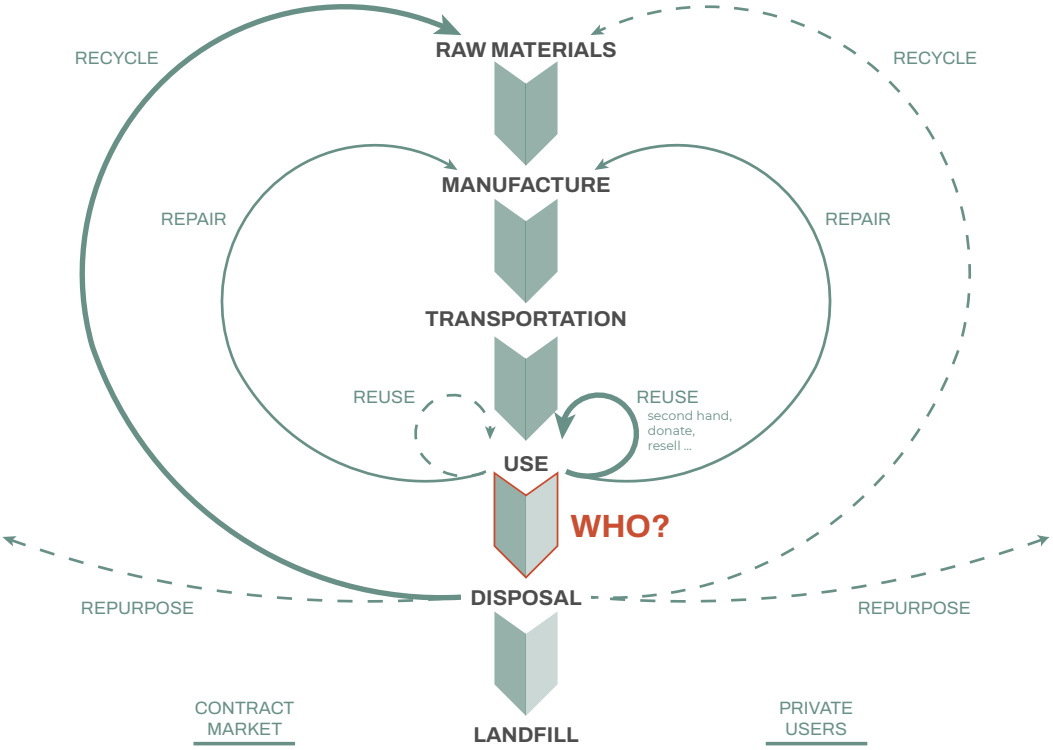
*1 Definition of soft space

Soft spaces refer to lounge areas in the office that feature comfortable furniture and more relaxed settings such as sofas or other informal workstations and relaxation zones. These are designed to promote relaxation, collaboration, and creativity, in contrast to more formal, desk-based workspaces.

*2 Definition of hard-surface area

Hard-surfaced areas refer to areas in the office such as desk areas covered with durable surfaces such as hardwood. These areas are often designed for functionality and is typically found in high traffic zones.

ill. 13

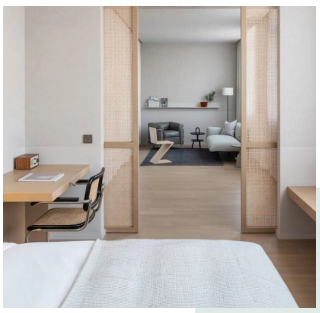


Early product category ideas for the contract market

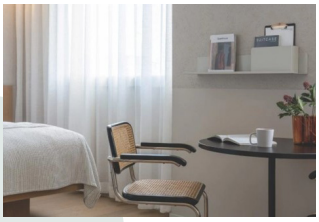
Based on insights from the interviews with the companies, product category ideas were developed to present to the product manager at FDB Møbler (WS 06). It is known that FDB Møbler mainly focuses on products for the domestic market with only a few designed for the contract market. The purpose of this presentation is therefore to gauge her thoughts on having a new product for the contract market in their portfolio.

HOSPITALITY CATEGORIES

ill. 14



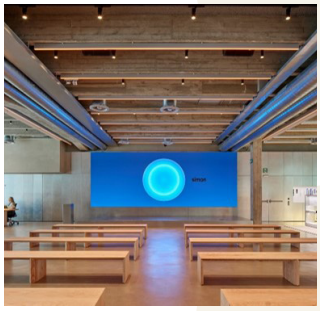
ADAPTABLE TABLE



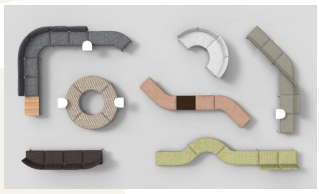
LOUNGE CHAIR

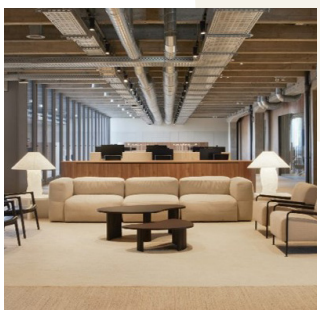
CORPORATE CATEGORIES

ROOM DIVIDER +STORAGE

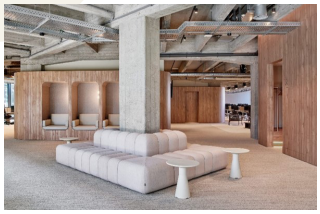


MODULAR SEATING





BREAKOUT FURNITURE



Feedback from FDB Møbler

Based on the presented product ideas, the Product Manager stated that FDB Møbler are seeking to expand into the contract market, however, given the company's size, they need to make sure that products designed for the contract market can as well be sold for the domestic market (WS 06).

Furthermore, the product manager expressed an interest in entering the office market, as their current contract market furniture targets hotels.

The solution must meet both domestic and contract market needs.

Chosen user group

In gathering this feedback, it was decided to work further with the two large private companies: PwC and Spar Nord. In addition to the Product Manager's feedback, it was found interesting that these companies hire an external firm to manage their discarded soft space furniture and their workstations, leading to the assumption that they dispose a significant amount of this furniture. Additionally, both companies have a purchasing department responsible for furniture purchases, suggesting that the necessary data regarding office furniture would be readily available at these two companies.

Company visits

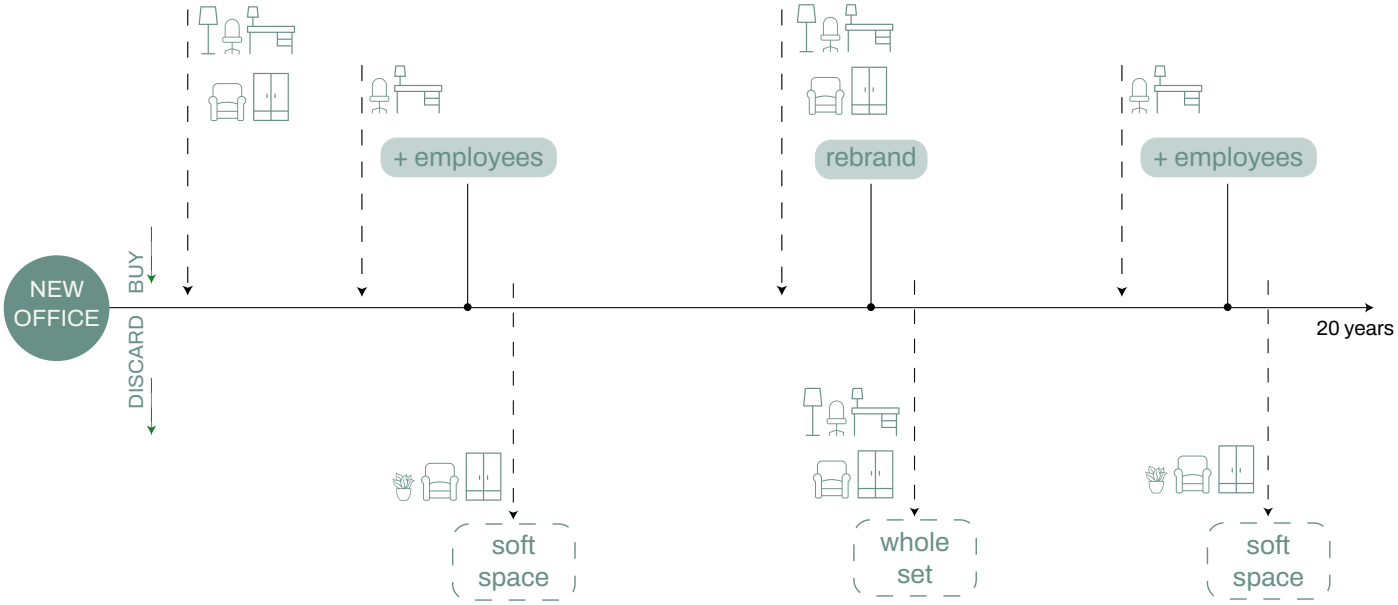
Following the decision of exploring large private companies, a visit to both PwC and Spar Nord was done to observe and gather more information about the companies, their furnishings and their discarding habits (WS 07). To obtain basic information about the companies, a number of questions were first identified:

	Spar Nord, Aalborg	PwC, Aalborg
Hot desking* or assigned seats?	Working towards hot desking because of lack of space	Hot desking
Do they have storage?	Only at the headquarters	No
Furniture budget per year:	3-5 million DKK distributed on 60 locations	Each office decides, but the budgets are high.
Who purchases furniture?	Tina Thorup, Design and Interior consultant. Tina proposes to the management of each location who approves. The employees' opinions are not considered.	Frida Ejlertsen, Interior consultant. Frida proposes to the management of each location who approves. Frida talks with employees from each office to know their opinions on the office furniture.
What furniture is discarded the most?	Good condition desks and soft space furniture because of an outdated appearance or scratches.	Good condition desks and soft space furniture because of an outdated appearance or scratches.

***Hot desking definition:**
When employees do not have assigned seats, it is called hot desking. This approach is used in many modern offices as a result of covid-19, where many people started to work from home and less permanent workstations at offices are needed.

In the previous interview with Spar Nord and PwC, it was mentioned by the furniture purchasers that the companies are trying to make their employees work from the offices instead of working from home. To support this, they aim to create a home feeling at the offices by incorporating soft spaces with lounge furniture. This prompted the question, why the most discarded items at PwC and Spar Nord, among others, are soft space furniture. Both companies said that for every new employee, they order a new desk, and since the companies grow, they quickly experience a lack of space. As a result, soft space furniture is substituted with more desktop tables. Below are office mapping form previous and current locations of PwC and Spar Nord, which show how soft spaces are discarded with traditional workstations over time.

ill. 15



ill. 16

However, soft space furniture are not the only items the companies describe as the most discarded ones. Desktop tables are also among the most discarded items of PwC and Spar Nord, because they tend to discard them when scratched or outdated. All of this discarded furniture is offered to the employees, but as the receptionist of PwC Aalborg, Lotte Kjær said:

> *"We have asked our employees if they want the discarded furniture, but they don't, because this is of course not furniture you want in your home."*

Since the employees do not want the discarded furniture, the companies are forced to hire an external company to handle the furniture; Spar Nord has hired Daarbak and PwC has hired Holmris B8.

After the company visits, two interesting problems were identified:

Companies create soft spaces that provide a home feeling at the offices to make their employees work from the offices, however these areas are often discarded and substituted with traditional workstations due to company growth.

Companies frequently discard desktop tables due to scratches or an outdated appearance. These are offered to the employees, who dislike the furniture because of its office look, so the companies hire external companies to handle their discarded furniture.

These two problems are connected to two different areas at an office. In order to determine a problem statement, these two areas are further investigated.

- The solution should be designed for second use
- The materials should maintain the appealing appearance, even when scratched or worn

Analysis of soft spaces and hard-surfaced areas

To further investigate the context areas of the two identified problems, pictures of soft spaces and hard-surfaced areas at PwC and Spar Nord were gathered and analysed (WS 08).

Soft spaces

It was observed that there are different kinds of soft spaces. Some areas are made mainly to provide a relaxed atmosphere and does not give the impression of being a workspace, while other areas are made specifically for working. These areas are marked with red. They are interesting, because the sofas in these areas are suited for working; they provide privacy, an ergonomic seat, and can adapt to both individual- and group work. However, the coffee tables in these areas do not fit the sofas and are not designed for working; they are too low and far away from the sofas.

Hard-surfaced areas

It was observed that all hard-surfaced areas had an industrial appearance, and that the most striking was the many elevation desks. As a results, these areas did not provide a relaxed atmosphere, as the companies want. The elevation desks seen at different offices were similar with only a small differentiation in style. The desks had cases to hide wires, and the shape makes it possible for the employees to rearrange the desks, whether there is a need for an individual workspace or group seating. Most employees had two screens, and some had add-ons on their desks to provide privacy. The tables take up a lot of space while stored, since they are not compactible.

ill. 17

Initial project direction

After analysing the two areas, it became interesting why soft spaces and hard-surfaced areas are complete opposites. Why are the hard-surfaced areas industrial, when the companies want to create a home feeling at the office? What is the reason for the similar desktop table's design, if no one want them in their home? This raised the question: can principles from the soft space furniture be integrated into the furniture in hard-surfaced areas and more specific into the desktop tables? And can this make it more appealing for the employees to take the desks home, when the companies discard them? This interest became the initial direction of the project.

Following this, wishes and demands from the analysis of soft spaces and hard-surfaced areas were developed:

- **The solution should allow the attachment of the companies' add-ons.**
- **The solution should be able to hide computer cables**
- **The solution should accommodate two screens.**
- **The solution should be movable by a single person.**
- **The solution should be rearrangeable.**
- The solution should offer a home feeling.
- The solution should be designed for compact storage.

What is home feeling?

As it was chosen to work with integrating soft space principles into hard-surfaced areas, it was essential to define these principles (WS 08). The companies incorporate soft spaces into offices because they want the employees to feel like home. But what is home feeling?

A moodboard with pictures from the home environment and offices which have succeeded to provide a home feeling was made to define principles used to create a home feeling.

In order to put words on these principles, a vocabulary of aesthetics and perception was used (Johnsson et. al 2003). The words that express the aesthetics and perception of the pictures on the moodboard are marked. These words are the ones that should express the product for the hard-surfaced area as well.

Aestetics-Sensory		Perception-Symbolic	
Feel	Soft	Passive	Simple
	Warm	Classic	Cozy
Texture	Smooth	Minimal	Common
Form	Organic	Delicate	Inviting
	Squared shape	Elegant	Informal
	Rounded details	Friendly	Robust
Colour	Muted colours	Functional	Handmade
	Natural		

Home... → **... Office**

ill. 18





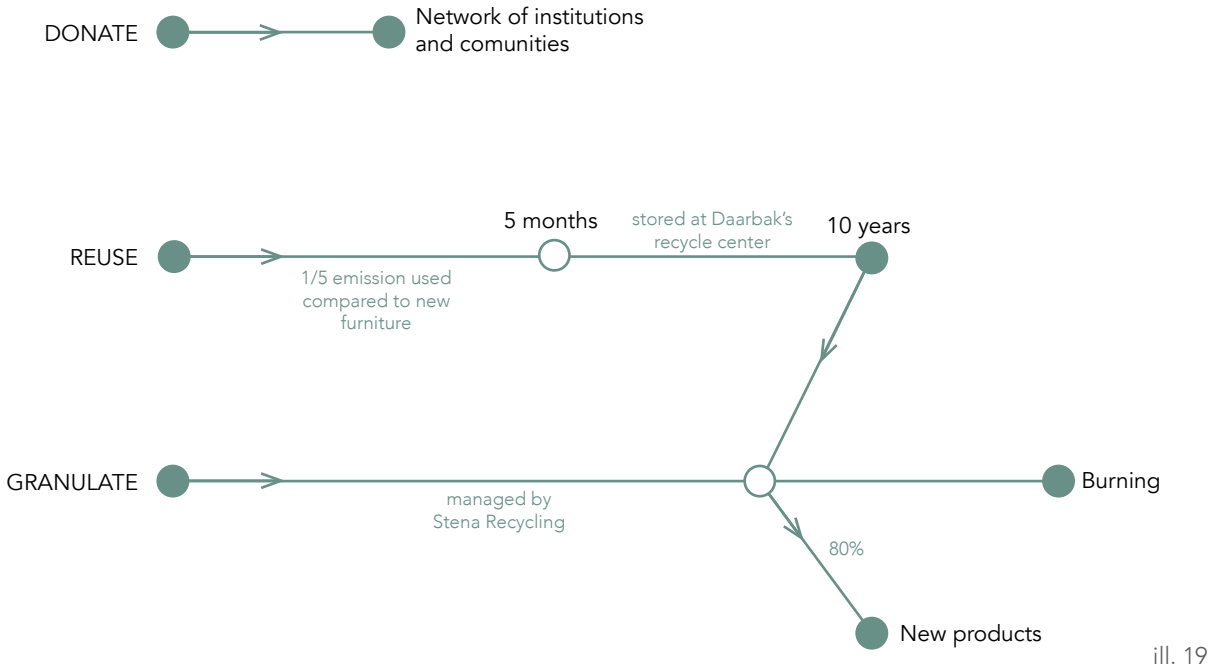



Who are Holmris B8 and Daarbak?

Holmris B8 and Daarbak are two Danish companies specializing in selling and dealing furniture to the contract market (Holmris B8, 2025), (Daarbak Design, 2025). As mentioned earlier, these two companies sell furniture to PwC and Spar Nord, while also handling their furniture waste. Furthermore, Holmris B8 also deals FDB Møbler's large sales for the contract market (WS 09).

The take-back programme

To know more about how these kinds of furniture dealing companies handle furniture waste for external companies, a situated interview with Daarbak's Marketing Director was established (WS 10) (Sperschneider & Bagger, 2003). He called the service the take-back programme, and this is visualized below:



ill. 19

The illustration above shows how the take-back programme is a marketing strategy for the furniture dealing companies to get more customers rather than an environmentally friendly initiative. As illustrated, a lot of the furniture ends up being stored or recycled with only a small amount being donated. Daarbak's Marketing Director explains that the reason for this is because of the furniture's bad condition or outdated appearance when discarded.

Gathering this information, it was assumed that companies like Daarbak and Holmris B8 are employed to provide a green image to their customers, while the furniture waste problem remains unchanged.

It was not possible to get an interview with Holmris B8, however current knowledge and insights suggests that Holmris B8 operates the same way as Daarbak (WS 11). A valuable note was however, that Holmris B8 offers a service programme to their customers, where they make frequent visits to companies and maintain their products.

Adapting strategy

Another insight from the interview with Daarbak was that they used a so-called adapting strategy. This adapting strategy referred to proactively influence users in the contract market towards responsibility in order to shape the market.

FDB Møbler has experienced many consumers claiming on fully functional furniture due to imperfections in wood materials. As a result, it was decided to use this adapting strategy in the product to aim to influence users to find value in wood with imperfections. If employees see it constantly in offices, they might adapt it to their home furniture.

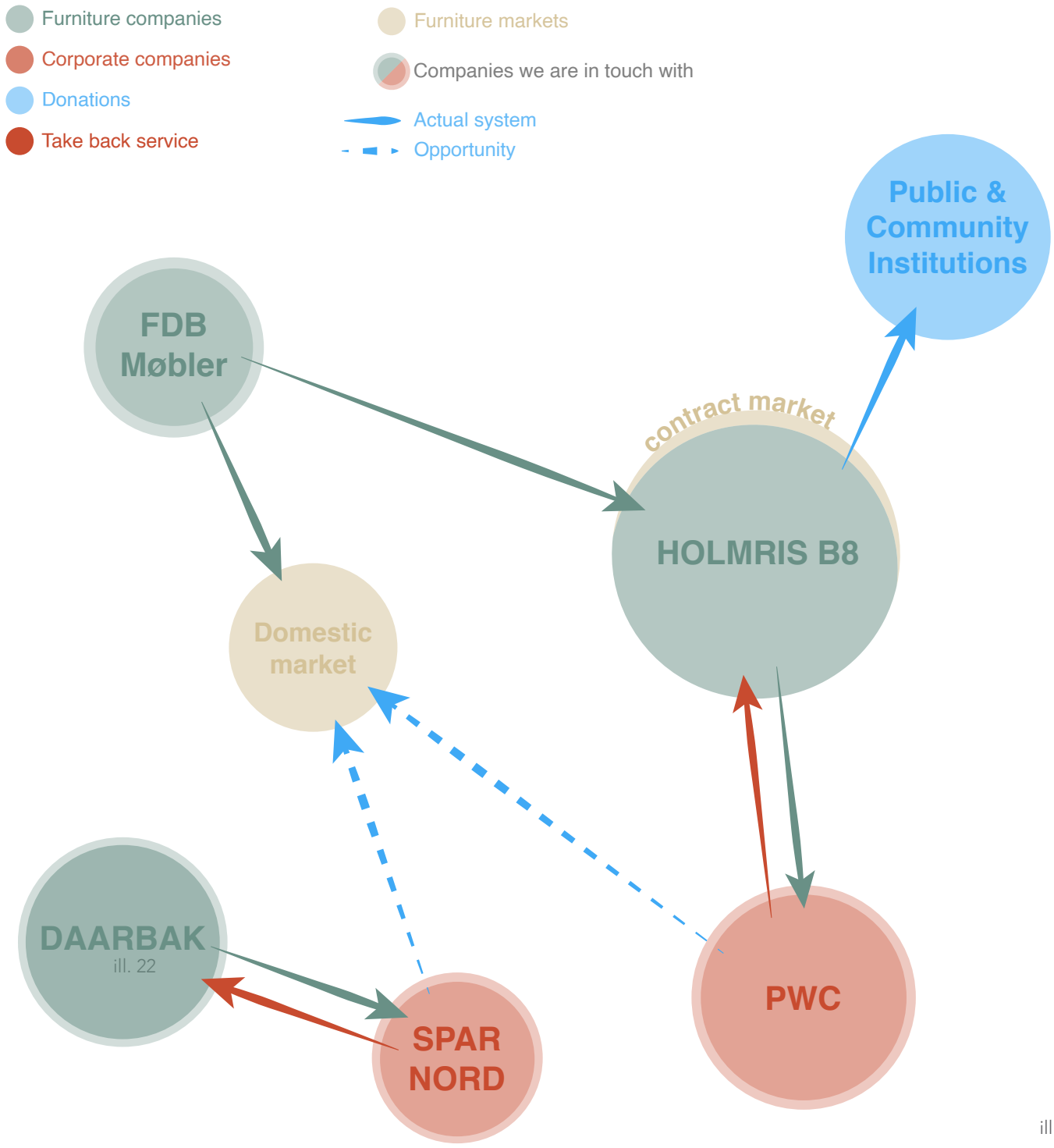
The design should feature unsorted wood.

To gain more knowledge about how much wood is unsorted, a situated interview with the Sustainability and Business Development Manager at Kvist Industries was conducted (Sperschneider & Bagger, 2003). Kvist Industries produce some of FDB Møbler's wooden products (WS 12). The following estimate was given:

"Around 10–20% of our wood materials are not suitable for a light lacquered finish, as any flaws and variations in the wood's appearance become much more visible with this treatment. In addition, there is also sorting out that happens at our suppliers, but unfortunately, I do not have those figures."

System mapping

In the development of the project, it became evident that several stakeholders were involved. As a result, a system mapping was made to provide an overview of the involved stakeholders.



ill. 20

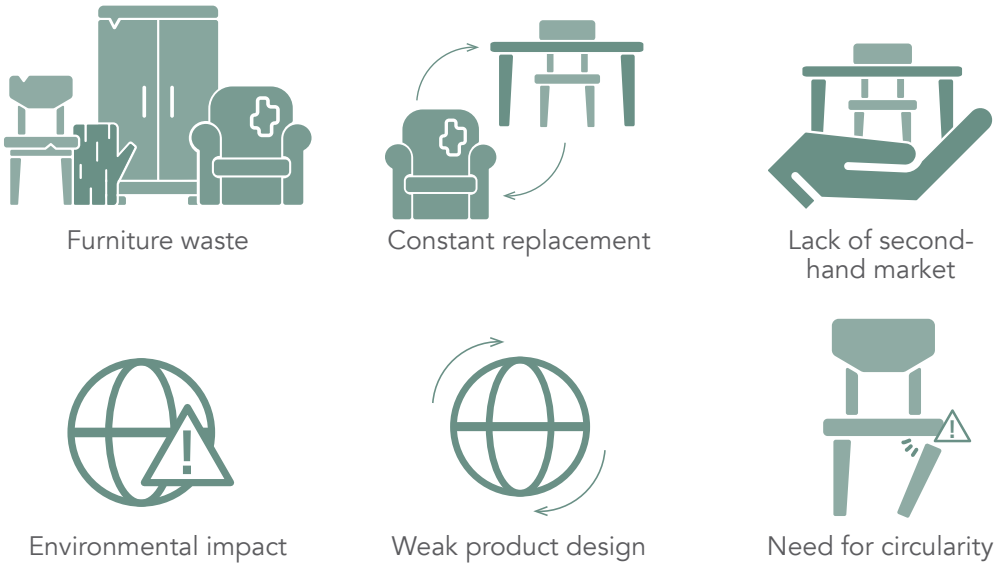
Initial problem statement

PwC and Spar Nord generate furniture waste due to frequent replacements during rebrands, expansions, and relocations. The companies strive to create a homely office environment, investing in soft spaces to enhance employee comfort and encourage them to work from the office rather than from home. However, as the businesses grow and hire more employees, space becomes a constraint, and the first elements to be removed are these soft spaces. The replacement is more traditional height-adjustable desktop tables. This results in companies repeatedly discarding furniture meant to improve workplace culture, only to replace it with traditional workstations that contradict their original goal of having comfortable and homely workspaces.

Besides not fitting into the companies' desire for a homely atmosphere, the traditional desktop tables are quickly scratched, worn out and going out of style, resulting in disposal. This disposal is managed by external companies, who offer a take-back system featuring donations, reselling furniture or recycling furniture. However, beneath the surface of these take-back systems is an underlying business of selling more new furniture and thereby wasting more furniture. PwC and Spar Nord aim to avoid this take-back system by offering their discarded desks to their employees to ensure the desk's second life, however current contract market desks are not designed to fit private homes resulting in the employees declining the offer.

As a result, the aim is to design a piece of furniture that takes these insights into account in order to slow down the current furniture waste loop of the companies. The following problem statement was developed:

"How can we design a piece of furniture that brings a soft, home-like feel to a hard-surfaced area while also allowing for second use?"



ill. 21

Initial design brief

Project overview

The aim of the project is to design a new take on a contract market desktop table for FDB Møbler's product portfolio. The reason for the project is based on an observed gap in the market for a desk that fits into a homely atmosphere and is designed for second use.

Mission

The overall mission is to:

Use insights and knowledge gained from current research to design a desk that slows down the existing furniture waste loop of desks.

Improving product durability, reusability, upgradability, and reparability.

Aim

The aim is to approach this mission by designing a desk that supports companies' desire to create a homely feeling at offices. Through better design of desks, there is a possibility of reducing the dominant culture of disposability in the contract market.

Context

The primary context of the desktop table is offices in private companies. The secondary context is private homes.

Target group

The primary target group is the users of the offices.

The secondary target group is private users.

Stakeholders

The desktop table must be designed for the Danish furniture company FDB Møbler's product portfolio, and FDB Møbler is the final approver of the product. Furthermore, the companies' furniture departments' opinions matter as they lead the furniture purchases.

Functionality and aesthetics

Demands

The solution should meet both private- and contract market needs.
The solution should be rearrangeable.
The solution should be movable by a single person.
The solution should allow the attachment of the companies' different add-ons
The solution should accommodate two screens.
The solution should be able to hide computer cables

Wishes

The solution should be made from solid wood.
The solution should be designed for second use.
The materials should maintain an appealing appearance, even when scratched or worn.
The solution should offer a homely feeling.
The solution should be designed for compact storage.
The aesthetics must fit with FDB Møbler's design principles.

Unique selling points

Designed for second use

Adaptable to the rearrangement of offices

Contributes with a homely feeling at offices

01 Wrapping up

Summary

The mission of the project fostered the exploration into office furniture. This opened up a large system with many stakeholders, insights and knowledge. This knowledge was used to create the framework of the project, initiating the intention of exploring desks. This phase visited the spiritual level, where research was translated into an intention. Furthermore, the contextual level was visited since observations were translated into concrete demands and wishes (Lerdahl, 2001).

Key takeaways

Reasons to discard in offices are because of reorganizations, rebrands, scratches or an outdated appearance.

Companies work towards a homely feeling at offices, however they buy industrial office furniture.

Companies want to donate their discarded furniture to employees, but it does not fit into the employees' home environment.

Demands

The solution should meet both private- and contract market needs.

The solution should be rearrangeable.

The solution should be movable by a single person.

The solution should allow the attachment of the companies' different add-ons.

The solution should accommodate two screens.

The solution should be able to hide computer cables

The design should feature unsorted wood.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should be designed for compact storage.

02 Idea generation

The following phase introduces a convergent approach to working with the initial problem statement. Furthermore, it presents how idea generation and a meeting with FDB Møbler contributed to a pivot, which changed the approach to divergent and reshaped the project's problem statement (Design Council, 2019).

IKEA visit

Since the aim was to design a desktop table which the employees want to bring to their homes, desktop tables for the private market were investigated. An employee from IKEA in Aarhus was asked to provide insights about the most popular desktop tables and sizes sold for the private market (WS 13).

A data sheet presenting IKEA's sales revealed that the most sold desktop table was the elevation table named Mittzon in the sizes 140x48 cm and 140x68 cm. 130 Mittzon tables in these sizes were sold the past week in their store in Aarhus (WS 13).

Based on this insight, it was concluded that many people buy desks for home use, and that the elevation function is also important in private homes. The sales furthermore showed that the private market values a large desk between 140x48 cm and 140x68 cm.

ill. 23

The size of the solution must be within 140x48-140x68 cm.

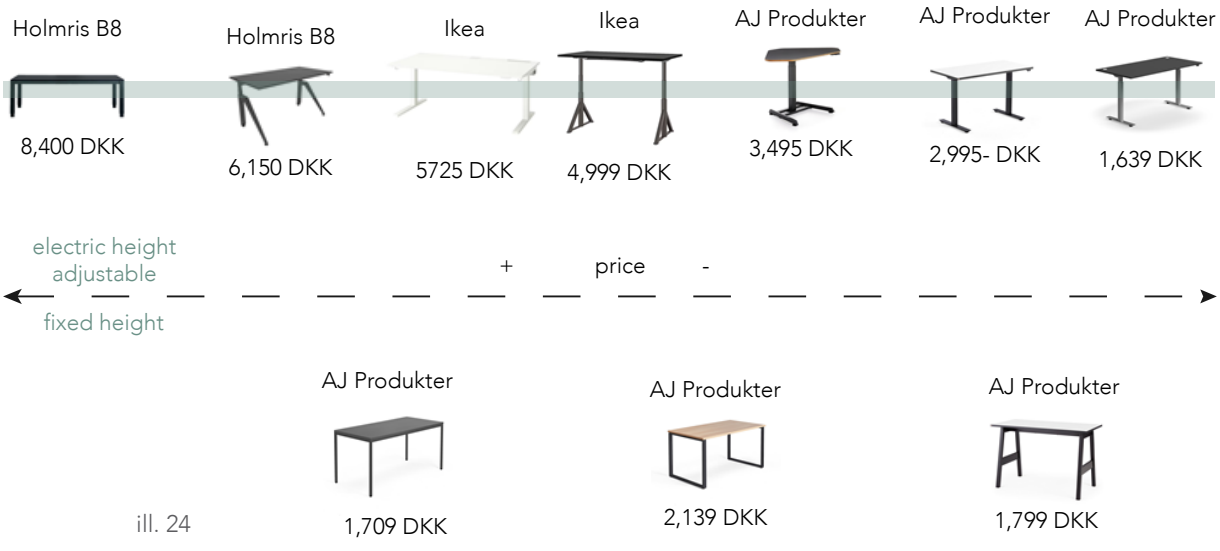
Market research: desks for offices

A market research was developed to conclude whether there is a potential for FDB Møbler to compete within the market of this product category (WS 14).

The following market research is divided in two. The first part investigates what is offered specifically for the contract market. The second part investigates what is offered by companies who, like FDB Møbler, are specializing in furniture for the private market but has already entered the contract market and are further along in the transition process.

Market research: Contract furniture brands

The market research revealed that electric height adjustable desks are dominating in this product category by companies specializing in office furniture. Entering this market could be challenging for FDB Møbler, since the solution would require complex electronic functions, which conflict with FDB Møbler's design principles.



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Market research: Private- and contract market furniture brands

This market research, on the other hand, revealed that only Montana offers a height adjustable desk, which also turns out to be electronic, however this aligns with the traditional industrial tables offered at Holmris B8. The other desks in this market, while not height-adjustable, feature a homely design using living materials. However, the price of branded desks was priced higher than those offered from the contract market brands.

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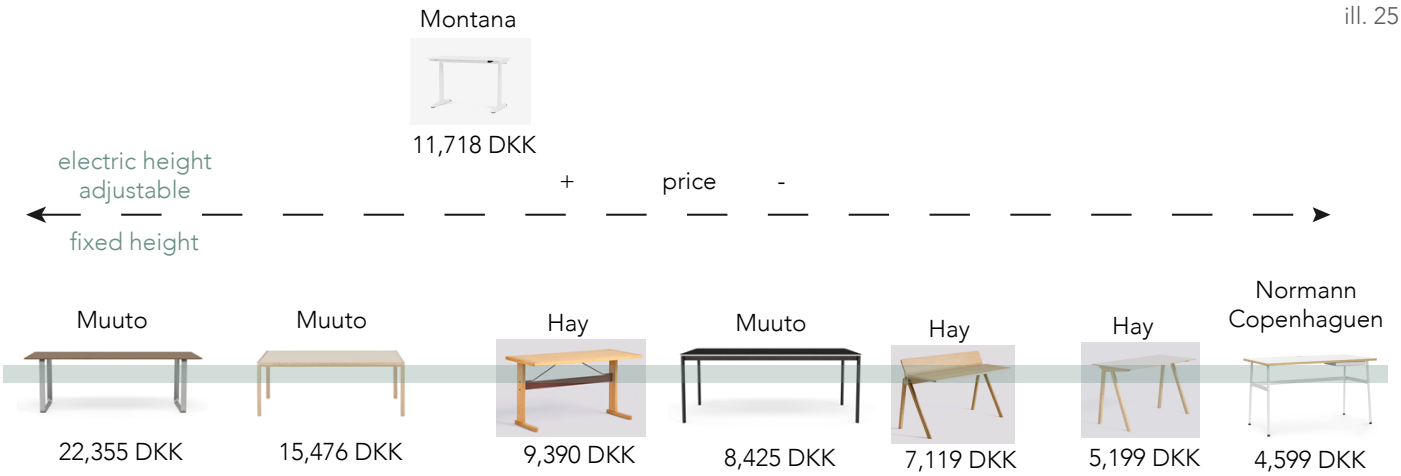


The contrast between the appearance between the industrial height adjustable desks and the homely not height adjustable desks raised an interest in the reasoning behind this difference. The interest initiated research into The Work Environment in Denmark's requirements for office desks (WS 15). It was found that if multiple employees are sharing the same desks, a height-adjustable function is required. Since the aim was to design this table for hot desking, the table must fit to various employees.

Overall, the office-oriented desks, including those from brands also targeting the private market, often appeared highly industrial. While this may reflect on limited demand for more homely, height adjustable desks, it could also represent a blue ocean opportunity, allowing FDB Møbler to differentiate by targeting an underserved segment within the contract market.

Concluding on the research into the desktop table market, there is a gap in the market for a desk featuring both a homely design and a height-adjustable function.

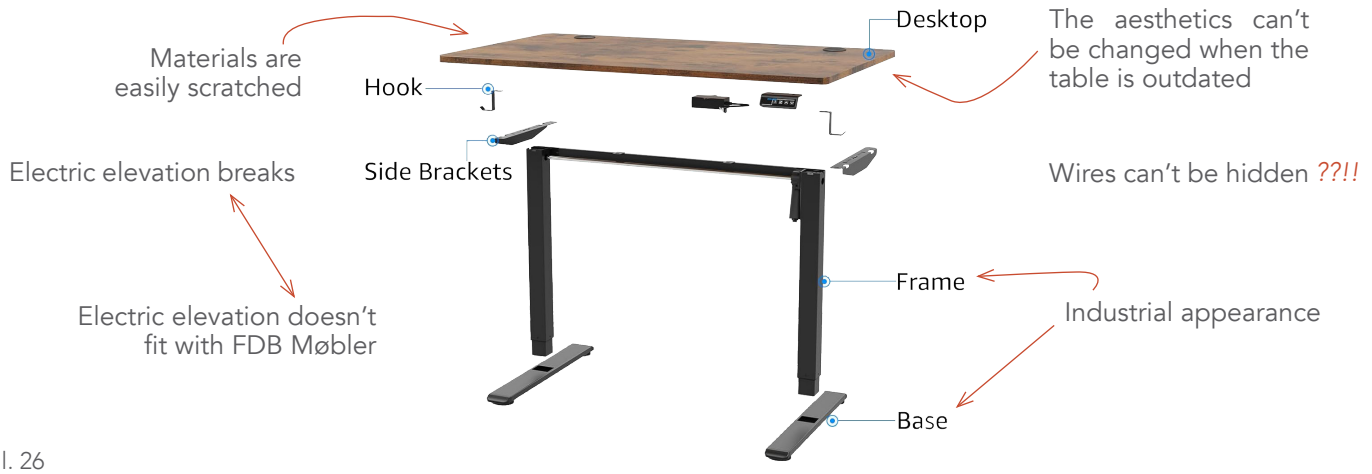
The solution must be height adjustable

1st round of concept development

After gathering insights and research into desks, the first round of concept development was initiated with the end goal of presenting concepts to FDB Møbler's product manager (WS 16).

Problem slicing

To create a framework for the concept development, the traditional elevation desk was sliced into problems observed in previous research. The problems are visually expressed on the illustration below. These were translated into demands and wishes to establish a basis for the ideation.



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~~The solution must be height adjustable~~ → **The solution should allow for manual height adjustment.**

The design should allow for changes in appearance.

SCAMPER

To initiate the ideation process, the SCAMPER technique was used. The SCAMPER technique is a brainstorming tool that allows for problem solution exploration by altering an existing product through the following approaches: Substitute, Combine, Adapt, Modify, Put in Another Use, Eliminate, and Rearrange (Elmansy, 2015). The outcome was the following prompts:

S – Substitute

What or who can be replaced?
What rule can be changed?
And what component?

S1: Replace solid wood with layers, so you can take off a layer, when it is worn out.
S2: Replace the legs with the leg system of an ironing board.
S3: Replace the legs with wall mounting.
S4: Replace the electric elevation with a manual elevation

C – Combine

What elements can we combine?
Could we combine different materials?
And process?

C1:Can we integrate the cables into the table?
C2: Can we combine a solution where you can choose whether you want the elevation or not.
C3: Can we combine different types of tables in one?

A – Adapt

What can be borrowed from another product?
What ideas from other disciplines can be brought here?

A1: Can we make it adaptable for movement?
A2: Can we make it adaptable for different seating positions?
A3: Can we adapt the airplane table principle to a table?

M – Magnify

What can be made larger?
How can it last longer?
What can be multiplied?
What can be made smaller?

M1: Can we multiply the number of curves to make it more organic and home-like?
M2: Can we make it lightweight?
M3: Can we make it easy to upcycle?

P – Put other use

What other uses could it be used for?
How could it acquire new uses through transformations?

P1: Can we design it for second life?
P2: Can we design the legs to fit different desktop dimensions?
P3: Can it be used for storage too?

E – Eliminate

What would happen if we eliminated a component?
How can we eliminate the competition?
How could we save costs?

E1: Can we make everything repairable to eliminate waste?
E2: Can we discard unused space on desktop?
E3: Can we use only one material?

R – Rearrange

How can we change the order or shape of the components?
In which locations could we rearrange it?

R1: Can we change the shape of the legs so they can provide elevation?
R2: Can we rearrange the legs, so they are on top of the table?
R3: Can we change the shape of the table, so it is groupable?

Lotus blossom technique

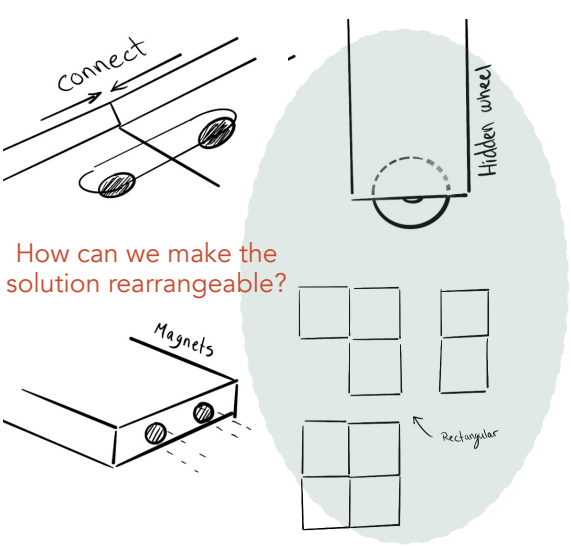
The Lotus Blossom Technique is an organized brainstorming session technique. It is structured as a grid where the core problem is written in the center square, and the subproblems are written in the surrounding squares. For each subproblem, a new grid is created, and solutions are sketched for the specific problem (Guthrie 2022).

Following the idea brainstorm, the Lotus Blossom technique was used to further explore possible solutions on the following demands and wishes:

Demand **The solution should allow for manual height adjustments.**

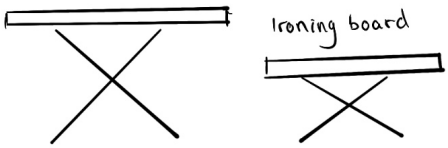
Wishes
The design should allow for changes in appearance.
The solution should be designed for compact storage.
The solution should be able to hide computer cables

These demands and wishes were translated into questions and placed in the centre of the Lotus Blossom. Subsequently, solutions were sketched for each individual question:



How can we make the solution rearrangeable?

How can we make a manual height adjustment?



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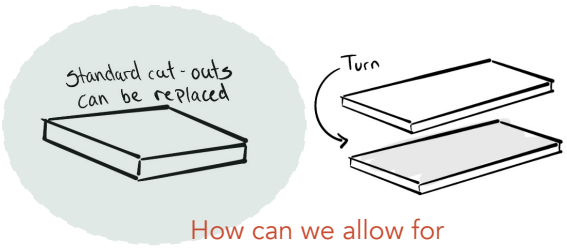
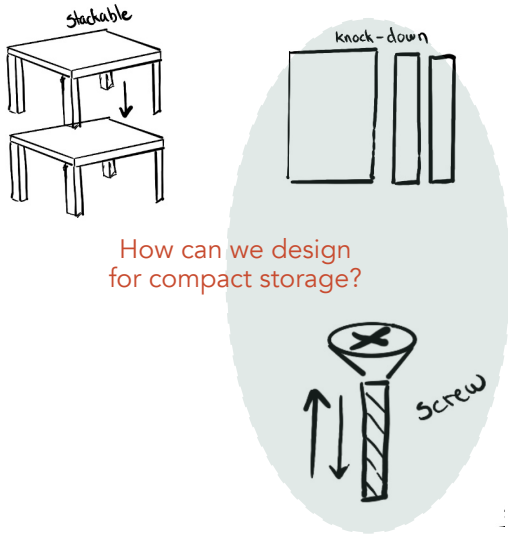


How can we allow for changes in appearance?



How can we design for compact storage?

During the sketching upon the wish; The solution should be able to hide computer cables, it was concluded to delete this wish, since it was known, that cable hiders can be bought as an add-on.

~~The solution should be able to hide computer cables.~~

Concepts proposals

After sketching using the Lotus Blossom Technique, it was decided to take a step back and show FDB Møbler a concept proposal concerning the two initial problems that were observed:

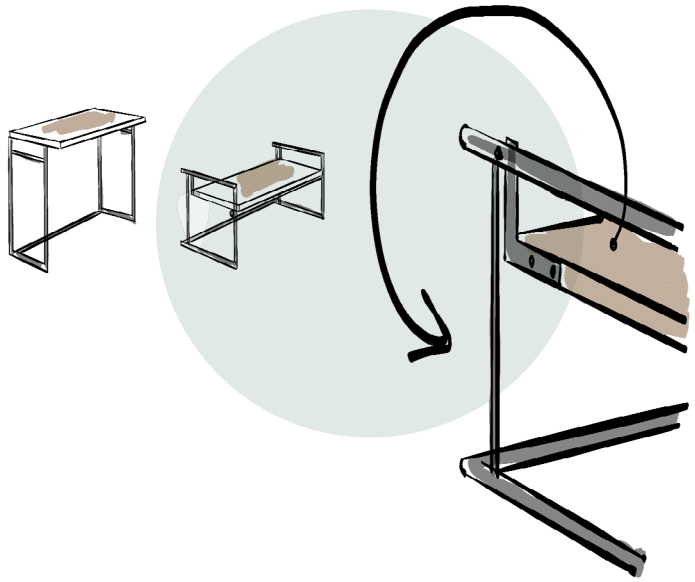
Companies create soft spaces that provide a home feeling at the offices to make their employees work from the offices, however these areas are often discarded and substituted with traditional workstations due to company growth.

Companies frequently discard desktop tables due to scratches or an outdated appearance. These are offered to the employees, who dislike the furniture because of its office look, so the companies hire external companies to handle their discarded furniture.

The intention of showing different options was to allow FDB Møbler to have an influence on the direction, which would ensure that the product category aligns with FDB Møbler's future plan.

Concept 1: An answer to problem 1

Since companies are trying to encourage employees to work physically at the office through design and facilities like soft spaces, concept 1 is a transformable coffee table for these exact areas. In contrast to the current coffee tables in soft areas, this coffee table can be manually height adjusted by employees and transformed into a flexible workstation that allows employees to choose where they work based on their needs.



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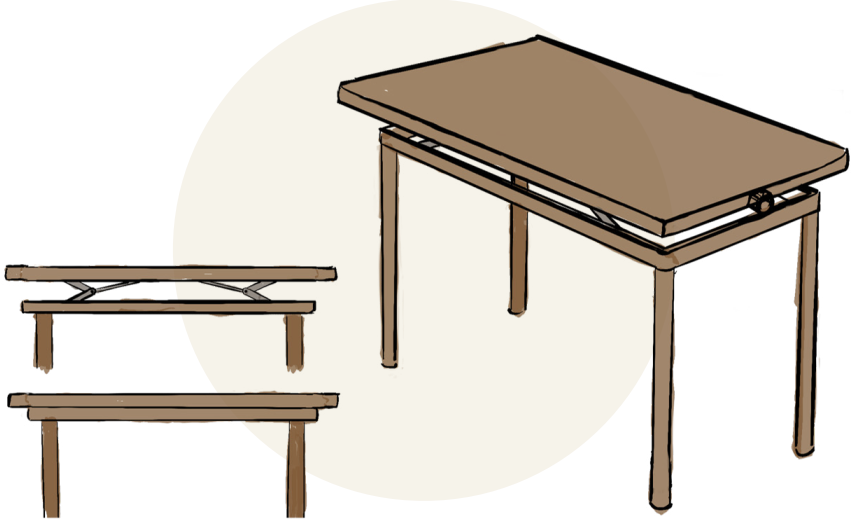
Concept 2: An answer to problem 2

To improve the second life of desks, concept 2 is a manually height adjustable desktop table. The desk can be height adjusted using the same principle as in a piano stool: by turning a knob that makes the tabletop go either up or down. This analogue principle provides tactility and intuitiveness making it suitable for FDB Møbler. Furthermore, the desk is made from solid wood, which makes it durable while bringing a soft feeling to a hard-surfaced areas.



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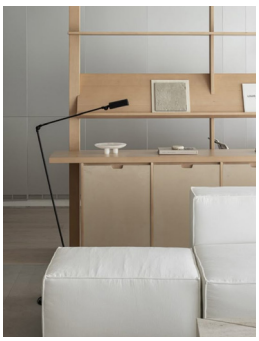
Moodboards

Despite the two concepts, three moodboards were also developed to show principles that were aimed to be incorporated in either of the two products.

Moodboard 1

Moodboard 1 represented the homely atmosphere that was aimed to be incorporated into the office product. It shows some of the features, shapes, materials and principles known from the home environment, which could be applied in the product. The moodboard features, among others, living materials, soft edges and shapes, ergonomic shapes and handcrafted details.





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Moodboard 2

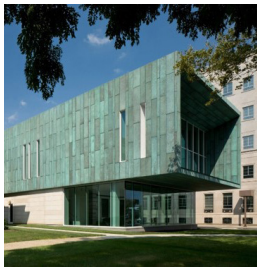
Moodboard 2 presented the aim of working with unsorted materials. This was to ensure that only a small amount of materials go to waste during production, and furthermore to change the perception of materials with imperfections into a valuable part of design.



ill. 31

Moodboard 3

Moodboard 3 featured materials that age gracefully. The aim behind this was to incorporate materials which have not necessarily reached their peak at the moment of purchasing. Incorporating this principle is to ensure a longer lasting product, that does not need to be discarded because of scratches.



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Feedback from FDB Møbler

The two concept proposals and the three moodboards were presented to the Product Manager of FDB Møbler (WS 09).

Key insights

"A desktop table is a too hardcore contract market product for FDB. All our competitors are looking at the contract market right now, and they are already big players, so we will never be in the top 10. We are only dating the contract market".

"The coffee table is interesting, because I can see a cross-over between the private- and the contract market. If offers something you do not see elsewhere".

"Choose a function that is analogue and naive. Even a kid should know how to use an FDB Møbler product".

The Product Manager saw the most potential in concept 1 for FDB Møbler. However, she provided valuable feedback for both concepts:

- The product must be easy to read.
- The design must be naive, intuitive and user-friendly.
- Use an old principle and renew it.
- Use assorted as a part of the design.

The design should feature assorted wood.

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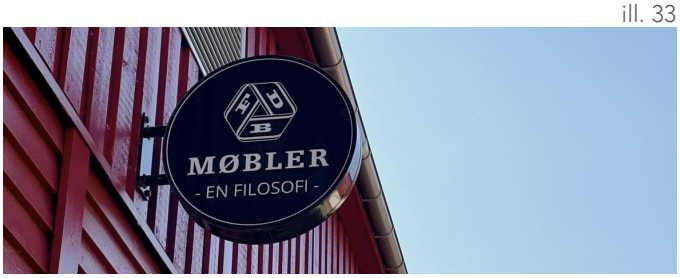

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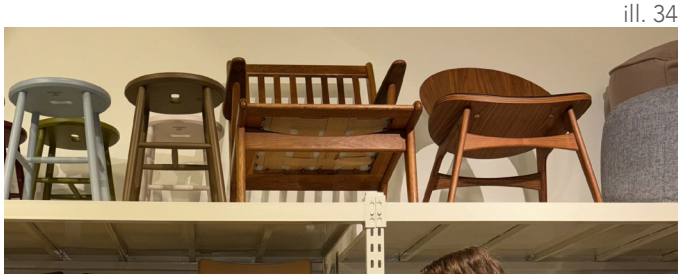

Pivot

After analyzing and reflecting on the feedback obtained, it was decided to change the direction of the project towards the observed problem 1:

1) Companies create soft spaces that provide a home feeling at the offices to make their employees work from the offices, however these areas are often discarded and substituted with traditional workstations due to company growth.

Firstly, there was an agreement that entering the desktop table market was out of scope and too competitive for a small company like FDB Møbler. Secondly, it was believed that the transformable coffee table will have a stronger position in the market, since a cultural shift away from traditional workstations has been observed.

Reflecting on this pivot, involving FDB Møbler during the process would have been beneficial. The gap between the first and second round of feedback had been too long, and focusing on a single product category at this point of the process was too narrow, when collaborating with a company. FDB Møbler was therefore more involved in the process going forward from this pivot.

Moving towards a new product category, some wishes and demands were adapted to the coffee table, while some were deleted.

Justification	Demands
This is a demand coming from FDB Møbler's business strategy and must be applied to all their products.	The solution must meet both domestic and contract market needs.
Since the product is a transformable workstation for various employees, the same requirements count for a coffee table.	The solution should allow for manual height adjustment.
It is still a desire to implement unsorted wood as an adaptability strategy towards the users.	The design should feature unsorted wood.
	Wishes
This is FDB Møbler's value, which is aimed to be followed.	The solution should be made from solid wood.
Since it is difficult to influence companies not to discard furniture, the focus remains on designing a product suited for a second life.	The solution should be designed for second use.
To prevent the product from being discarded quickly because of scratches, the aim is to use materials that age gracefully with use.	The materials should maintain an appealing appearance, even when scratched or worn.
The product should still fit into the companies' desire to create a homely atmosphere at offices.	The solution should offer a home feeling.

Architects and interior designers as stakeholders

As a result of basing the pivot, among other reasons, on an observation showing a cultural shift away from traditional workstations, this observation needed to be tested. FDB Møbler's Head of International Sales had previously stated that architects and external interior designers are often employed by companies to select furniture for their locations. It was therefore decided to test the observation by asking two interior architects about trends within the office market (WS 17).

Hotdesking

"We see hot desking almost everywhere – companies no longer have space for all employees".

"Ergonomics are not as much of a concern in a lounge environment, but for standing workstations and alternative seating arrangements, it is a focus." - Interior designer

Soft spaces

"There is likely more focus on soft spaces, as many employees now work from home several days a week following the covid19 pandemic. Companies are looking for ways to attract employees back to the office by creating a cozier atmosphere. Additionally, if regular workstations are occupied, lounge areas can be used as alternative workstations." - Interior designer

Since the interior architects confirmed the thesis of a shift in the office culture, further research into the coffee table market will be conducted.

Market research of coffee tables

Market research into coffee tables was developed to discover potential gaps for FDB Møbler (WS 18). Similar to the previous market research into desks, Holmris B8 was used, this time focusing on what kind of height adjustable coffee tables they offer, since they are one of the biggest furniture dealers in Denmark. Another market research focuses on what coffee tables FDB Møbler currently offers to know, what products are already in their portfolio.

Market research: Height adjustable coffee tables at Holmris B8

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Based on this market research it was observed that Holmris B8 only offers a narrow range of height adjustable coffee tables. In addition, the coffee tables available offer similar principles; small tabletops, industrial appearance, and most of them are height adjustable with a gas pump or a knob screw. The height adjustability in these tables varies from 48-80 cm. Besides only knowing some of the prices, it was observed that the price point for height adjustable coffee tables at Holmris B8 is high with the cheapest table priced at 3,700 DKK.

~~The solution should allow for manual height adjustments.~~ → **The solution should allow for manual height adjustment between 48-80 cm.**

Market research: Coffee tables at FDB Møbler

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FDB Møbler's current coffee tables are designed for the domestic market and features previously defined home-furniture principles. They are all made from different types of solid wood and does not feature any adjustable functions. The price point varies from 1,799 DKK to 5,999 DKK.

Based on the market research into Holmris B8's adjustable coffee tables, it was concluded, that there is a gap in the market for height adjustable coffee tables that uses the previously defined home-furniture principles and offer a cozy atmosphere. Furthermore, FDB Møbler does not yet have adjustable coffee tables in their product portfolio, which opens up the possibility of developing a homely, adjustable coffee table for FDB, that can distinguish in the market.

Observations of people working in soft spaces

To obtain an understanding of the user interaction and needs in soft areas, field research was conducted (Beyer & Holtzblatt, 1998) (WS 19). The field research contained observations of students and employees working at AAU Create, AAU Innovate, and Spar Nord.

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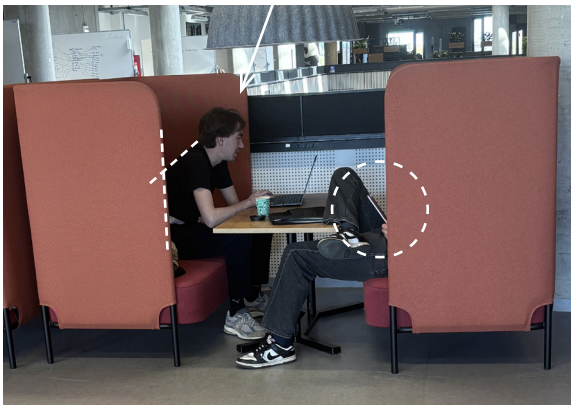

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Following the observations, interviews were conducted, resulting in the following insights:

The reasoning for using the soft spaces:

Soft spaces were used as a privacy area for focus work, because hard-surfaced areas can be noisy and distracting.

When meeting rooms were occupied, soft spaces were used for small meetings.

Soft spaces were used because they were more comfortable and relaxing.

Soft spaces were used for 121 meetings to create an unformal situation.

The solution should convey a sense of a productive workspace.

Insights:

The user's ability to shift working position was highly valued.

A soft space must provide a change of environment.

Users valued comfort over posture in soft spaces when using it temporarily.

Users working an entire day in soft spaces claimed ergonomics as important.

A soft space should be cozy but must also convey a sense of a productive workspace.

When working from home, some users tended to alternate between using a desk and a sofa.

Scenarios

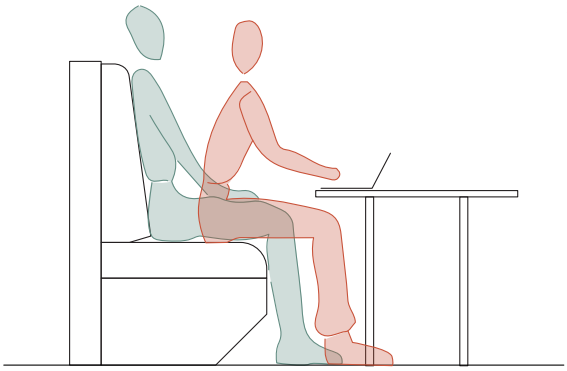
Gathering the observations from the field research, three common user scenarios were mapped out. The user scenarios helped to identify user needs and user equipment, which became the basis for the coffee table's key features.

Individual meeting webinar

Computer camera ON

Computer distance adjusted to the camera's position

Cup of coffee



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Small group or 1:1 meeting

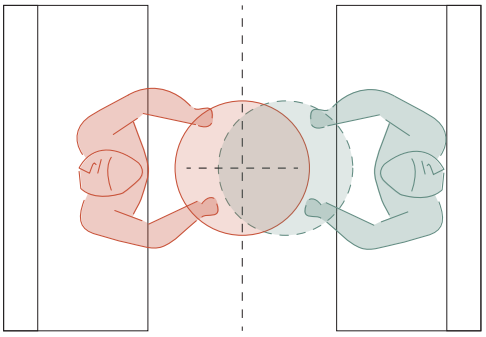
Shared computer screen

Physical papers

Users taking notes

Two cups of coffee

Reasonable distance between two users



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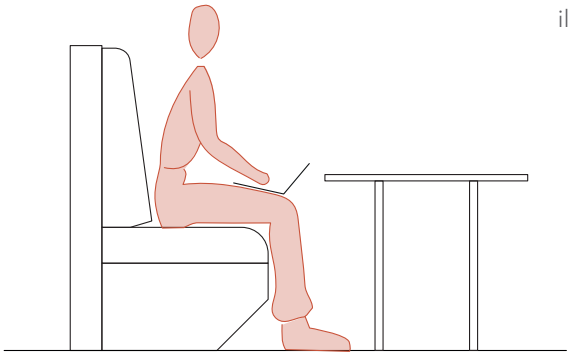
Individual focused work

Computer close to the user

Arms in 90°

Switching positions: leaned back and sit upright



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- **The solutions should accommodate 121 meetings**
- **The solution should accommodate individual focus work**

Dimension research

In the user observation it was found that users who work an entire day in soft spaces value ergonomics. Furthermore, the consideration of anthropometry is essential for creating tables for working. Anthropometric principles refer to the application of human body measurements to the design of products to optimize posture, comfort and work efficiency (Kaarwan, n.d.). According to the previously defined scenarios the ergonomic design should refer to following anthropometric principles:

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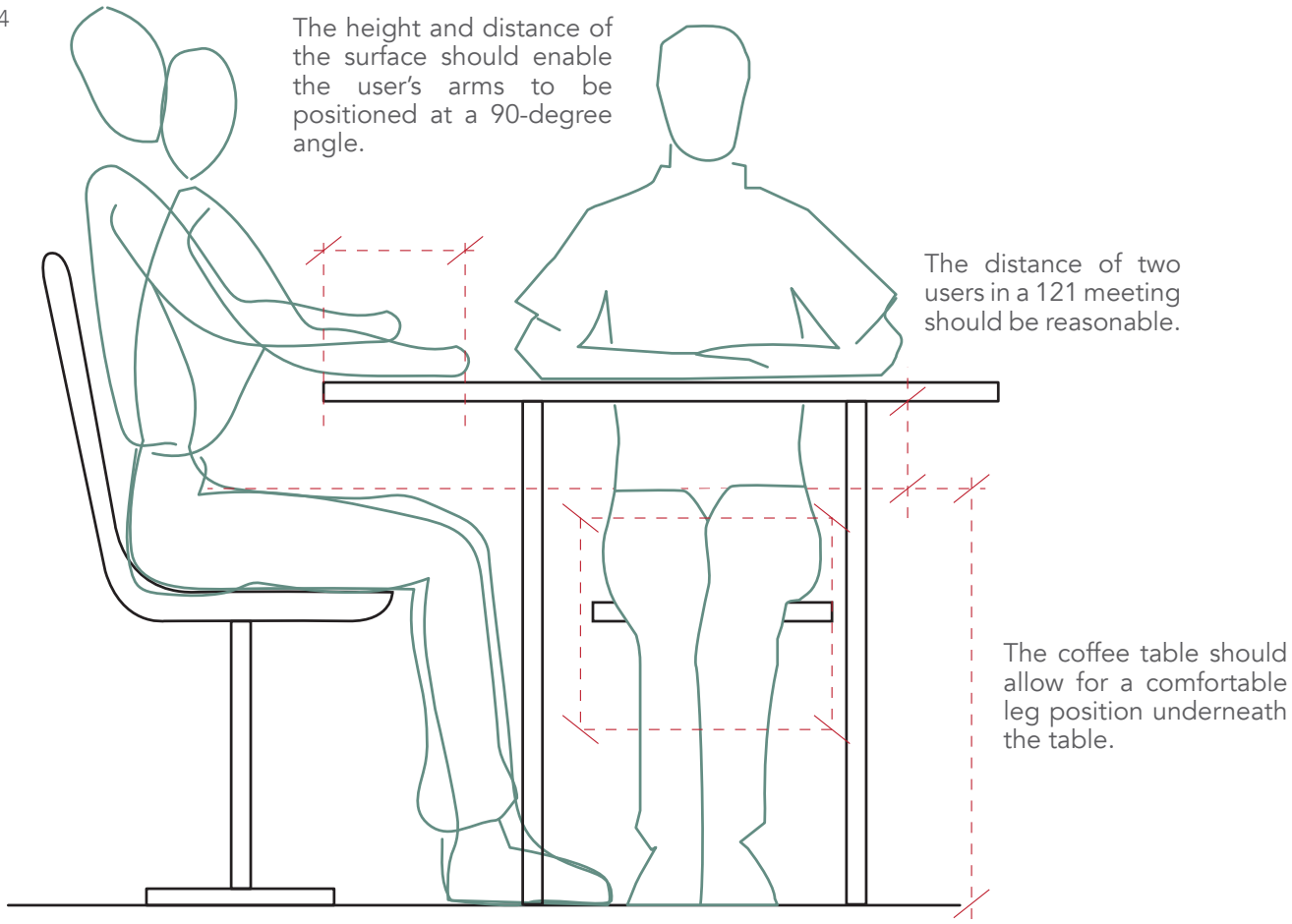

Alongside the above, the context of the coffee table must be taken into consideration. Therefore, measurements of the soft spaces have been determined considering soft space furniture (WS 20). However, it must be taken into consideration, that the dimensions of soft space furniture differ, and that it has been observed, that users might move the furniture. (ill. 45)

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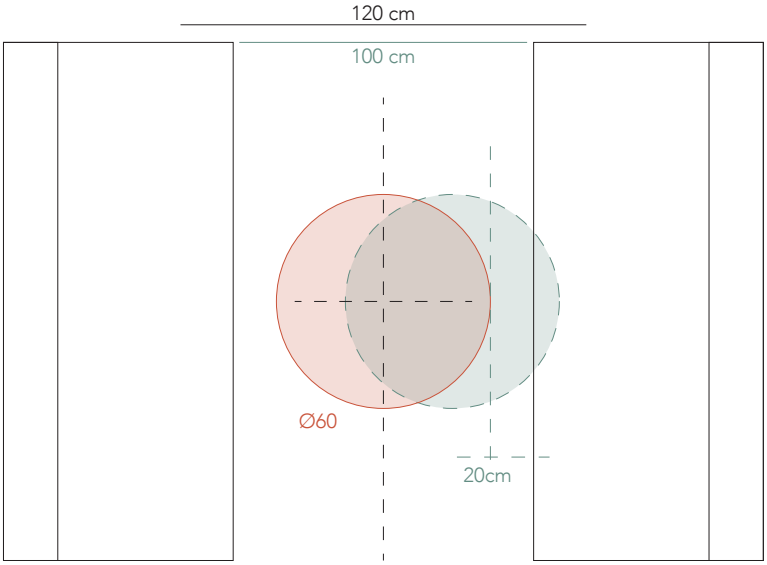
As a result, these dimensions are based on the worst-case scenario, which were the largest dimensions observed.



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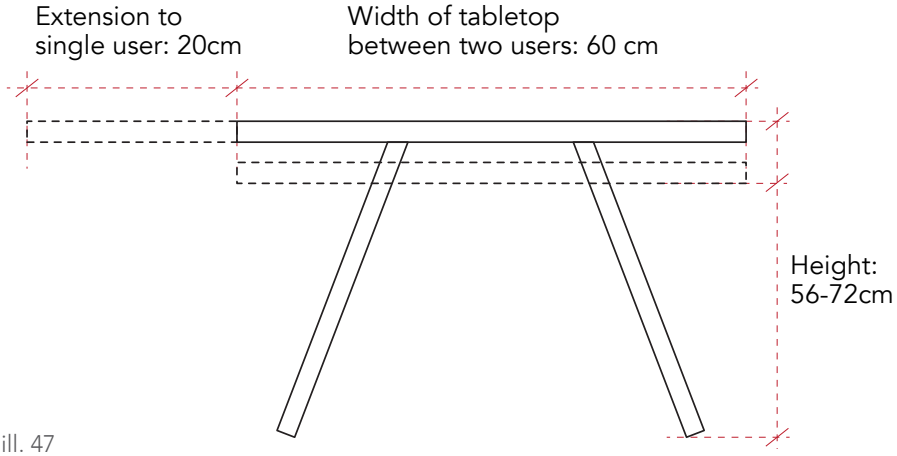
The following dimensions were defined using the worst-case scenario context measurements and applying them to the anthropometric principles in order for the solution to accommodate the scenarios.



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Furthermore, The Work Environment in Denmark suggests that objects that can be lifted weights maximum 11 kg (WS 15) (Arbejdstilsynet, 2020).

EN standards for coffee tables

Designing products for the contract market includes following EN Standards. To gain knowledge of what kind of EN standards and testing procedures a coffee table for the contract market must complete, the Technological Institute in Høje Taastrup was interviewed (WS 21). This institute is responsible for testing FDB Møbler's furniture.

The insights from the Technological Institute were:

A table must go to through a stability, durability, and impact test to ensure its ability to withstand regular use (Dansk Standard, 2023).

There are two levels of testing: level 1 (private market furniture), where the requirements are lower, and level 2 (contract market furniture), where the requirements are higher due to more intensive use.

Look into the EN Standards EN 15372, EN 1730 and EN 14749.

Implementing a height adjustable function could result in more tests to ensure the table meets necessary requirements.

Furniture companies do not always follow these standards, as it depends on their own quality assurance and the requirements of their industry.

This knowledge will be further investigated and used in the development of the product.

This knowledge will be further investigated and used in the development of the product.

New problem statement

Following the project's pivot, a new problem statement was developed.

Modern offices in private companies have undergone a transformation in recent years. One of the biggest changes is that many companies are moving towards hot desking, which means employees no longer have assigned seats. The reason for this is that a lot of employees work from home frequently, so less permanent desks are needed.

Moreover, companies want their employees to work from the office more often. To support that, the furniture departments are working towards making the office feel more inviting and more like home. They do this by incorporating soft spaces with sofas and coffee tables to create a relaxed atmosphere.

However, the issue occurs when companies grow, and they experience a lack of space. Then they discard these soft spaces to make room for more traditional workstations; desks. It has, however, been observed that there is not a need for more desks. Instead, there is a need for smaller, flexible workstations that can adapt to different kinds of work.

To maintain the wanted relaxed atmosphere in offices and prevent soft space furniture from being discarded as companies grow, there is a need to redesign this furniture in order to make it adaptable for flexible workstation requirements.

Observations showed that coffee tables in soft spaces have not been redesigned for this transformation that modern offices undergo and are therefore not used as intended. As a result of this observation, the following problem statement was developed:

"How can we design a coffee table for soft spaces that can transform into a flexible workstation suited for various kinds of work while considering second use?"

New design brief

Project overview

The aim of the project is to design a transformable coffee table for offices for FDB Møbler's product portfolio. The reason for the project is based on an observed gap in the market for a coffee table, that can transform into workstation while fitting into a homely atmosphere.

Mission

The overall mission is to:

Use insights and knowledge gained from current research to design a coffee table that slows down the existing furniture waste loop of desks.

Improving product durability, reusability, upgradability, and reparability.

Aim

The aim is to approach this mission by designing a desk that supports companies' desire to create a homely feeling at offices. Through better design of desks, there is a possibility of reducing the dominant culture of disposability in the contract market.

Context

The primary context of the desktop table is offices in private companies. The secondary context is private homes.

Target group

The primary target group is the users of the offices.
The secondary target group is private users.

Stakeholders

The desktop table must be designed for the Danish furniture company FDB Møbler's product portfolio, and FDB Møbler is the final approver of the product. Furthermore, the companies' furniture departments' opinions matter as they lead the furniture purchases.

Functionality and aesthetics

Demands

The solution must meet both domestic and contract market needs.
The solution should be movable by a single person.
The design should feature assorted wood.
The solution should allow for manual height adjustment between 56-72 cm.
The width of the tabletop must be 60 cm.
The tabletop should be able to extend by at least 20 cm.
The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be of honest materials and construction.
The solution should be designed for second use.
The materials should maintain an appealing appearance, even when scratched or worn.
The solution should offer a home feeling.
The solution should convey a sense of a productive workspace.

Unique selling points

Designed for second use

Adaptable to the rearrangement of offices

Contributes with a homely feeling at offices

02 Wrapping up

Summary

A pivot was made changing the direction towards soft spaces and more specifically coffee tables. However, the insights were not wasted, since some could still be included in the new product category.

A larger potential was seen in soft spaces as a shift was observed; employees value working in soft spaces both for 121 meetings and for individual focus work.

This phase visited both the spiritual level, where new research based the foundation for a new intention. The contextual level was visited where the intention took shape into idea generation and concepts (Lerdahl, 2001).

Key takeaways

Including FDB Møbler during the process should be done to stay within scope.

There was no need for more desks, there was a need for flexible workstations.

Employees use soft spaces for 121 meeting and individual focus work

Demands

The solution should meet both private- and contract market needs.

~~**The solution should be rearrangeable.**~~

~~**The solution should be movable by a single person.**~~

~~**The solution should allow the attachment of the companies' different add-ons.**~~

~~**The solution should accommodate two screens.**~~

~~**The size of the solution must be within 140x48-140x68 cm.**~~

~~**The solution should be able to hide computer cables**~~

The design should feature unsorted wood.

~~**The solution should be height adjustable**~~

The solution should allow for manual height adjustment.

~~**The solution should allow for manual height adjustment between 48-80 cm.**~~

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

~~The solution should be designed for compact storage.~~

The solution should convey a sense of a productive workspace.

03 Concept Development

The following phase presents the transition from ideas to concepts and how validation of Haase and Laursen's (2023) three long-lasting fits were constantly driving the descision-making and development.

2nd round of concept development

Upon gathering insights and research into coffee tables, another round of concept development was conducted. The goal was to develop concepts that would initiate the creation of mock-ups for user testing (WS 22).

Research working principles

In previous feedback from the Product Manager of FDB Møbler, she stated that incorporating an old working principle to make the design native and intuitive fits with FDB Møbler's design heritage. As a result, different types of known working principles to adjust height or extend width were gathered and used as inspiration for the concept development.

Methods for adjusting height

ill. 48

Turning principle

ill. 49

Screwing principle

ill. 50

Folding principle

ill. 51

Gas spring mechanism

ill. 52

Knob principle

Methods for side adjustable solutions

ill. 53

Wheels

ill. 54

Moveable

ill. 55

Rotateable

ill. 56

Extendable flight/train/dinner table

Lotus Blossom

The lotus blossom technique was again used to further explore possible solutions on the following demands (Guthrie, 2022):

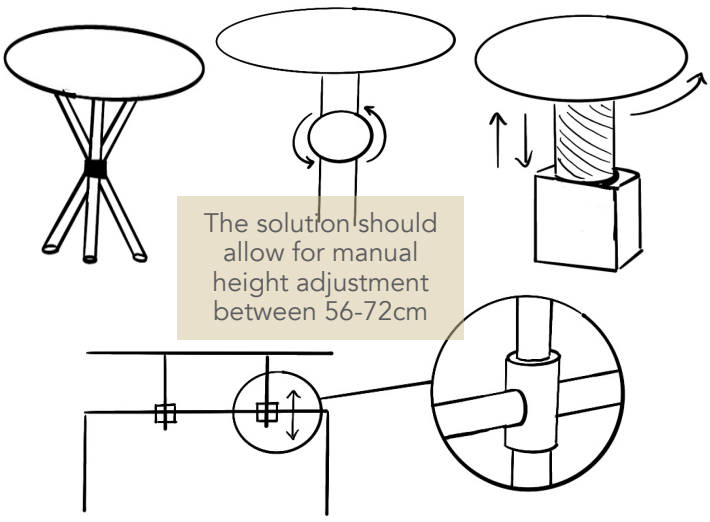
Demands:

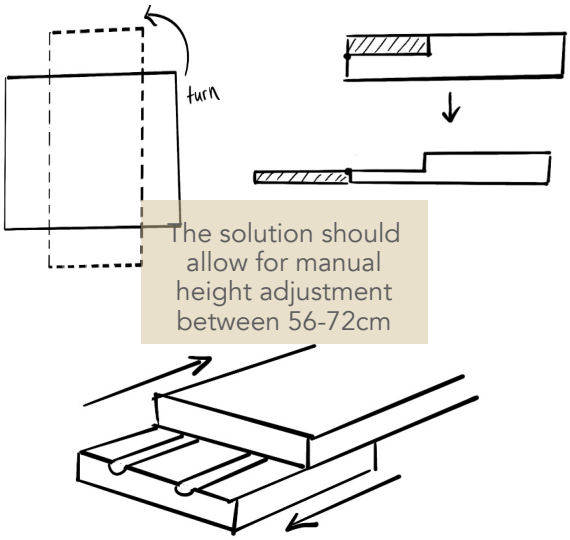
The solution should allow for manual height adjustment between 56-72 cm.

The width of the tabletop must be 60 cm.

These demands were translated into questions and placed in the centre of the lotus blossom. Thereafter, solutions were sketched for each question:

The ideas considered with most potential were marked with a star and used for the development of concepts.





Milestone

The concepts were presented to product design experts. Key insights from the feedback of the experts were that the concepts were too complex. As a result, it was concluded that the boundary for complexity was reached and that there was a need for revisiting the working principles in order to explore less complex solutions.

1:1 mock-ups

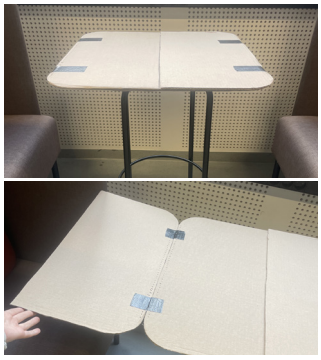
After revisiting the working principles, it was decided to make 1:1 mock-ups of some of the principles in order to make a usability test (Rubin & Chisnell, 2008; Nielsen, 1993) with users to observe, how they interact with the different

functions. Three mock-ups were related to the demand: The tabletop should be able to extend by at least 20 cm:

"Move It" is an existing table, which is very lightweight and can be moved by one person.

ill. 57

"Extend It" features a two-sided extendable tabletop.



ill. 58

"Rotate It" is a tabletop, that can rotate and change its direction.

ill. 59

Five mock-ups were related to the demand:
The solution should allow for manual height adjustment between 56-72 cm:

"Knob Lift" allows the user to screw on a knob while lifting the table to adjust the height.

"Knob Screw" allows the user to screw on a knob while the table moves up and down itself.

"The Big Thread" allows the user to screw on the tabletop to move the table up and down.

"Gas Pump" allows the user to push on a handle to move the table up and down.

"Mikado" allows the user to adjust the height by moving a handle. This was not possible to prototype in time for the usability testing, however principles from the Mikado function can be evaluated through some of the other prototypes.

ill. 60

ill. 61

Usability testing observations

This usability test (Rubin & Chisnell, 2008) was conducted to observe participants interact with 1:1 mock-ups (WS 23). The 15-minute test included nine people. The participant began at a designated starting point and walked to a soft space where one of the mock-ups was placed. Using the method Think-aloud, the participant was asked to share thoughts on the mock-up while interacting with it (Ericsson & Simon, 1993). To follow up on the participants thoughts, wh-questions were asked to obtain a better understanding of the motivation behind the participants thoughts and actions. The participant was asked to return to the starting point after each test.

The following is a summary of key insights gathered from the usability test.

Individual work

Move It:

- Tables that appear lightweight makes users pull it. Participants pulled the table very close.
- The accessibility makes participants interact with it.

Extend It:

- Participants pulled the table closer instead of using its extendable function.
- Inconvenient to remove items before closing it.
- The size and shape of the tabletop is like a café table.

Turn It:

- Smooth and easily accessible. Function must be visible to be readable.
- The shape of the table hits the user, while turning it and enables the user to leave the table without turning it.

Mikado:

- Participants' feet and legs were locked in one position.
- Function must be visible, otherwise users do not use it.

Knob Screw:

As well difficult to read the height while adjusting. Place knob closer to the user.

Knob Lift:

- Multiple attempts were needed to adjust the height, because of the placement of the knob underneath the tabletop.
- Required too much interaction and incecurities about whether the screw was tightened enough.

The Big Thread:

- Free space for different leg positions is important.
- The function is playful buy must be visible to read it.
- The table should be able to stop spinning.

Gas Pump:

- Easily readable function, because it is known from other products.
- Gas pump moved too quickly.
- Annoying to lower the table if it becomes too high.

ill. 62

ill. 63

ill. 64

121 meeting

With the participants, a simulation of a 121 meeting was made.

Key insights:

Participants sit on the edge of the couch when sharing paper and lean back in the couch while talking without equipment.

ill. 65

The outcome

The verbal and behavioural feedback gained from the usability testing (Rubin & Chisnell, 2008) could help influencing the decision-making process regarding which working principles to refine and further develop.

Reflection:

When working with low-fidelity mock-ups, such as cardboard models and parts from other products, certain considerations were kept in mind (Nielsen, 1993). Since the mock-ups only function partly, the participants might be influenced negatively by the appearance of the mock-up or the fragility of a cardboard model. This might have influenced their behaviour and thoughts about the functions (Ericsson & Simon, 1993).

Product proposals

Based on the outcome of the usability test with users, an evaluation of the different functions was done (WS 24). Move It was deselected because it was ergonomically infeasible to move a table and because this limits the innovation and value proposition of the coffee table. Knob Lift was deselected because the user feedback revealed that this function required too much interaction, and the users did not trust their own ability to lock the knob. The functions left were used to develop three product proposals, which could be presented to FDB Møbler. Furthermore, three additional product proposals were developed to present a naive approach to the height adjustment (WS 25). This was done to explore FDB Møbler's boundaries of complexity, because their current products do not feature height adjustable functions. This approach was taken upon a reflection from the previous presentation for FDB Møbler, where it was concluded, that it is essential to involve the company during the process to stay within scope.

Product proposal 1: Mikado

The name of this proposal comes from the group of legs placed diagonally to each other connected around a center point. The height of the table changes, as the legs move either closer or further from each other. To move the legs, the user moves a handle forwards.

Mikado can be used as a cozy coffee table for a 121 meeting or the tabletop can be extended for individual work by unfolding the top, which is divided into two extendable pieces. This extension is assembled by hinges, which are showed as metallic details, when the tabletop is closed.

Tabletop size: (+20) 60x60 (+20)

ill. 66

ill. 67

Product proposal 2: Gas spring

The Gas Spring works like an office chair and features both a swivel mechanism, integrated into the foot, and a gas spring with a built-in lock. The height is adjusted when pressing a handle. The spring force matches the weight of the tabletop, so the table stays balanced and can be moved with minimal effort while seated.

The foot of the coffee table allows the leg to rotate at the bottom. This makes it possible to adjust the position of the table by pulling the tabletop, so it can fit both a 121 meeting and individual work.

Tabletop size: 60x60 cm

Product proposal 3: Rotate

Rotate is a rotatable and height-adjustable coffee table. The table can adjust by lifting and rotating the tabletop. Meanwhile, the legs' "knots" follow a spiral hidden within the base cylinder of the table. Along this spiral are small locking holes where the knots can secure the tabletop into place. The table can lock in two positions: one optimized for sharing the surface during a 121 meeting, and another for individual work at either end of the table. During rotation, the table height automatically adjusts, supporting ergonomic comfort in both work modes. A visible gap between the tabletop and the base is designed to highlight the table's function.

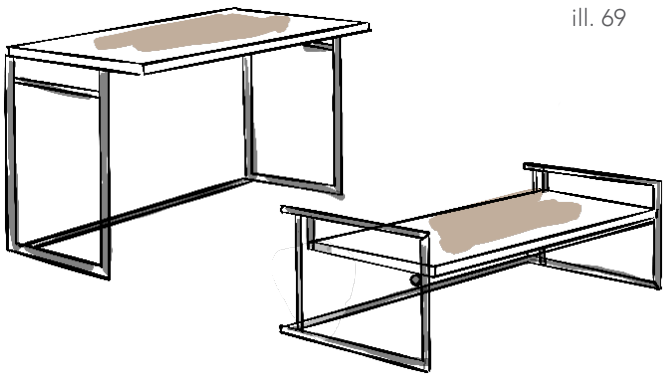
Tabletop size: 110x60 cm

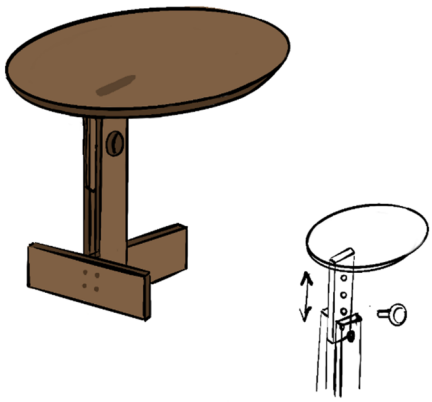
ill. 68

Product proposal 4: Nesting

Nesting is a coffee table with two fixed heights. The table can be used horizontally as a low coffee table for 121 meetings and vertically as a side table for individual work. To turn the coffee table into a side table, the user lifts it, places it with its hollow side downwards and drags it closer.

ill. 69





ill. 70

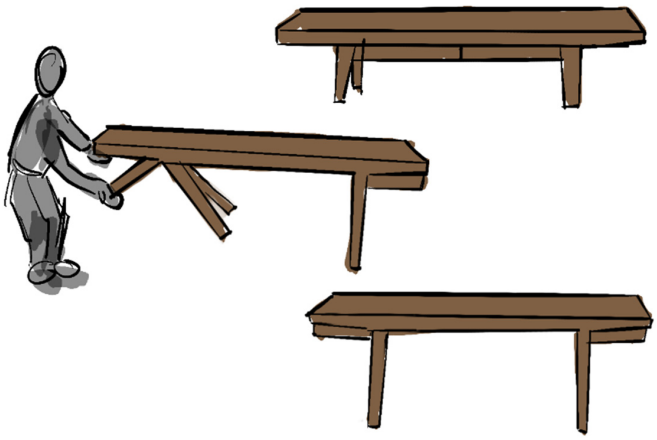
Product proposal 5: Knob

Knob is a coffee table that can be height adjusted by placing a knob into either of its fixed holes placed in various heights.

ill. 71

Product proposal 6: Shift

Shift features two leg lengths which allows the user to height adjust the table. By lifting the tabletop, the user can either pull or push the legs to choose between its two heights.



Feedback from FDB Møbler

The six proposals were presented to the Product Manager of FDB Møbler to get feedback before developing on one concept (WS 25).

The product proposal Rotate was proclaimed as the Product Manager's preferred proposal: "This is the best proposal. It is simple and elegant in an effortless way". In combination with the outcome of the criteria matrix, this feedback served as the foundation for the choice of developing on the product proposal Rotate.

The Product Manager's feedback on the other product proposals was gathered to collect valuable insights, that could be incorporated in the development of Rotate:

Mikado: *"I like the design language".*

Gas Spring: *"It is overall simple in an appealing way".*

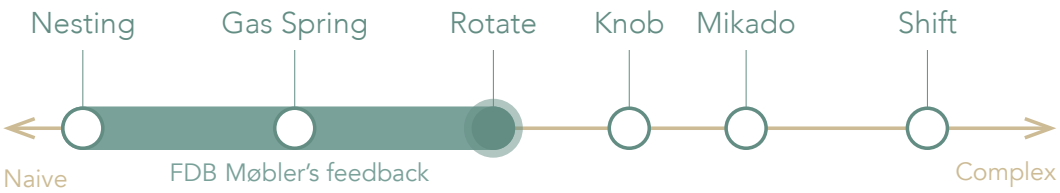
Nesting: *"I like the function. It is naive".*

Knob: *"The function is good, but it is solved better in Rotate".*

Shift: *"Do not demand too much effort from the users".*

Overall: *"Be aware of stability. I think you can benefit from diving into EN Standard 15372 L2".*

The Product Manager likes the design language of Mikado. Analyzing the design language of Mikado, it is eye-catching but discreet, and these principles could be incorporated into Rotate. She furthermore commented that Gas Spring was appealingly simple and Knob was positively naive. As a result, the aim was to make Rotate as simple and naive as possible. Additionally, the analogue function of Knob was inspiring to simplify Rotate's functionality and minimizing user effort was prioritized. Lastly, the EN15372 L2 standard can be used when testing the stability of the product.

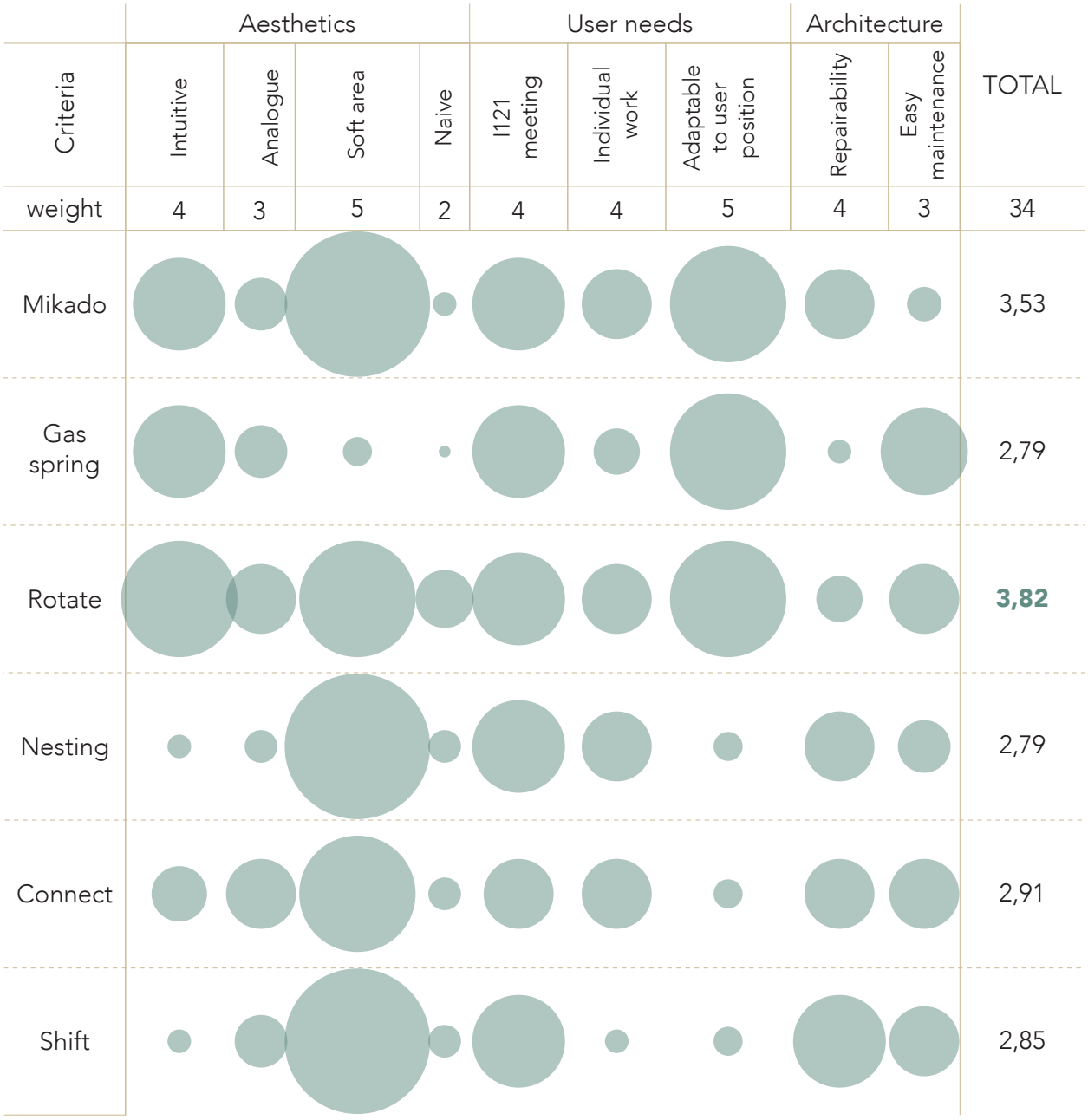


ill. 72

The illustration above shows a scale between complex and naive to describe which concepts were intented to challenge FDB Møbler the most in terms of the adjustable function.

Criteria matrix

A criteria matrix is a systematic tool used for decision-making processes to objectively evaluate and compare proposals based on defined criteria (Enz, Cathy A.,2013). The criteria matrix was developed according to demands and insights gained from previous research. It was used to evaluate the product proposals to ensure choosing solutions that fulfil as many requirements as possible (WS 26).



ill. 73

According to the criteria matrix Rotate had the best overall performance, however, the matrix also revealed areas where Rotate needed to improve. The determination of what concept to further develop was done after receiving feedback from the Product Manager of FDB Møbler.

03 Wrapping up

Summary

In this phase the contextual- and principal level transitioned where the development of concepts turned into development of product proposals featuring functional and technical principles (Lerdahl, 2001). User tests provided insights into interactions and usage of these principles, and an evaluation determined to continue with the product proposal Rotate.

Key takeaways

Working with furniture and functional principles, a difficulty was to develop high-fidelity models in order to make valid tests with users.

FDB Møbler was surprisingly open-minded to concepts that were assumed to be more complex than their existing product portfolio.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

04 Feasibility and development

The following phase introduces a conflict between the project's aim and reality. In the aim of narrowing the project, new insights occurred, initiating a new iterative loop (Brown, 2008).

Why wood?

The first edition of the concept Rotate is entirely made from solid wood, which was the initial aim for the product. The reason for this was a combination of collaborating with FDB Møbler, who mainly operates in wood, and an observed progress in repairing and renewing furniture made from wooden materials. It was aimed to take part in this progress by designing a repairable wooden product.

Firstly, previous research into Holmris B8 showed that the company offers a maintenance service, which among other things, contains maintaining wooden surfaces. Furthermore, in an interview with the owner of Dansk Design Fix, who specializes in repairing furniture, he mentioned that they were currently repairing all of SKAT's wooden Børge Mogensen chairs, and that more companies were seeking out to Dansk Design Fix, because they wanted a green image (WS 27).

In other cases, renewing furniture was furthermore observed as a progressing trend. At Aarhus University old furniture was renewed by being painted or getting a new upholstery or surface (WS 27. This case furthermore indicated a progressing willingness to repair and renew, and since it was believed that wood was the best material for this approach, the possibility of a wooden design was explored.

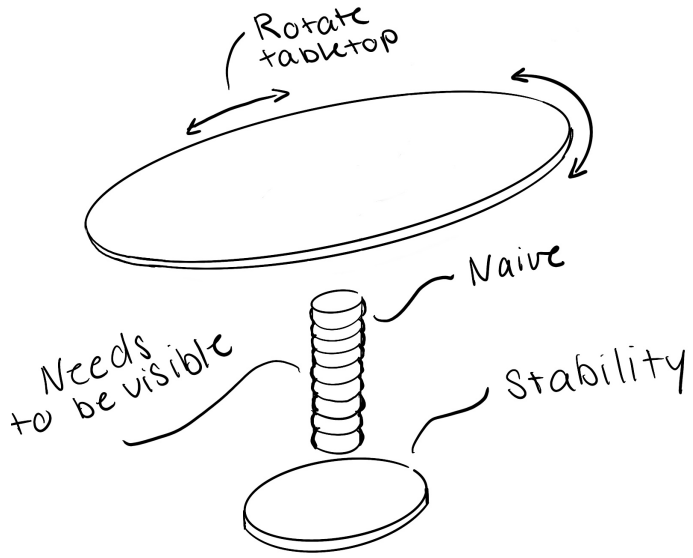
ill. 74

ill. 75

Developing Rotate

To proceed exploring the possibility of producing the coffee table mainly in wood, Rotate was developed. It was desired to draw on previous feedback from other product proposals in order to refine Rotate. The aim was to:

- Simplify the design
- Make it more intuitive and naiver
- Minimize the demand of user effort
- Focus on stability



ill. 76

To make the design more intuitive and naive, previous user feedback was incorporated. Participants in the usability test emphasized the need for a clearly visible function to encourage users to engage with it. Furthermore, FDB Møbler's Product manager had stated that even a kid should know how to use the function of a product. As a result, the thread was placed visibly in the bottom of the coffee table to draw the user's attention to the function and make the product readable.

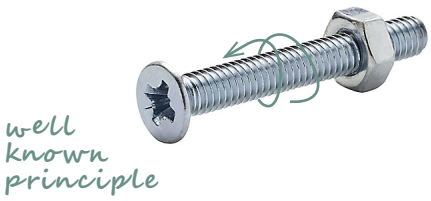
It was furthermore decided to explore the possibility of designing a self-stopping thread with the intention of deleting the locking mechanism of Rotate to simplify the design and minimize user effort.

Lastly, FEM analyses were conducted to test the stability of the product (WS 28). As a result of these tests, a bottom plate was added to the design to enhance stability without using as much material as in the previous version of Rotate.

Research of wooden threads

As a result of the design development, research into wooden threads was conducted with the intention of exploring the feasibility of this element in wood (WS 29). The well-known principle behind a thread is mainly seen in plastic and metal used for example soda bottles and screws. The familiarity of the principle makes it intuitive and naive.

ill. 77



ill. 78

However, wooden threads have also been a well-known working principle in old products. The pictures below illustrate products using a wood thread.

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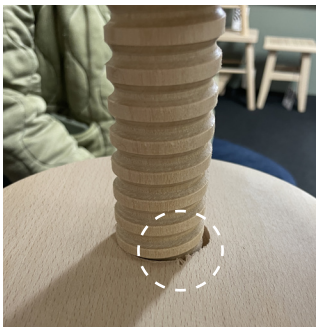
Finding the feature in other products strengthened the belief that it is possible to make the thread part in wood. As a result, wooden threads were collected to test the function of turning wood against wood.

It was concluded that turning wood against



ill. 85

ill. 86

wood is not feasible. While the male part remained well-preserved, the female part gradually wore out over time. Furthermore, the friction between the wooden parts added a whirring sound.

ill. 87

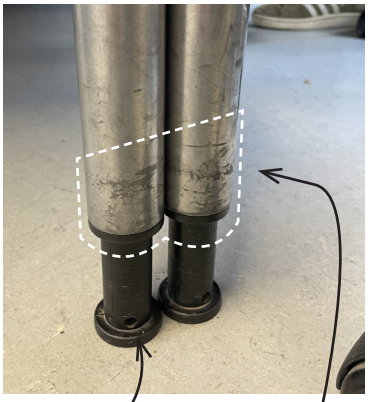
ill. 88

As a result, a female part in plastic was 3D printed in order to test wood turning inside plastic.

The softness of the plastic made the interaction with wood silent. Furthermore, the friction between the two materials provided a smooth outcome. As a result of this test, the female part should contain a plastic insert.

What's with all the metal in offices?

During the attempt to produce as many parts of the coffee table in wood as possible, multiple observations prompted a question: "What's with all the metal in offices?". Since the aim is to produce in wood and since it is known that companies want to include living materials at offices, it raises a curiosity why wood is not more commonly used in contract market products. Therefore, reasonings for this was aimed to be found.
An observation at Aalborg University was conducted with the intention of exploring what tables in the contract market needs to withstand (WS 30).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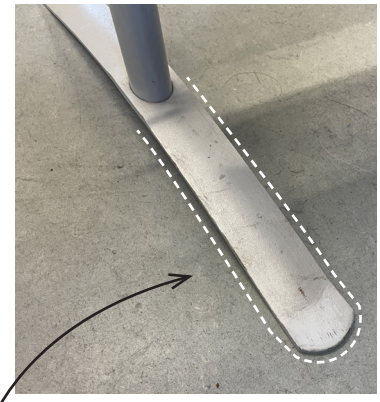
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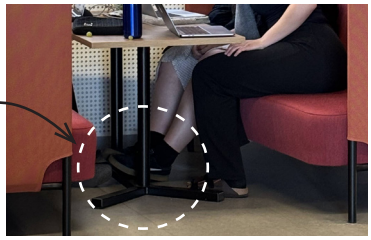
Furniture in public spaces won't be treated as in privat homes

feet on the bottom

scratches and visually damaged


ill. 92

people step and damage the bottom

Furthermore, potential unforeseen scenarios involving a coffee table in an office environment were simulated (Sperschneider & Bagger, 2003) (WS 31). This was done to consider possible scenarios a contract market table must withstand.

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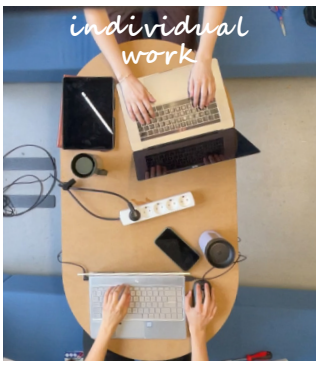

ill. 98


ill. 99

This heavy use of tables in a contract market context clearly necessitated daily cleaning (WS 32). Therefore, a member of the cleaning staff at Aalborg University was asked act out in order to observe her normal procedure of cleaning (Sperschneider & Bagger, 2003). The act out revealed that the cleaning staff sometimes moves the tables to clean both the floor and the bottoms of the tables. This is done with for example 4-legged tables, which are difficult to get under. The cleaning staff described that 1-legged tables would not be moved in a situation like this, because the bottom is reachable.
These observations clarified why most contract market products are mainly made from metal. The reason is the intensive use of furniture in public spaces, combined with the fact that users treat it differently than they would at home. As a result, it was decided to develop new proposals incorporating metal, which could be presented to the Product Manager of FDB Møbler to know her opinion on incorporating the material into an FDB Møbler product.

Design proposals

Five design proposals were developed. Each incorporated metal to a greater or a lesser extent to identify where the boundary lied. These five proposals were presented to FDB Møbler's Product Manager to gauge her thought on the design and materials.

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ill. 104

Feedback from FDB Møbler

The Product Manager stated that first priority for FDB Møbler's products is always to produce as much in solid wood as possible, however she acknowledged the issues of using wood in the contract market (WS 33).

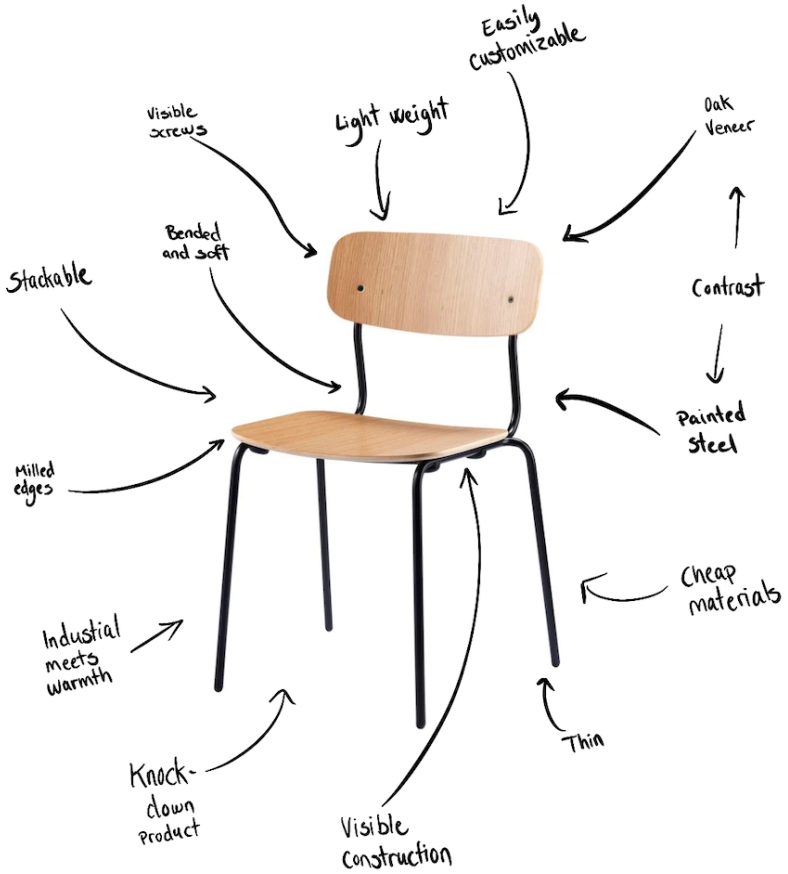
Furthermore, she saw the most potential in design proposal two and four:

"Version two and four offer much of what your goal is - tactility and warmth. Version two is an exciting design formally as well, as it is very uncompromising. Also be aware that you cannot design a piece of furniture for everyone, you must choose the most important features."

The design language behind version two was used for further development.

Contract market chair of FDB Møbler

Given the Product Manager's emphasis on prioritizing solid wood production, the approach was critically evaluated. FDB Møbler's product portfolio features a metal and wood chair designed for the contract market. However, it was known that all of FDB Møbler's products should be sellable in the private market. Therefore, it was assumed that this chair is also sellable for the private market even though it features metal. The chair was therefore analysed, and the findings were compared with the feedback to identify misalignments between the Product Manager's statements and the actual product portfolio of FDB Møbler (WS 34). The greatest misalignment was that Holmen chair features no solid wood but oak veneer and steel. As a result, the aim was still to explore wood production, but in combination with metal parts. Furthermore, additional insights gained from the analysis of the chair could be used in the development of the product.



ill. 105

Manufacturing research of wood threads

To gain knowledge about the feasibility of producing the thread part in wood, three woodturners and three CNC-machine specialists were contacted (WS 35).

The Danish company Uldum Drejeri was the first company which was contacted. The owner expressed his believe in the project and claimed that strong types of wood like oak or beech could withstand being used for this purpose. He offered a price of 2500 DKK excl. VAT for a prototype, however mass production was placed at a lower price point. As an example the production of 200 pieces would cost 235 DKK each. As a result, it was assumed that prototyping at this price point was infeasible for FDB Møbler.

ill. 106

Therefore, other companies were contacted to gain broader knowledge and find out whether the wood thread can be produced cheaper using alternative methods. The following key insights were gathered from five different companies or professionals:

- Wood is not as strong anymore as it once was.
- Wood turning is a dying profession, because production can be made more precise and cheaper on a CNC-machine.
- The production is feasible on a 5-axis CNC machine with a special turning tool for creating perfectly circular wood threads.
- Solid wood will deform over time, because it is a living material.
- Glue works against the tensions in wood. Therefore, to turn wood into a dead material, pieces of wood can be glued together. This will prevent it from deforming.
- The process of CNC-milling a thread generates great amounts of waste.

Kill your darling

The manufacturing research revealed that it was feasible to produce the wood thread, however several constraints caused the killing of the darling; the wood thread. Turning threads in wood is an old principle, however today it is not as feasible as it used to be. It is associated with too many risks, a large investment, and causes too much waste during production. As a result, reconsiderations of materials were done to find other materials better suited for this purpose.

Reconsideration of materials

To evaluate on what materials are the most appropriate for the individual parts of the product, the coffee table was sliced into four parts: the tabletop, the thread, the nut and the bottom.

The SWOT analysis was used to evaluate plastic, metal, veneer and solid wood, partly inspired by the analysis of the Holmen chair (WS 36). A SWOT analysis is a technique used to assess the internal strengths and weaknesses, and external opportunities and threats of an element (Humphrey, 2005).

The following was the outcome of the analysis:

Tabletop

Due to the following reasons, solid wood was chosen as the best suited material for the tabletop.

- Solid wood is able to be sanded, making it repairable.
- Solid wood is a homely material and provides warmth.
- Solid wood tends to remain timeless longer than many other materials.
- Solid wood ages gracefully with use.
- Solid wood is durable.
- Solid wood offers tactility.
- Using solid wood for coffee tables in offices differs in the market.

Nut

Due to the following reasons, plastic was chosen as the best suited material for the nut.

- Metal is strong and can withstand weight.
- Metal is ductile.
- Metal is durable.
- It is an opportunity to source a standard metal thread manufacturer.

Thread

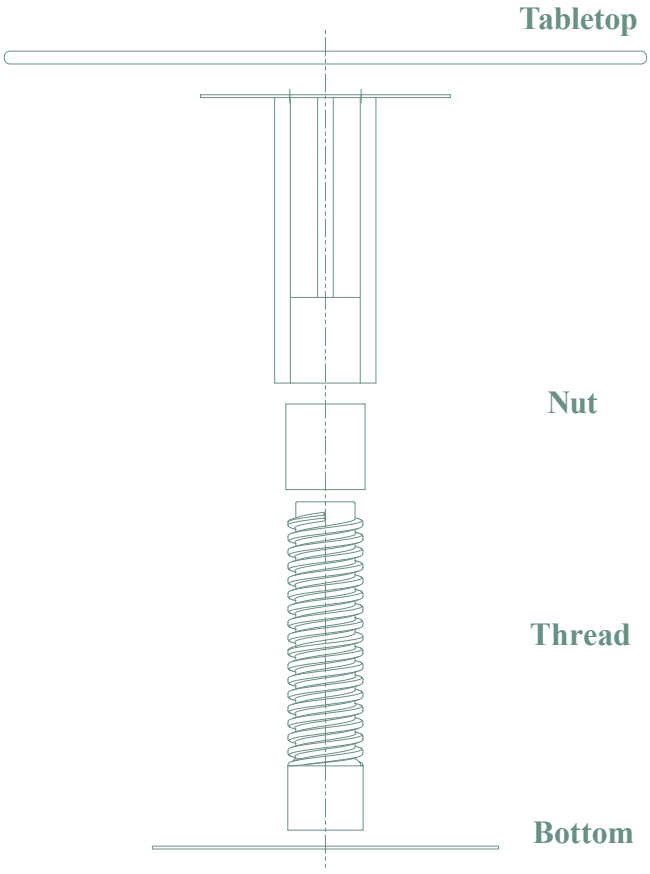
Due to the following reasons, metal was chosen as the best suited material for the thread.

- Metal is strong and can withstand weight.
- Metal is ductile.
- Metal is durable.
- It is an opportunity to source a standard metal thread manufacturer.
- Metal opens up more opportunities for customization.

Bottom

Due to the following reasons, metal was chosen as the best suited material for the bottom.

- Metal is strong and can withstand weight.
- Metal is ductile.
- Metal is durable.
- It is an opportunity to choose a heavy metal, which is positive for the bottom.
- Metal opens up more opportunities for customization.

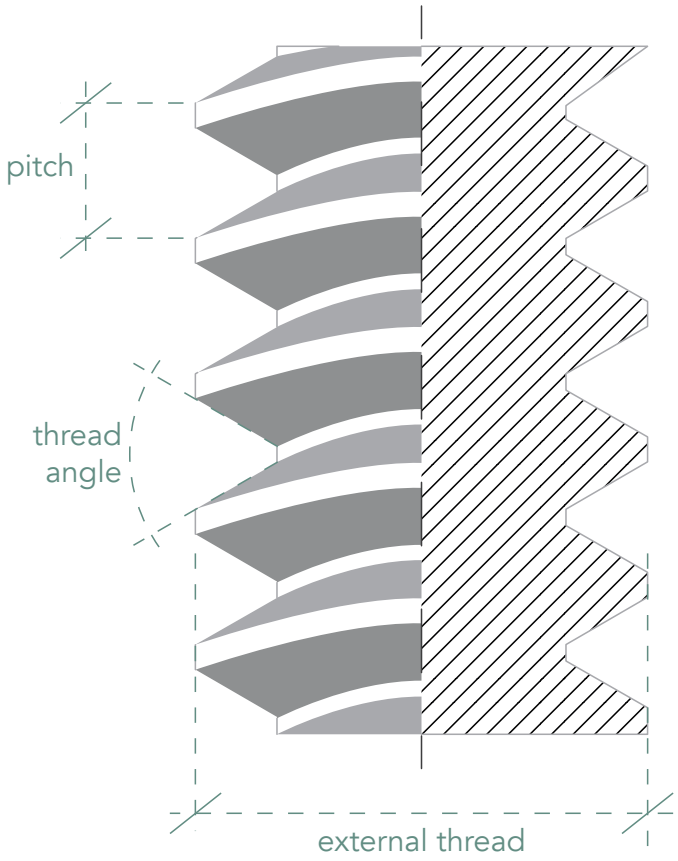


ill. 107

Research into metal threads

It was known that metal threads come in a large variety of options. To find the most optimal thread for the coffee table, research into metal threads was conducted (WS 37) (WS 29). The research was based on desk research, prototype testing and insight knowledge gained from experts at NES Maskinfabrik and CNC-team A/S.

Through this research it was claimed that producing a thread in metal for this purpose was feasible. However, it was discovered that different aspects of a thread must be determined in order to customize the thread to the desired properties. As a result, the knowledge about these aspects and the justification for the various determinations was described. An illustration was made to visually support the overview of the aspects.



ill. 108

Thread type

A trapezoidal thread was chosen because its large surface makes it feasible for carrying weight. A single trapezoidal thread and a double trapezoidal thread were considered. A single thread can be self-stopping with a very low coefficient of friction, however this is not ensured. A double thread can move faster, however it might not be self-stopping (Smart Lathe, 2022). As a result, a double trapezoidal thread was chosen, because a fast movement was chosen over an unsure self-stopper.

Tolerance

A self-stopping mechanism requires a low coefficient friction, which means the tolerance between the female and the male part must be precise. Testing the tolerance is therefore important.

External thread vs internal thread

A 3D print model of a male part with an internal thread was shown to experts. They revealed that an external thread is easier and thereby cheaper to produce

Nut thread

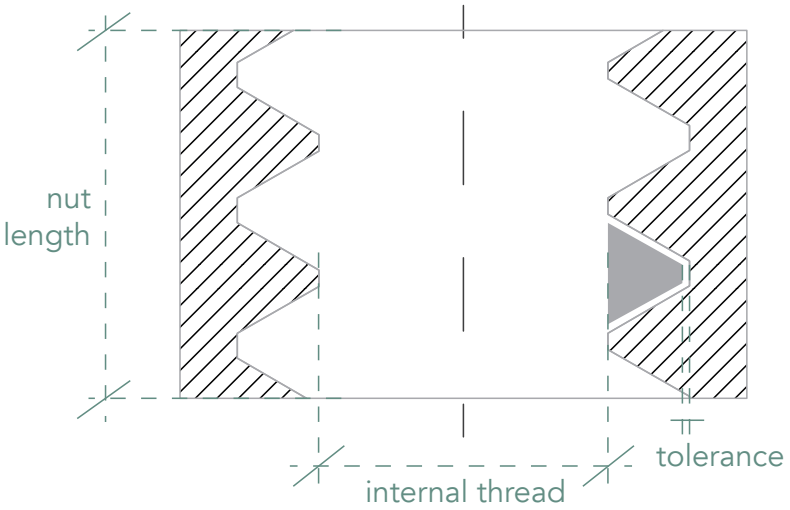
Experts claimed that the production of an internal thread in the female part is complicated, because the machining tools will struggle to reach the necessary depth. Instead, they suggested producing the nut in plastic, because plastic offers favorable friction properties. It was therefore decided to make the nut in plastic.

Nut length

Expert claimed that the length of the female part must be at least equal to the diameter of the male part.

However, the larger the lead, the less self-stopping effect. Furthermore, a larger lead can also result in more backlash leading to instability. Backlash is the motion between the female and male part when the load direction is reversed while it is not turning (Linear Motion Tips, 2025). As a result, the tolerance between the male and female parts should be tested.

Knowledge about metal threads was gained, however the size of the thread and the individual aspects should be determined through prototype testing. However, before prototyping, it was important to gain knowledge about which EN tests the coffee table should withstand.



ill. 109

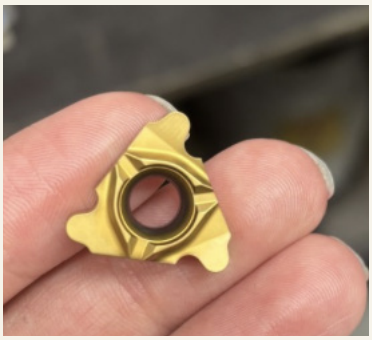
Pitch

Intentionally, prototypes featured a tall pitch, because tests with 3D prints showed that this pitch enabled faster movement. However, an expert revealed that a die is needed when producing a thread (ill 110). A die is made from diamond dust, which extends its lifespan. However, this also makes a die a costly investment, if a customized thread is needed. As a result, the size of the pitch should be determined by a standard thread.

Lead

The lead describes how much the nut moves in one revolution. For a single thread, the lead is equal to the pitch. For a double thread, the lead is equal to twice the pitch (Thomson, 2025).

Experts revealed that the smaller the diameter of the male part, the smaller the lead. However, the larger the lead, the less self-stopping effect. Furthermore, a larger lead can also result in more backlash leading to instability. Backlash is the motion between the female and male part when the load direction is reversed while it is not turning (Linear Motion Tips, 2025). As a result, the tolerance between the male and female parts should be tested.



ill. 110

EN standard test

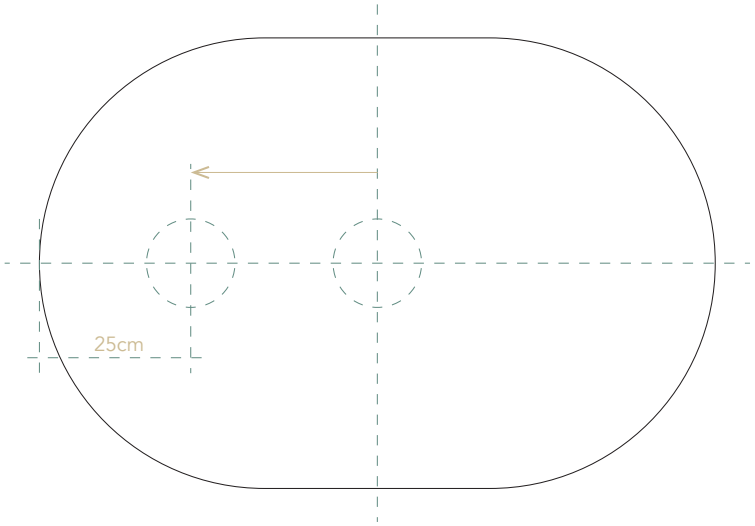
A previous interview with the Technological Institute in Høje Taastrup provided insights into the EN standards for coffee tables. Research into the recommendations of the institute was conducted (WS 38).

Since the context of the coffee table was soft spaces, where the intended use is a mix of short-term use and long-term use, the tables should be tested according to level 2 (Dansk Standard, 2023). The stability and durability of the coffee table is tested by dropping a number of kilos onto the tabletop 5 cm from the edge. The number of kilos is determined by the size of the tabletop (Dansk Standard, 2012).

An expert from the Technological Institute was asked to provide information on how many kilos was needed to be dropped on the current tabletop of 110x60 cm. Furthermore, an approximate visualization of the coffee table was provided to the expert. The feedback from the expert was that the number of kilos was 28 kg, and based on his experience, he knew the table would not withstand the drop test due to the large tabletop. As a result, there was a need for a redesign of Rotate.

Redesign of Rotate

The desire of redesigning Rotate was to make the tabletop as small as possible (WS 39). To reduce the tabletop size as much as possible while adhering to the dimensional research, it was considered to prioritize 121 meeting and individual work for one person at a time. A solution to this was to move the leg away from the center and place it 25 cm from the edge, so the extension remains on one side of the table and thereby reduces the tabletop dimensions to 75x60 cm.



ill. 111

Prototype testing

The feasibility of moving the leg of the table and reduce the tabletop was tested by placing a cardboard tabletop onto an existing table and interact with it. The size of the tabletop suited both 121 meetings and individual work. However, two problems were identified:

1. When users in a 121 meeting adjusted the height, the tabletop moved away from their seating position. This might require the users to move depending on the desired height.

2. A single user using the table for individual work needed to turn the table an entire revolution to reduce or increase the height. This meant that the user had less height adjustable options comparing to the original design of Rotate. More height adjustable options in this case would require a low pitch of the thread, which would slower the movement of the table.

ill. 112

ill. 113

To test the stability of the table, a prototype was made and loaded with weight. However, it was not capable of carrying more than approximately 12 kg before it tips.

Since the materials used in the prototype was not directly equivalent to the chosen materials, an FEM analysis was furthermore made to test the stability (WS 39). The FEM analysis concluded that the table could be stable with the right dimensions, however the previous version of Rotate would be more stable than the new because of its equal weight on both sides of the table leg.

It should however be taken into consideration that the FEM analysis cannot calculate correctly on wooden materials.

Revisiting Rotate

Following the test of revised dimensions and the new solution's stability, it was determined to evaluate on the two solutions by setting up pros and cons (WS 40). Evaluating on these, it was decided to take a step back and continue with the original concept behind Rotate. The new solution compromised too much on usability, interaction and stability. Instead, it was decided to revise the dimensions of Rotate.
The current dimensions were based on the dimensional research, however this research was based on the largest gap observed between two sofas, which was 110 cm. Since it was also observed that users frequently move sofas, and thereby altering the distance between them, it was concluded that prioritizing usability and interaction was more valuable than optimizing for dimensions that are likely to change.
As a result, reduced tabletop sizes were tested.
90x60 cm was the smallest acceptable size for maintaining adequate distance between the users. Furthermore, this size still accommodates 121 meetings and individual work efficiently. As a result, 90x60 cm was determined as the new dimensions of the tabletop.

ill. 114

ill. 115

Dimensions

As the tabletop size was determined, the dimensions of the other parts needed to be explored before developing a 1:1 function model (WS 41). Since the FEM analysis could not calculate correctly on wooden materials, other tables were used as inspiration for choosing initial dimensions.

ill. 116

ill. 117

ill. 118

ill. 119

A Bottom

a[1] Similar tables with a circular metal plate in the bottom determined the size of the bottom to be Ø48 cm. (ill 104 and ill 105)

B Thread

The legs of similar tables were maximum Ø7 cm, however since the coffee table's leg was divided into two parts, it was assumed that the legs should be larger. As a result, the dimensions of the thread were determined to be Ø9 cm on the inside and Ø12 on the outside of the spiral. The pitch was determined by a standard thread: 20 mm.

b[1] From previous user feedback it was known that users must be able to visually see the function of the table to know how to use it. In combination with the height-adjustability requirement, it was determined to make the thread larger than the female part to make it as visible as possible. As a result, the length of the thread was 45 cm.

C Nut

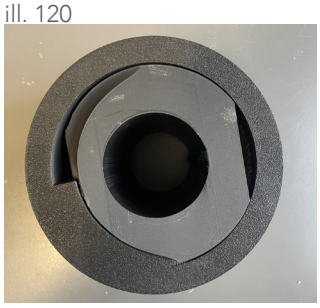
c[1] Previous research into nuts have shown that the length of the nut should at least equal the diameter of the thread. As a result, the length of the nut was determined to be 12 cm.

It was concluded that a 1 mm tolerance provided a low friction, which required external forces to make the nut move around the thread.

c[2] Since it was aimed to make the thread as visible as possible for the intuitiveness of the table, the nut was aimed to be attached to three metal pipes, so the construction would be stable and see-through. Furthermore, since the thread was 45 cm, this determined a length of the nut part with the pipes to be 40 cm.

c[3]

ill. 120



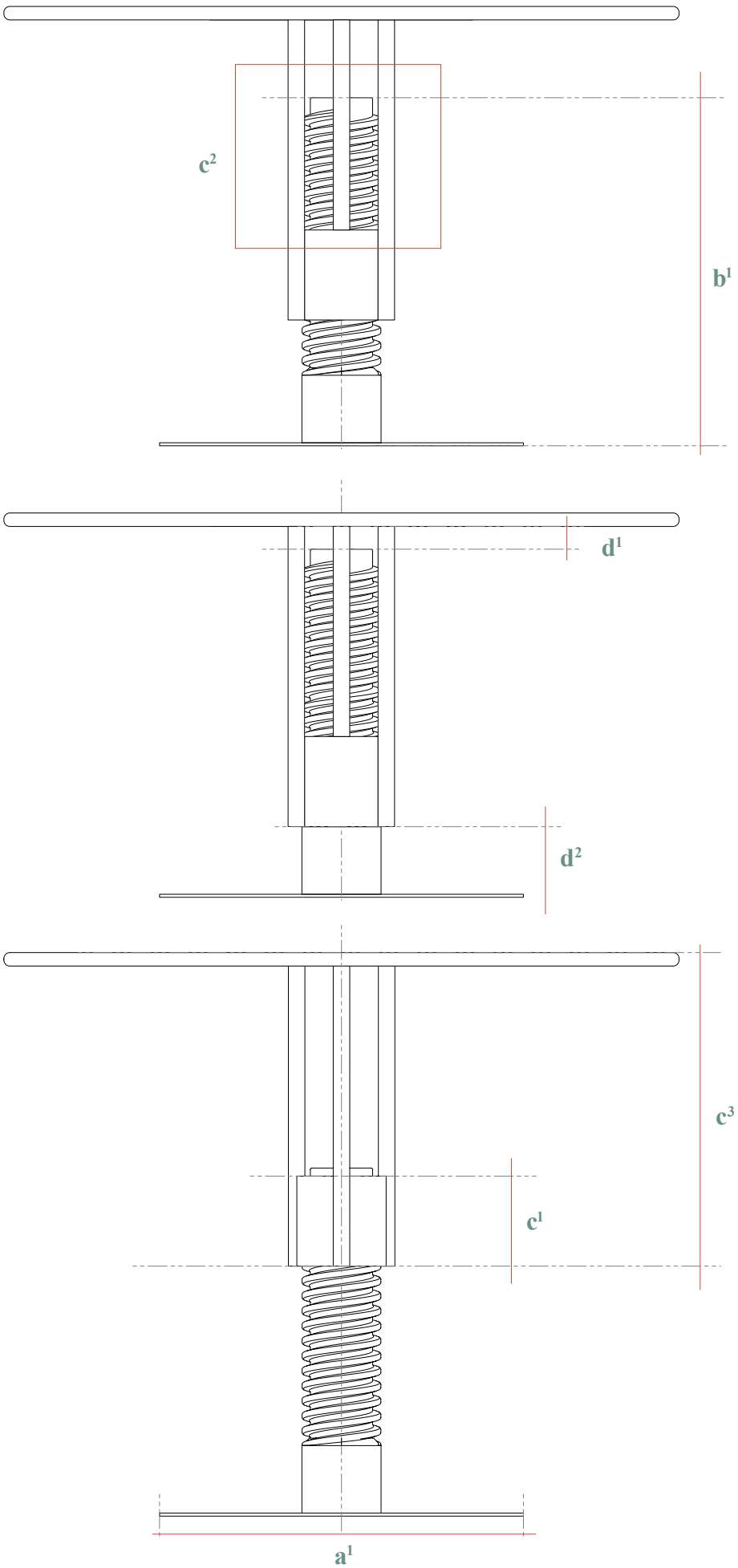
ill. 121

ill. 122

D Gap between thread and nut

d[1] According to the EN standards, products that have movable parts cannot have a gap between 8-25 mm, because users risk getting their fingers pinched (Dansk Standard, 2023). As a result, it was determined that gap between the thread and the nut should be 5 cm.

d[2] To prevent the tabletop from moving closer than 5 cm from the thread, the bottom of the thread should leave 10 cm without a spiral, so the nut cannot move further down.



ill. 123

04 Wrapping up

Summary

This phase shifted between the principal level and the material level (Lerdahl, 2001). Using solid wood only turned out to be infeasible, and metal was incorporated into the design. This initiated a material evaluation, which concluded that the tabletop should be made from solid wood, the thread and bottom should be made from metal, and the nut should be made from plastic.

Key takeaways

The reasons for minimal wood in offices are heavy use and because users treat furniture differently outside of their homes.

There was a need to kill the initial desire of producing entirely in wood in order to accommodate both private- and contract market needs.

Good intentions are positive but might not be feasible.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

05 Detailing

The following phase introduces a constant shift between observing the need for improvements (divergent) and detail refining (convergent) (Design Council, 2019).

1:1 function model and test

A 1:1 function model was produced to test the coffee table (WS 42). The model was made from metal, plastic and oak veneer, opening the possibilities for uncertainty. However, the outcome was:

Stability

ill. 124

The table was stable, and it was assumed, that the stability would improve in an actual product made from the correct materials, since this would make the thread heavier and stronger.

ill. 125

The top of the thread part was made without a spiral, because it was assumed, that this could stop the movement, when the top height was reached. However, it was observed, that when the nut reached this height, it started to become unstable.

Dimensions and friction

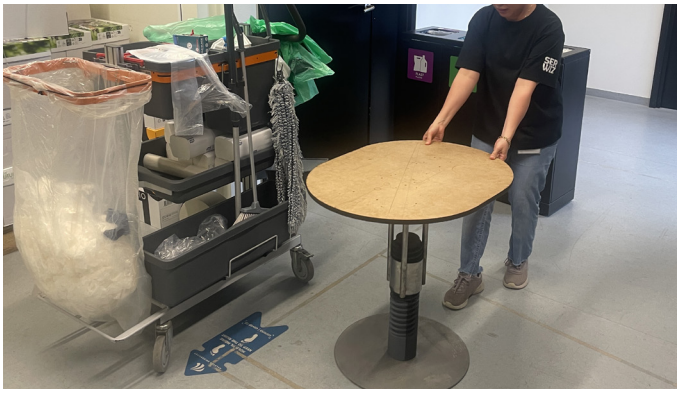
The dimensions of the tabletop, thread and bottom worked as desired and provided stability. The tolerance between the nut and the thread, which seemed tight when testing it however became looser, when putting weight onto the thread and nut. It must though be considered that the thread was made from plastic and that the friction became poorer during the use of the prototype, because the plastic became worn. This was assumed to be improved in metal.

ill. 126

Pulling

Previous research revealed that cleaning staff might move tables when cleaning. The cleaning staff was asked to pull the table. The cleaning staff could easily pull and move the table, however she suggested to soften the bottom, to make the table move smoother and avoid scratching the floor. It must however be considered that the actual table would be heavier.

It was observed that the joint between the wooden tabletop and the nut part was a vulnerable point when pulling the table and as a result this needed strength improvements.



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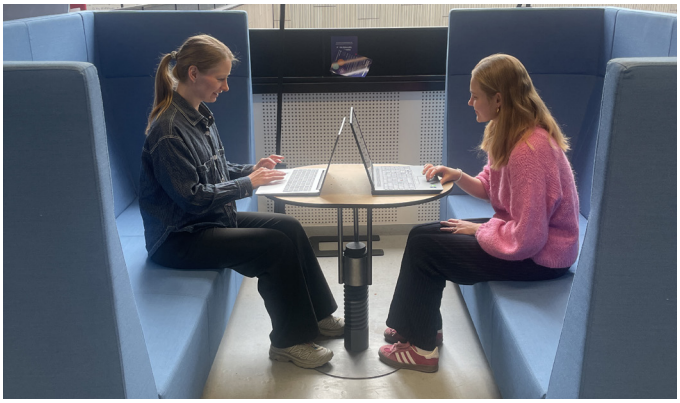
Interaction

Different users at Aalborg University tested the prototype and commented on the interaction. The outcome was:

- The edges of the tabletop were too hard. They should invite the user to grab it and turn the table.
- Surprisingly, the tabletop did not move, while the users were working, though the friction was poor.
- The users had free space to move their legs and change their seating position.
- The playful interaction encouraged the users to adjust it.

"I never imagined I would describe a table as cute, but this one really is, because it is so playful and fun."

ill. 129



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ill. 131

Detailing dimensions and usage

Testing the function model, it was found that the dimensions of the tabletop, thread and bottom provided stability in the coffee table. The tolerance between the nut and the thread was difficult to test, because thread was made from plastic, however a 1 mm tolerance in a standard in threads, so this tolerance remains untouched.

To improve the usage, it was determined to incorporate an element, that would stop the nut from turning all the way up to the top of the thread and result in instability. Since the aim is to make the product repairable, it is a desire to make all parts separable. As a result, it should be possible to separate the thread and the nut. Therefore, it was decided to make a small insert, which the user can place into the thread, when the nut and the thread are assembled. Likewise, this insert can be removed when disassembling the product.

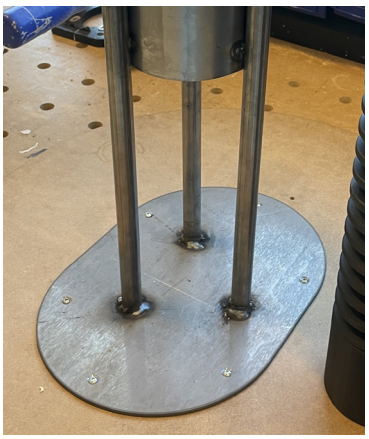
ill. 132

ill. 133

ill. 134

Strength detailing

The function model test highlighted a vulnerable point in the joint of the tabletop and the nut part. To strengthen the stability, the three pipes were welded onto a metal plate, which was screwed into the tabletop. This improved the strength of the table.



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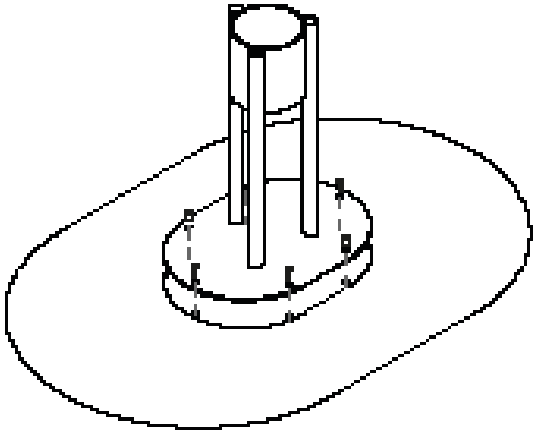
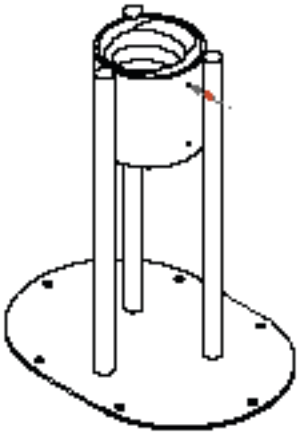


ill. 136

Furthermore, the table would be stronger if the pipes were welded onto the nut, however the internal thread had been determined to be made from plastic due to previous thread tests. Therefore, outside of the nut would be a metal pipe screwed onto a plastic part, so the parts can be separated.

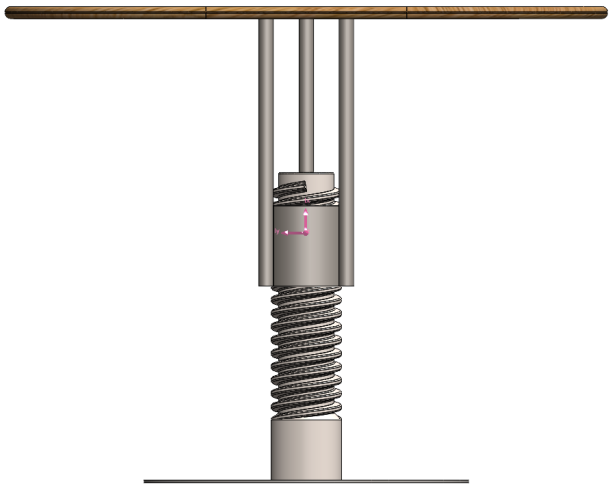
ill. 137



ill. 138

FEM

An iterative process in Solidworks simulations was made (WS 43). First step was to check the stability of the coffee table. The symmetric designed ensured that the centre of mass was placed within the volume of the leg, ensuring stability without risk of tilting. Parameters were changed iteratively to see how that would affect the performance of the assembly and the table's performance under a load pressure. The analysis simulated a user adding 22 kg to the edge. The coffee table passed the test.



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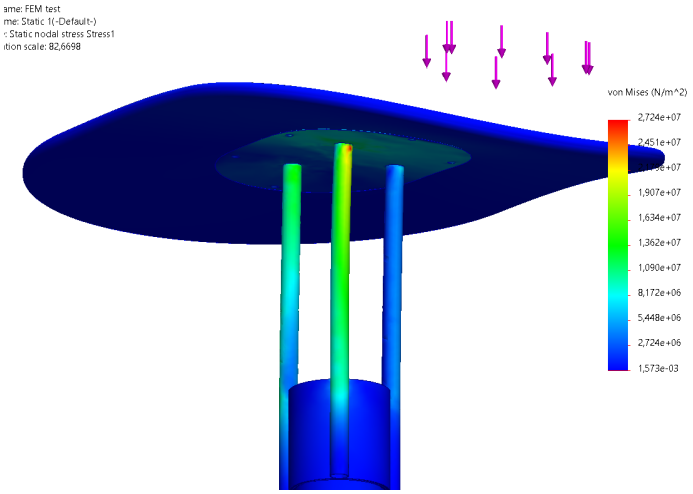
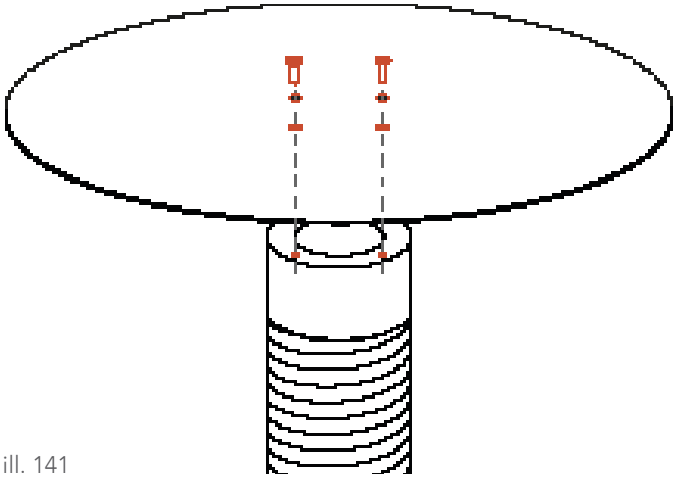


ill. 140

Detailing the product architecture

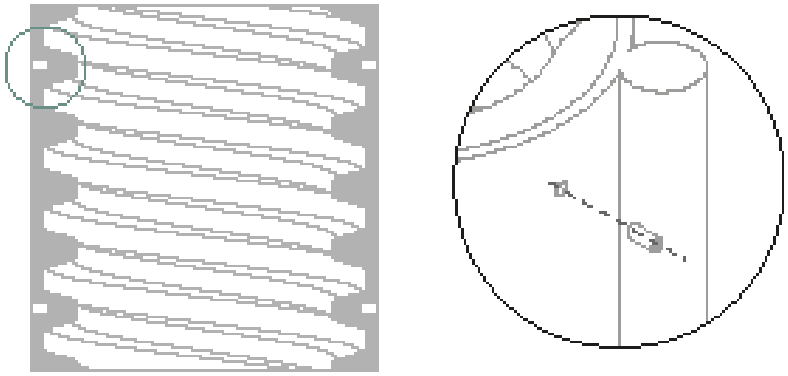
Repairability was influencing the descision-making throughout the process. In the detailing of the product architecture the focus was therefore on separability.

To make the thread separatable from the bottom plate, they should be joint by screws. As a result, the walls of the hollow thread were determined to be 20 mm to be able to drill a hole for a screw.



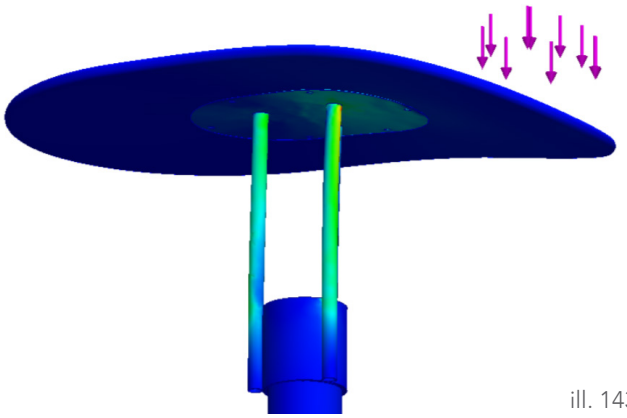
ill. 141

Likewise, the nut cylinder and the plastic insert are determined to be joined by screws to be separatable. To fix the plastic insert into the nut cylinder, they are joined by three screws in the top and three screws in the bottom. The screws are placed where the internal thread's walls are thickest and have a thickness of 15 mm.



ill. 142

Furthermore, the tabletop and the nut part are, as mentioned previously, jointed by screws. The nut part was welded together, because the walls of the pipes were too thin, and because this area was, according to the FEM analysis, the most vulnerable area of the product.



ill. 143

Reflection

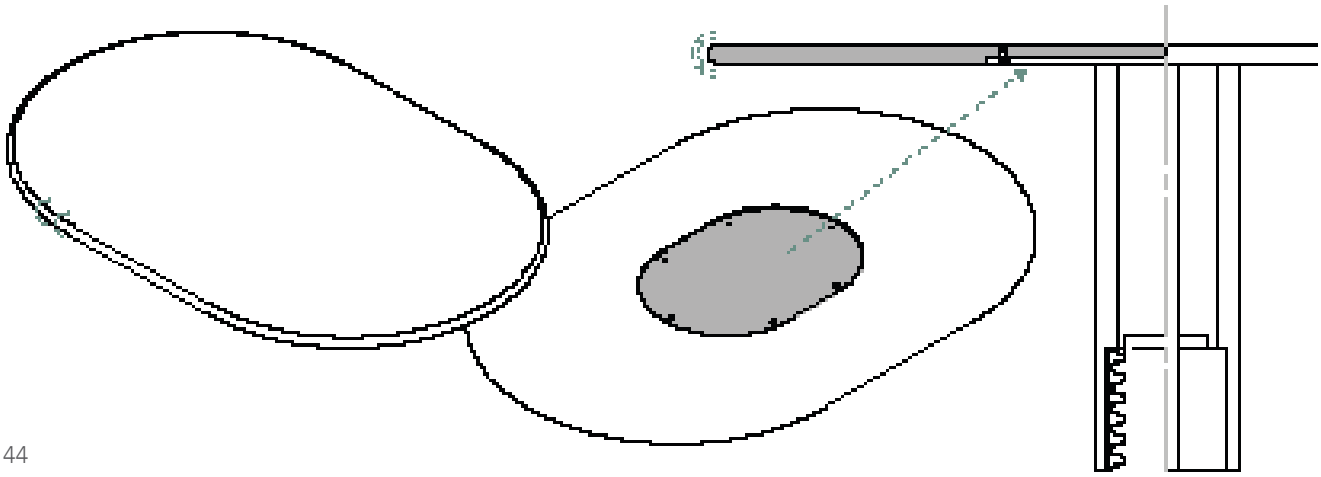
A consideration upon working with repairability and a turning table was, whether the screws will loosen during use or whether the architecture is strong enough to withstand use.

Furthermore, it was considered whether jointing by screws or jointing by welding was better. Welded parts cannot be separated however welding is very strong a durable, so it might last long. On the other hand, jointing by screws make the furniture separatable but the production of screws also costs co2 emissions, and screws might not be as durable as weldings, leading to a consideration of which option is better in terms of responsibility.

Aesthetic detailing

To make the user interaction with the tabletop smoother, the edges of the tabletop were rounded. The desire of the rounded shape was, that it would fit nicely into the user's hands.

Furthermore, it was determined that the tabletop should feature an engraving for the stability plate. This should both provide a seamless transition between the tabletop and the plate and an indication of the placement of the plate for the user who assembles it.



ill. 144

Unsorted wood

It was previously mentioned to use an adapting strategy by implementing unsorted wood in the product. As a result, unsorted wood was explored further.

FDB Møbler only uses wood classified as grade A, which refers to the most flawless wood (WS 12). This means, FDB Møbler has a wood sorting guide, which they hand out to their manufacturers. The sorting guide presents the following reasons for unsorting wood:

- Contrast in colour nuance
- Medullary rays
- Black spots
- Knots
- Contrast in grain patterns

To aim for lowering the number of wood being unsorted by using an adapting strategy, a case study on existing unsorted wood products was conducted to get inspiration for how to implement unsorted wood in the tabletop.

ill. 145

ill. 146

ill. 147

ill. 148

ill. 149

Case study on unsorted wood products

Three different products featuring unsorted wood was analysed. The outcome was the following strategies (WS 44). The aim was to implement one or more of these strategies depending on the manufacturing process:

ill. 150

ill. 151

ill. 152

ill. 153

ill. 154

Introducing Nordkraft

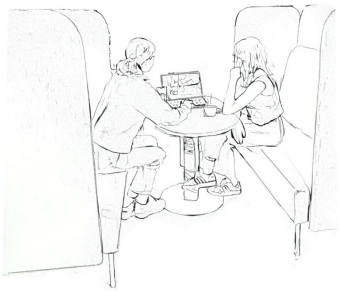
Like the former power station turned cultural hub, the Nordkraft coffee table is a product of local collaboration - a collective design process rooted in shared vision and community. The table embodies a flexible, functional approach, reflecting the same honest aesthetic, authenticity and rawness that defines the cultural center.

ill. 155

Story board

The following Story board visualizes a day in an office for the coffee table

Sophie and Tina are having a coffee while talking.

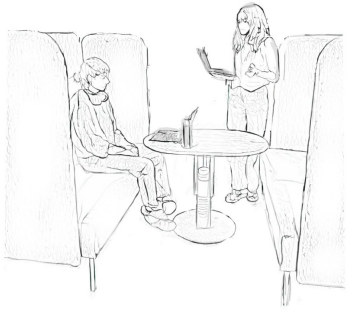


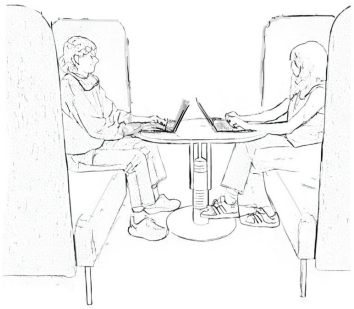
Christian takes a seat for joining an online meeting.

After the online meeting, Christian decides to stay and finish some work.

ill. 156

Mary comes to ask if she can sit to do some work.





Christian and Mary turn the table to leave.

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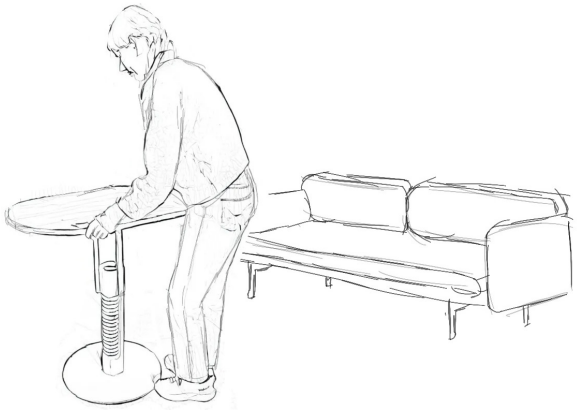
This storyboard presents the beginning of the coffee table's second life. The company has rebranded itself, and the interior designers decide not to keep the coffee table. The company offers the coffee table to employees, and Alex has happily accepted the table – it fits just perfect into his living room.

Alex disassembles the coffee table so he can easily carry it in his trunk.

Alex assembles the coffee table and place it by his couch.



Alex raises the table and turn it to have dinner while watching his favourite TV show.

After dinner, Alex lowers the table. He brings a bowl of candy, puts up his feet and turns on a movie.

ill. 156

05 Wrapping up

Summary

This phase also shifted between the principal level and the material level (Lerdahl, 2001). The test of a 1:1 function model based the foundation of detailing the product and its interactions. The detailing focused partly on repairability, which is why most parts were designed to be separatable.

Key takeaways

Repairable might not be better than not repairable.

The stability of the table cannot be fully confirmed.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

06: Production & Supply Strategy

The following phase explored how the product could practically be realized, along with research into the market in which the product was to be placed.

Business model Canvas

A Business Model Canvas was developed to provide a clear overview of FDB Møbler's current structure. This overview served as a foundation for identifying the necessary implementations required for the company to successfully enter the office market. These were marked green.

Key partnerships	Key activities	Value Propostions	Customer Relationships	Customer Segments
Manufacturers Logistics partners E-commerce tech provider Wholesale partners + Contract partners	Inventory management Store design and maintenance Sales and marketing Customer service + Developing contract management systems	Medium priced design furniture FSC, Oeko-Tex, BSCI, Nordic Swan Ecolabel, and EU Ecolabel. High quality materials Home-like appearance Scandinavian design + After-sales service or maintenance agreement	Personalized customer support (e-mail, call) Storytelling and offers through newsletters and social media Member prices + Contract prices + Establishing long-term partnerships	Homeowners Businesses Interior designers/ Architects + Contract clients
	Key Resources Physical: Warehouses, Inventory, stores, + Inventory of spare parts, + Customizable products Intellectual: Product designs, Brand reputation, C2B catalogs, +B2B catalogs Human: Sales consultants, Support staff Financial: Working capital, Investment capacity		**Channels** E-commerce websites Social Media (Instagram, Facebook, etc.) Furniture dealers (Holmris B8, etc.) + B2B website or landing page	

Cost structure		Revenue Streams	
Product development	Royalty payments to designers	Direct sales via webshop	Physical stores
Payment to manufacturers	Marketing and advertising spend	Delivery fees	B2B wholesale sales
Platform/website maintenance	Storefront expenses	Agents	Contract manager (just hired)
Warehousing and shipping logistics			

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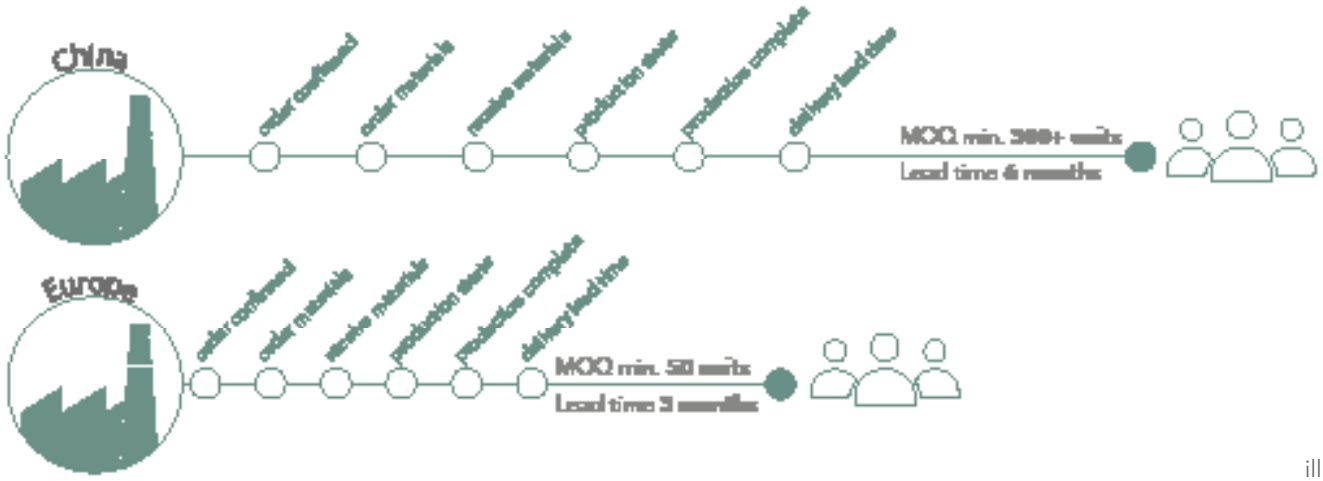
The new implementations ensure a clear plan for FDB Møbler to transition into offering furniture for the office market. Furthermore, FDB Møbler is a well-suited company for the contract market, as its products are designed for long-term production rather than following short trends. This ensures that contract clients can reorder the same products when they are expanding companies.

Some of the necessary implementations can be addressed through strategic partnerships with external companies, such as after-sales service or maintenance agreements.

Supply Chain



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A value proposition canvas was conducted using knowledge from new and previous expert interviews (WS 17). The outcome concluded that customization, budget and customer lead time are highly valued.

The understanding of the internal layout is essential when developing a product for a company. Therefore, a situated interview with a supply chain planner of FDB Møbler was arranged (Sperscnheider & Bagger, 2003) (WS 45). The purpose was to investigate how much the location of the manufacturing company effects the different aspects, which will also have an impact on the cost estimation in later stages. Furthermore, there was an interest in knowing how launches of new products work.

Lead time

The lead time is defined by the time between the order and when the customer receives the product. The lead time can vary a lot depending on different factors. In most cases, the location of the manufacturing has the biggest impact on the lead time, especially when looking at Europe and China (see ill. X).

In general, FDB Møbler strives to keep an inventory of 50 units of each product. If a contract client places a large contract order, they often make a separate order, so it does not affect their inventory.

Minimum Order Quantity (MOQ)

Minimum Order Quantity (MOQ) refers to the smallest number of units a manufacturer is willing to produce or sell in a single order. MOQ vary between China and Europe. Manufacturers in Europe generally has a lower MOQ compared to those in China (see ill. X). Moreover, in terms of logistics, manufacturing in China often requires filling entire containers with large quantities, leading to higher shipping costs. In contrast, in Europe it is possible to fulfil orders with a single truckload which typically results in lower shipping costs. This difference in shipping volumes impacts the overall cost structure, balancing freight costs with inventory storage expenses. However, manufacturing in China has one big key advantage, which is the significantly lower cost. This is also the reason why FDB Møbler's other contract product, J182 Holmen, is produced there.

Launch of a new product

When an agreement is made with a manufacturing company a fixed price for producing the product is defined. Supply chain takes into account the risk of the new product cannibalizing existing products in the same product category. A small batch order is placed for the initial series, which is typically determined by the MOQ. There is a risk of either under- or overproduction, which is addressed through forecasting with the manufacturer.

Currently, there are no issues with scaling up or down, as this is managed on a weekly basis.

Prototyping

In an earlier interview with the Product Manager of FDB Møbler it was mentioned that companies spend a significant amount of money on prototyping. The high cost is primarily due to the investment a prototype might involve. Additionally, it is expensive for a company to send the product to the Technological Institute for testing (WS 45).

Conclusion

The interviews offered insights into a potential implementation plan for the new product. The outcome resulted in choosing a manufacturer in Europe as first priority, as lead time is much shorter, and it is a good selling point for contract clients if they want customized option. However, the risk of this is the price point being too high, which will be examined in the cost estimation. This could result in the need to relocate manufacturing to China like J182 Holmen Chair, as competitive pricing is also a key selling point for the contract clients.

Choice of materials

Table top: Oiled/lacquered hardwood

Wood is a natural material valued for its strength, warmth, and visual appeal and it is commonly used in furniture. Hardwood such as oak and beech is a durable and dense type of wood and is used due to its strength, resistance to wear and natural grain. Wood is a living material, meaning it responds to its environment, such as humidity and temperature, meaning that wood can expand, contract and develop patinas over time. To ensure longevity, solid wood needs regular care and maintenance. However, if treated properly, it can retain its durability for decades (FDB Møbler, 2025).

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Nut frame and base: Stainless Steel

Stainless steel is a widely used material in the furniture industry due to its mechanical properties. It is highly resistant to rust, corrosion, and staining, making it ideal for both indoor and outdoor environments, including humid or wet conditions. The material is strong and durable, with a high load-bearing capacity and good impact resistance, which ensures long-lasting performance even under heavy use. Stainless steel also offers a clean, modern appearance with a smooth surface finish that can range from brushed to polished, depending on the design. It is hygienic and easy to clean, which is especially beneficial in public spaces, and commercial settings. Additionally, it is 100% recyclable, making it an environmentally friendly choice for sustainable furniture design (Eagle Tube, 2025).

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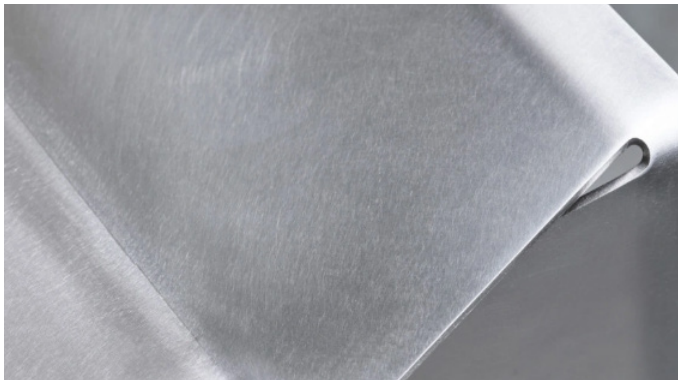

Internal thread insert: Pom

POM (polyoxymethylene) is a plastic type known for its mechanical properties such as low friction and high wear resistance. It features a smooth surface that reduces friction when in contact with other materials, making it ideal for applications where parts need to slide or move with minimal resistance. POM has good dimensional stability and is partially self-lubricating, requiring little to no external lubrication, which reduces maintenance needs (Ensinger, 2025).

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Standard components: Electrogalvanized steel

Electro-galvanization is a technique that applies a thin zinc layer onto the steel through an electroplating process. It provides a smooth, clean finish and protects against corrosion and discoloration to the wood. This material is commonly used in furniture construction, is available pre-treated by suppliers, and offers a cost-effective solution alternative to stainless steel, without compromising durability and aesthetics (MST Steel, 2025).

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Manufacturing processes

Tabletop

During the production of a 1:1 prototype, insights were gained into the production process of the coffee table. A company was visited to provide insights into the production of the tabletop (WS 46). A discussion about using unsorted wood gave the following outcome:

When CNC milling the oval shape, it could be a risk to use parquet pieces as on the prototype, since small pieces might break off during production, if the CNC machine hits a vulnerable corner, leading to more wood waste. Instead, long planks should be used. As a result, it was decided to use long planks and downscale FDB Møbler's requirements to wood, so nothing is wasted due to imperfections (WS 12).

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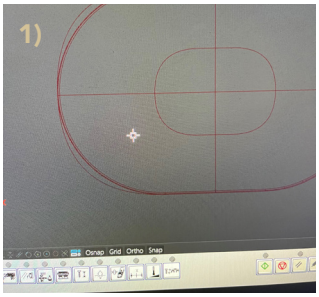

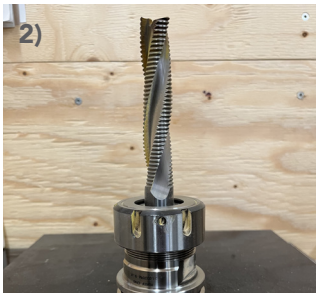

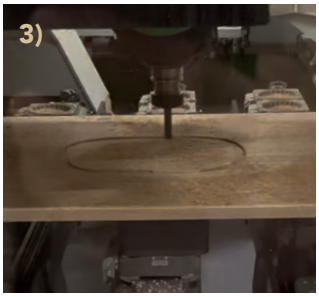

1) Importing the design file

A CNC operator begins by importing a CAD file into the CAM software. Here, the file is optimized and converted into a format suitable for machining. Thereafter, the wood is positioned on the CNC machine bed, where it is held in place using a vacuum clamping system.

2) Rough milling

First, the tabletop is cut into its approximate shape in a process known as rough milling. During this step, the contour is machined approximately 1 mm larger than the final dimensions. The roughing tool aggressively removes material, effectively pulverizing it to quickly shape the wood.

3) Pocket milling

The same tool is then used to perform the pocket milling operation.

4) Finishing pass

Next, a finishing tool is used to machine the tabletop to its correct dimensions. This step is referred to as finishing, and it ensures a precise and clean cut.

5) Edge profiling

Afterwards, a handheld router is used to round the edges and create the desired profiling. This operation can alternatively be performed by the CNC machine.

6) Post-processing

Finally, the tabletop undergoes post-processing, which may include sanding, oiling, or lacquering, depending on the desired surface finish and material requirements.

Frame and base

A 1:1 prototype was produced and worked well, however expert interviews provided insights into how the parts would be produced professionally, which differed slightly from the production of the prototype. The following description describes how a professional manufacturer would produce the parts (WS 47).

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Top and bottom plate

1) The top- and bottom plate are cut from a 5 mm thick steel plate, in the correct shape with the necessary holes for screws. The top plate must have holes with a 22 mm diameter for the three pipes.

Pipes

2) To be able to connect the pipes and the top plate a recess of 20x4 mm should be turned on the top of the pipes so they fit into the holes and can be welded from the top. The advantage is that it is easy to position the pipes correctly and prevent the top plate from warping during welding.

The steel cylinder with external threads

3) A circular end cap is tack welded onto a pipe before fully welded around the circumference. The end cap is cut simultaneously with the top- and bottom plate. The weld seam is ground flush to ensure a smooth, continuous surface.

4) The pipe is mounted in a lathe. The lathe is set to the correct pitch and a trapezoidal threading tool is used. The thread is cut in multiple passes to gradually reach the required thread depth. Sharp edges are deburred to ensure a clean finish.

5) Axial holes are drilled into the bottom of the cylinder, and a tapping tool threads the holes, for easy assembly with the bottom plate.

POM insert with internal thread and steel cylinder

6) The POM pipe and steel pipe are standard sizes available for purchase. A hole, slightly smaller than the outer diameter of the steel cylinder with external threads, is drilled in the pipe.

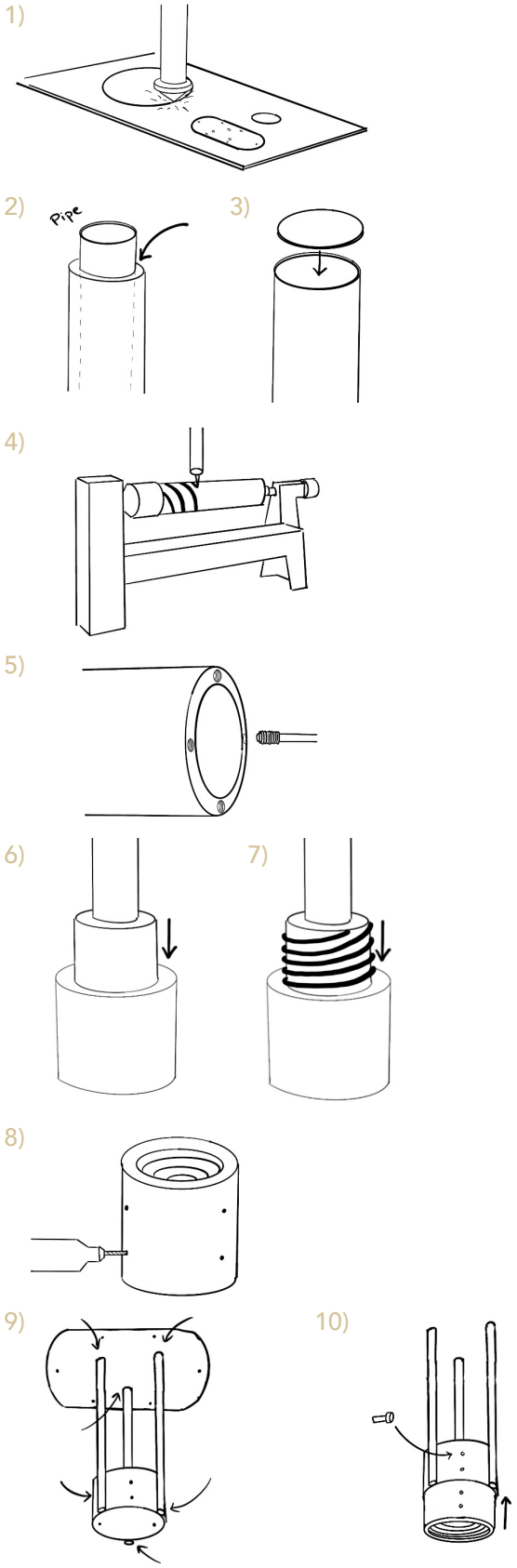
7) An internal trapezoidal thread tap is used to cut the internal thread, ensuring it matches with the external thread profile.

8) Two holes for screws are drilled perpendicular to the insert from the outside.

Assembly process by the manufacturer

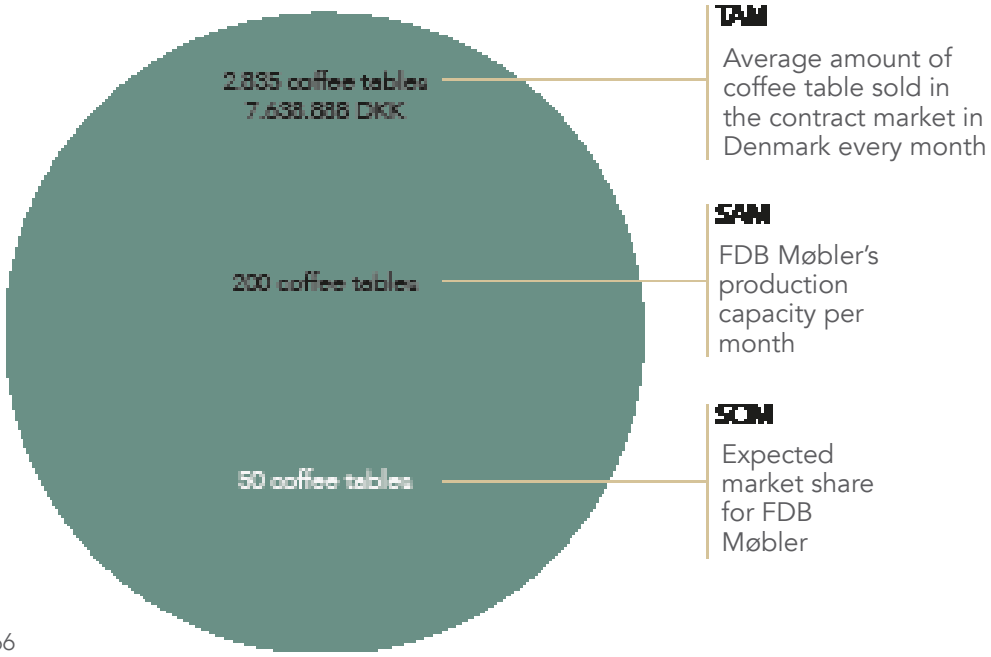
9) The manufacturer welds the top plate, the three pipes and the cylinder for insert together. The parts are sent for post-processing.

10) The POM insert, and cylinder are screwed together.



Market size analysis

The purpose of the analysis was to assess the market potential and size of a new coffee table designed to fit soft spaces in office environments. The diagram used illustrates the potential market size, it includes three acronyms: Total Available Market (TAM), Serviceable Addressable Market (SAM), and Share of Market (SOM) (Kotler & Keller, 2016).



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TAM (Total Addressable Market)

TAM represents the total revenue opportunity available for a product or service in a specific market. It respresents the revenue opportunity that a company has if it has 100% of the market share without competition.

The initial data is compiled from a phone interview with Daarbak, who was called to hear if they had a number on how many coffee tables they sell (WS 45). They are the second largest player in the contract market in Denmark and stated that 2-3% of their revenue comes from coffee tables, approximately 750-1,000 coffee tables per month. Their annual revenue is approximately 1.1 billion.

Holmris B8 is the biggest player but unfortunately did not have any numbers as they just have started calculating 1st of May 2025.

During the interview, Daarbak estimated that they have 30% of the contract market share. Therefore, taking 850 units as an intermediate point between 750-1000, and these represent 30% of the total market, that means 2,835 coffee tables are sold each month.

SAM (Serviceable Available Market)

SAM represents the "slice" of the TAM "pie" that can be served by a company's products and services.

Taking into account FDB Møbler's production capacity and the logistics required to produce for the contract market in large quantities, it is estimated that they could distribute 200 units per month. This is based on an interview with a supply chain planner, who mentioned that FDB Møbler normally aims to keep 50 units in stock in Europe for their private market customers, however, for the contract market they would aim to keep a higher amount.

SOM (Service Obtainable Market)

SOM represents the actual amount of the market that is being served by the company's products and services.

Access to the contract market through Holmris B8 and relevant network provides the opportunity to establish volume and ensure delivery reliability. Compared to private market sales, a contract market sale can mean selling larger numbers of products in just one transaction. Therefore, it is estimated that the actual amount of market served by FDB Møbler would be 50 units per month.

Reflection

Using this method it was concluded that the coffee table represents a small share of the market. This is a realistic strategy for a small company like FDB Møbler entering a new market, as it allows for growth and easier adaptation to market needs. Since FDB Møbler is entering a relatively new market it makes sense to aim for a modest initial share, as the approach helps the company build brand recognition and credibility in the early stages.

Reflecting the product's value, it has potential to reach a broader audience as it can be used for multiple purposes, however, taking small steps in a new market minimizes risk. It is important to note that this is an estimate because of the difficulty in finding the data needed. The data used, only applies to Denmark; in other countries, where FDB Møbler also operates, the number of sold coffee tables is significantly higher.

06 Wrapping up

Summary

The phase introduced a description of the materials, manufacturing process and the market share, that was estimated for FDB Møbler. It was estimated that FDB Møbler can sell 50 coffee tables per month. Since the project was at its most concrete level, the phase visited the material level (Lerdahl, 2001).

Key takeaways

A long lead time can affect sales negatively in the contact market.

A thread is a complex component.

Taking small steps into a new market minimizes risk.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

07 Market implementation

The following phase introduced an estimate of the cost and sales price of the coffee table.

Cost Estimation

Introduction

To calculate the price of the coffee table, a cost estimation of the coffee table's various components was done. Initial price quotations were obtained from Danish manufacturers supporting the creation of the 1:1 prototype (WS 48). These quotations included manufacturing costs which therefore reflected production under Danish conditions. However, the estimated prices were found to be too high to align with FDB Møbler's general cost structure, making the product economically infeasible. Since FDB Møbler already manufactures several of their products in Eastern Europe such as Latvia, it is likely that the production of the coffee table could also be relocated to this region. As a result, adjustments were necessary to reflect the anticipated cost differences. The quoted prices were divided into three estimated cost components:

- 30% for raw materials
- 30% for machine usage
- 40% for labour

Based on publicly available data, the average hourly labour cost for a production worker in Latvia (SkyPlanner, 2025) is approximately 60% lower than in Denmark (Indkomsten.dk, 2025) . This wage difference was applied to the labour part of the cost, resulting in an overall reduction of approximately 25%.

Although machine operating time remains constant across regions, operational costs such as electricity and maintenance tend to be lower in Eastern Europe. Therefore, a 15% reduction was applied to the machine usage cost components, corresponding to a further 5% reduction in the total cost. These adjustments allowed for a more accurate estimation of production costs under Latvian conditions.

The remaining components were identified as standard parts available on the market, and their prices were then adjusted by subtracting the value-added tax (VAT) (Startupsvar, n.d.).

The prices were calculated based on a production run of 100 units by the manufacturer, with raw materials supplied by the manufacturer, and excl. VAT (WS 48).

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QTY. 100 Units	Parts	Original cost price (production in DK included)	Cost price (production in Latvia included)
1	Oiled/lacquered tabletop, oak	980 DKK	686 DKK
1	Top plate, steel (cut w. holes)	110 DKK	77 DKK
1	Bottom plate, steel (cut w. holes)	180 DKK	126 DKK
1	POM insert with internal thread and cylinder, steel	500 DKK	350 DKK
1	cylinder w. end tab and external thread, steel	1,000 DKK	700 DKK
3	Pipes, steel	90 DKK	67.5 DKK
6	M4 x 12 mm wood insert, hex drive, type 9038	5.8 DKK	5.8 DKK
4	DIN 913 M4x10 – 45H: M4 x 10 mm hex socket set screw, flat point	2.76 DKK	2.76 DKK
1	DIN 912 M4x8 – 8N: M4 x 8 mm socket head cap screw	0.6 DKK	0.6 DKK
10	DIN 7991 M4x16 – 11.6N: M4 x 16 mm hex socket countersunk screw	5.8 DKK	5.8 DKK
1	Finishing Costs	220 DKK	150 DKK
1	Packaging	80 DKK	80 DKK
1	Assembly cost (25 min for 67.5 DKK/an hour)	125 DKK	17 DKK
	Total variable costs/ cost price:	**3,856.9 DKK excl. VAT**	**2,268.5 DKK excl. VAT**

It should be noted that this cost estimation was made as an early-stage cost comparison, and there are several uncertainties, as the cost breakdown was based on assumptions. Furthermore, these numbers were given as if the manufacturer was expected to only produce 100 units which may result in higher unit costs due to small-scale efficiencies. However, the transportation costs were not included in the current estimate and would be higher if the production takes place in Latvia (WS 48).

Price Estimation

To calculate the selling price of the product, the cost price was multiplied by four, resulting in a profit margin of 300%.

Price estimation	
Cost price	2,268.5 DKK
Profit margin	6,805.5 DKK
Selling price without TAX	9,073.9 DKK
+25% TAX	2,268.5 DKK
Selling price including TAX	**11,342.4 DKK**

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The estimated selling price excl. VAT was 9,073,9 DKK. Compared to the market research into FDB Møbler's current coffee tables, this price is relatively high. However, since it was designed to act as a flexible workstation, it was viewed in the context of the desktop table category. In this comparison, the price falls in between the two desks FDB Møbler offers. This suggests that while the product may appear expensive within its immediate segment, it remains competitively positioned when evaluated across another relevant market. This raises the question of whether the coffee table's multifunctionality adds enough value for the user to justify the cost price.

07 Wrapping up

Summary

The phase introduced an estimation of the cost- and sales price of the coffee table. It included considerations into the placement of the manufacturing, which affected the price significantly. The selling price excl. VAT was 9,073,9 DKK. Since the project was at its most concrete level, the phase visited the material level (Lerdahl, 2001).

Key takeaways

The use of many product specific components has heightened the price.

Reflection upon whether the user values the function enough to pay a high price for this coffee table.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

08 Responsability evaluation

The following phase presents an evaluation of the product's responsibility and the project's mission.

Responsibility evaluation

To evaluate the responsibility of the coffee table, it was decided to evaluate it the same way as FDB Møbler evaluates their products. To get information about how FDB Møbler evaluates their responsibility, the Sustainability Manager was contacted. The answer from her was the following (WS 49):

> FDB Møbler only work with FSC certified companies. And they conduct due diligence on the companies in their supply chain to ensure they comply with the relevant sustainability regulations.
>
> FDB Møbler visits their facilities to have as accurate an image as possible of what is really going on in their supply chain.
>
> FDB Møbler calculates the CO2e emissions produced due to the operations, as per product throughout the whole life cycle.
>
> FDB Møbler are working towards certifying all of their products with the Nordic Swan Ecolabel.

CO2e emission estimate

As a result, an estimate of Nordkraft's CO2e emissions produced due to the operations was made (WS 50). An LCA tool was used to make the following estimate (Exiobase, 2025):

Phase	Description	Estimate CO_2e (kg)
1. Raw forest production	Forestry, mining, plastic feedstock extraction	10-15
2. Material processing	Steelmaking, galvanizing, drying wood, plastic compounding	35-50
3. Manufacturing	CNC milling, welding, laser cutting, drilling (metal & plastic), threading, powder coating	14,5-24,5
4. Shipping (material + final)	Upstream shipping + China to Denmark via sea freight	3-5
5. Use phase	Passive use — no emissions	0
6. End-of-life treatment	Recycling, incineration, landfill	5-15

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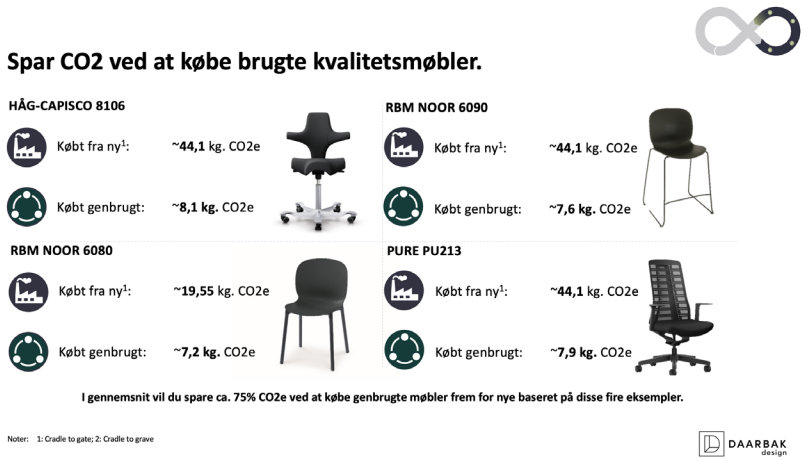
The estimate of the whole life cycle of the coffee table was 109 kg CO2e according to the LCA tool. Please note that it was not possible to find all manufacturing processes in the LCA tool and this might affect the outcome.

Comparing with Daarbak's products, it was clear that the CO2e emissions of the coffee table was higher than other products in the contract market, which was a weakness of the product. However, a strength of the product was that if it succeeded in having a second life as intentionally, the CO2e emissions of reusing the product would be very low.



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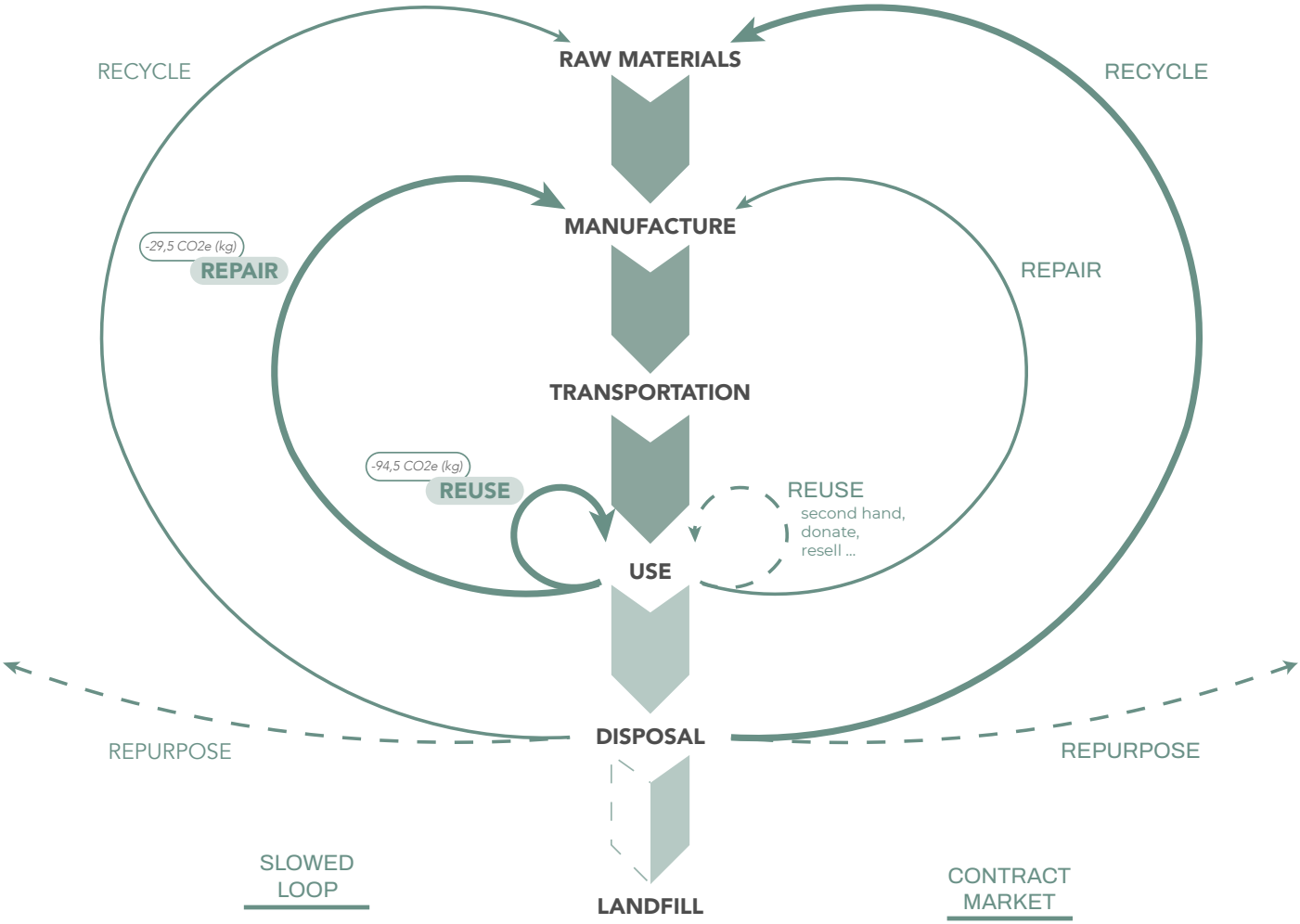
Reflection

If the product was produced in the real world, it would be ideal to explore potential manufacturers in order to align with FDB Møbler's requirements of working with FSC certified companies. Furthermore, it could be an aim to get the Nordic Swan Ecolabel.

The weight of the table is heavy, meaning that the table features a lot of material. The most CO2e-heavy part also comes from processing the materials, while the second biggest part comes from manufacturing all of the parts. This is furthermore a weakness in the product, which must be refined if the product should be responsible for implementing in the market.

Contract market waste loop

It was aimed to slow down the contract market waste loop. The following illustrations present the current waste loop of the contract market and the waste loop of Nordkraft.



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Mission index evaluation

The mission was to research the reasoning for furniture discarding and design a piece of furniture that would slow down the current furniture waste loop while improving product durability, repairability, upgradability and reusability. The product was designed using knowledge about furniture discarding, however the product durability, repairability, upgradability and reusability was not yet evaluated.

How to evaluate the mission?

France is the only country who has developed a repairability and durability index evaluation system, however these are only made for electronics devices. The aim is to extend or make an index evaluation system for other products, which could possibly include furniture, since this is a huge focus in the upcoming EU regulations. As a result, a self-made index evaluation was created based on the French index evaluation for electronics (WS 51). In addition, evaluation points were added in order to evaluate on all four aspects: durability, repairability, upgradability and reusability. A point system equal to the French one was used. The evaluation table was divided into the four aspects. Each aspect had different criteria, which had sub-criteria. Each criterion had a weight and was scored on 20 points, and each number was then compiled into an aggregate score out of 100, which was then divided by 10 and rounded to 2 decimal digit to make the final grade.

The mission index evaluation was applied to the final product and two other tables in the same product category. One of these coffee tables is one from the market research into coffee tables; Fritz Hansen's Little Friend. This was chosen, because Fritz Hansen partly provides information on how to maintain and disassemble some parts on their website, assuming that this table would be the best scoring table of the ones in the market research. The other coffee table is from FDB Møbler. The scoring of these three tables was compared to evaluate whether repairability, reusability, upgradability, and durability was improved in the product.

Reflections on the evaluation of Name:

The evaluation provides an overview that showed that the focus was on designing for repairability, reusability and the durability of the product. A lack was seen in the upgradability aspect, which was not a focus point in the project.

Furthermore, a lack in criterion 4 was observed, because the coffee table contained many product specific elements. This is a negative part of the product, because after FDB Møbler's 10-year warranty, the consumers will have to get these spare parts themselves, which might not be feasible.

Comparison of the three tables

Nordkraft gets a higher score than the other tables, because it was designed with the aspects in mind. As a result, it was concluded that repairability, durability and reusability was improved, noting the reflections underneath. Name also scored higher on upgradability because of its separability, which made it easier to enhance, for example, the color. However, it was concluded not to be enough to say that it was improved.

Reflections on the index evaluation table

It must be taken into consideration that the design team was the ones to evaluate their own design.

The matrix was based on what were believed to be important criteria.

Only two other tables were compared to Nordkraft and as a result the improvement cannot be fully confirmed.

Topic	Criterion	Sub-criterion	Score of sub-criteria /5	Weighting factor of sub-criteria /2	Score of criteria /10	Total criteria scores /100
Repairability	Criterion 1: Availability of technical documentation	1.1 Availability of documentation related to repairability and maintenance instructions	5.0	2.0	10.0	62.8
	Criterion 2: Materials	2.1 Repairable materials	2.5	2.0	5.0	
	Criterion 3: Disassembly, accessibility, tools, fasteners	3.1 Ease of disassembly	3.9	1.0	8.4	
		3.2 Use of standard tools	5.0	0.5		
		3.3 Use of fasteners	4.0	0.5		
	Criterion 4: Availability of spare parts	4.1 Feasible price of parts compared to price of product	1.2	0.5	3.6	
		4.2 Standard sizes	1.9	0.5		
		4.3 Available over time	2.0	1.0		
Durability	Criterion 5: Wear and tear resistance	5.2 Long-term reliability	3.8	0.7	7.9	
		5.3 Ease of cleaning	3.9	0.3		
		5.4 Durability of materials	4.5	0.7		
		5.5 Fatigue resistance of fasteners	3.1	0.3		
	Criterion 6: Test data and certifications	6.1 EN standard certified	2.0	2.0	4.0	
Reusability	Criterion 7: Transportation and storage	7. Knock-down or stackable capability	5.0	2.0	10.0	
	Criterion 8: Lifetime of design	8.1 Long-lasting design	2.5	2.0	5.0	
Upgradability	Criterion 9: Modularity	9.1 Component rearrangability	0.0	0.3	4.5	
		9.2 Add-on capability	0.0	0.2		
		9.3 Repurposability	3.0	0.5		
		9.4 Enhancement potential	3.0	1.0		
	Criterion 10: Aging	10.1 Ability to develop character over time	2.2	2.0	4.4	
					INDEX ON 10	6.3

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08 Wrapping up

Summary

This phase introduced an evaluation of the CO2e emissions and the project's mission. It was estimated that the CO2 emission of producing the product was too high, and that the product needed refinement before being implemented into the market. The mission was concluded to be accomplished, however the product still has areas to improve. The phase visited the material level of the Vision-Based Model (Lerdahl, 2001).

Key takeaways

The CO2e emissions are too high.

The focus has been too much on succeeding with the function, accommodate the scenarios and design for repairability, however in retrospect, a bigger focus should have been on the responsibility of the product.

Demands

The solution should meet both private- and contract market needs.

The design should feature unsorted wood.

The solution should allow for manual height adjustment between 56-72 cm

The solutions should accommodate 121 meetings

The solution should accommodate individual focus work

The maximum allowable weight for the solution must be 11 kg.

Wishes

The solution should be made from solid wood.

The solution should be designed for second use.

The materials should maintain an appealing appearance, even when scratched or worn.

The solution should offer a homely feeling.

The solution should convey a sense of a productive workspace.

09 Epilogue

Conclusion

The initial approach to this thesis was to design a piece of furniture for FDB Møbler, which improved the current furniture loop and aligned with upcoming EU regulations. As the project progressed, a much more complex framework emerged, and the aim became to design a flexible workstation for soft spaces in offices, designed to suit its purpose and users better than existing options.

The solution was Nordkraft, an innovative coffee table. Nordkraft was designed to fit various kinds of work through its two main functions: it can be height adjusted from 50-72 cm, and its tabletop can rotate to fit the purpose. Additionally, Nordkraft embraces responsibility by designing for repairability and using unsorted wood as a strategy to encourage users to appreciate natural imperfections in wood. Lastly, Nordkraft is designed to fit both offices and private homes to create a possibility for a second life.

No other coffee table in the market offers what Nordkraft does. This is a strong value proposition, but it also represents the risks of implementing Nordkraft in the market. While cost, manufacturing and market position is estimated in this report, the coffee table cannot be compared to other products in the market resulting in insecurities about its business potential.

Reflection

Product

The difficulty of working with functional principles

The value proposition of the coffee table relies highly on its function, and several manufacturers have assisted in the exploration of the function's feasibility. However, the table's stability and functionality are validated by a 1:1 prototype and FEM analysis. Since the prototype is not made from the correct materials, and since using wood in an FEM analysis can result in measurement uncertainties, these tests cannot validate the actual coffee table with certainty. A key learning from working with a functional principle is that it must be tested through multiple prototypes and interactions to fine-tune a function to the desired perfection. A user-friendly function cannot be tested using a simulation.

Furthermore, the coffee table aims to adapt to various types of work and various types of people. However, in the aim of solving multiple aspects at once, are any aspects then solved to perfection? A reflection upon this is that when working with functionality, prioritizing is the key.

Thread - a great idea or a great struggle?

Reflecting on the product, using a thread as the working principle of the table has costed many headaches and problems. The complexity of the manufacturing process, the high price and the time-consuming production of a 1:1 prototype can all be referred back to the use of the thread. On the other hand, the coffee table offers a new and innovative product to the market, which users might actually use, because of its playfulness. This has raised questions on whether the thread as the working principle was a great idea or a great struggle.

Is a homely atmosphere possible in an office?

Designing for second use and providing a homely feeling through furniture has been a big focus throughout the project. However, as the project progressed, the difficulty of incorporating principles from home furniture into contract market furniture was discovered. The intensive and different use of contract market furniture changes the possibilities for the design of these products. As a result, the design of the coffee table turned out differently than first expected. A reflection is therefore whether a homely design and "designing for second use" in private homes have succeeded or if the product will end up as furniture waste at the next office reorganization.

Will FDB Møbler produce the coffee table in the future?

Working with a conservative company like FDB Møbler, while aiming to design an innovative and adjustable product was a challenge. Reflecting on the collaboration, the context might have been too far out of scope for FDB Møbler in the first place. The design was aimed to be a future market-opener for FDB Møbler to enter the office furniture market, however the requirements of this market conflicts with FDB Møbler's design heritage. As a result, it is taken into consideration, whether FDB Møbler will be adventurous enough to produce a coffee table like this.

Furthermore, the responsibility evaluation of the product revealed on of the product's weaknesses. The CO2e emissions of producing the product was too high, which might conflict with FDB Møbler's responsibility desire.

Process

A complex problem

During the process, the problem showed up to be more complex than first expected. As a result, the initial research part of the project was time consuming leaving only a short amount of time for detailing and testing the actual product. Looking at the process in retrospect, this complexity in the problem is reflected in the product. As a result, a reflection is whether the product ended on the right path or whether it should have contributed with more simplicity.

Prototyping of furniture

A key learning has been, that furniture development requires great interactions and therefore, multiple iterations of 1:1 prototypes. However, prototyping high-fidelity models for this matter is both time-consuming and demands specific tools and materials. As a result, time and process has been a constant conflict during the project. Furthermore, it leaves uncertainty towards the usage of the coffee table. This leaves a reflection on whether developing furniture while solving a complex problem is feasible within a master thesis period or whether the time was poorly balanced between research, framework, and developing the product.

Has striving for innovation become a hindrance?

Striving to differ and be innovative in a red ocean requires time and a very good value proposition. The value proposition for this project was based on an identified shift in user behaviour and office culture. The challenge lay in translating this abstract understanding into concrete and tangible demands. In this project, the demands have both contributed with a way to differ in the market, but also a lot of complexity. This has raised questions whether striving to be innovative in the furniture market is a hindrance to good and simple design.

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Illustrations

Illustrations and images that are self-made or self-photographed are omitted from this list.

ill. 2: The vision-based model (Lerdahl, 2001)

ill. 3: Strategic durability (Haase & Laursen, 2023)

ill. 4: ESPR timeline (European Commission, 2024)

ill. 6: Desing strategies for slowing resource loops (Haase & Laursen, 2023)

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ill. 146-150: Guideline from FDB Møbler (WS 12 - Reseach of unsorted wood)

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