Recover-in

Bringing home to the office

MASTER'S THESIS

Industrial Design, Aalborg University - MA4-ID2 - June 2022
By Daniel Clausen, Maja Louise Christensen & Patricia Overgaard Christensen

Title page

Title	Recover-in
Theme	Master's Thesis
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Submission	May 25. 2022
Project group	MA4-ID2
Main supervisor	Mário Barros
Co-supervisor	Jørgen Kepler
pages	22

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Abstract

Working in an open office environment can be energy demanding, due to noises and disturbances from surroundings, increasing stress and lowering productivity. The Covid pandemic has contributed to a new way of working partly physical at the office and partly remotely, also increasing the focus on the employees' mental- and physical health. This project taps into how to provide a private space for the individual employee when the surroundings gets overwhelming. As well as contributing with a product that taps into the new trend of hybrid work. The result is a piece of office furniture, offering a moment of comfortable seclusion in a public space.

Reading instruction

The product report is the first report of two in total. This report is a visual representation of the pain behind the project and the final product proposal, Recover-in.
This report only includes the outcome of the design process. It is recommended to read the product report first and afterwards the process report. The project also comes with an appendix folder and technical drawings.

Introduction

The design of a open plan office has a direct influence on the employees' productivity.
Working in an open plan office tends to reduce productivity from 15% to 28 % and also influence the overall health, where noise is the key source to stress. The consequences of open offices have tried to be solved with multiple coping strategies, however this is not suitable in the long run. Accelerated by Corona, hybrid work is the new black within work style, providing a more flexible work structure for the employee. Working from home created the right conditions for immersion that was missing at the open offices. Coming back to work therefore calls for a new way of designing our offices, together with new types of office furnitures, that fits with the flexibility of working hybrid.

Table of content

The weakness of open-plan offices

Through the last 20 years we have been trying to solve many problems of open space office with stop-gaps such as acoustic- paneling, walls or ANC headsets. Noise and disruption is integrated in the configuration of open office spaces, and employees that need to concentrate either cannot, or have to go home. During the Covid pandemic, many businesses have seen a rise in productivity, from employees working from home.

The office space is changing

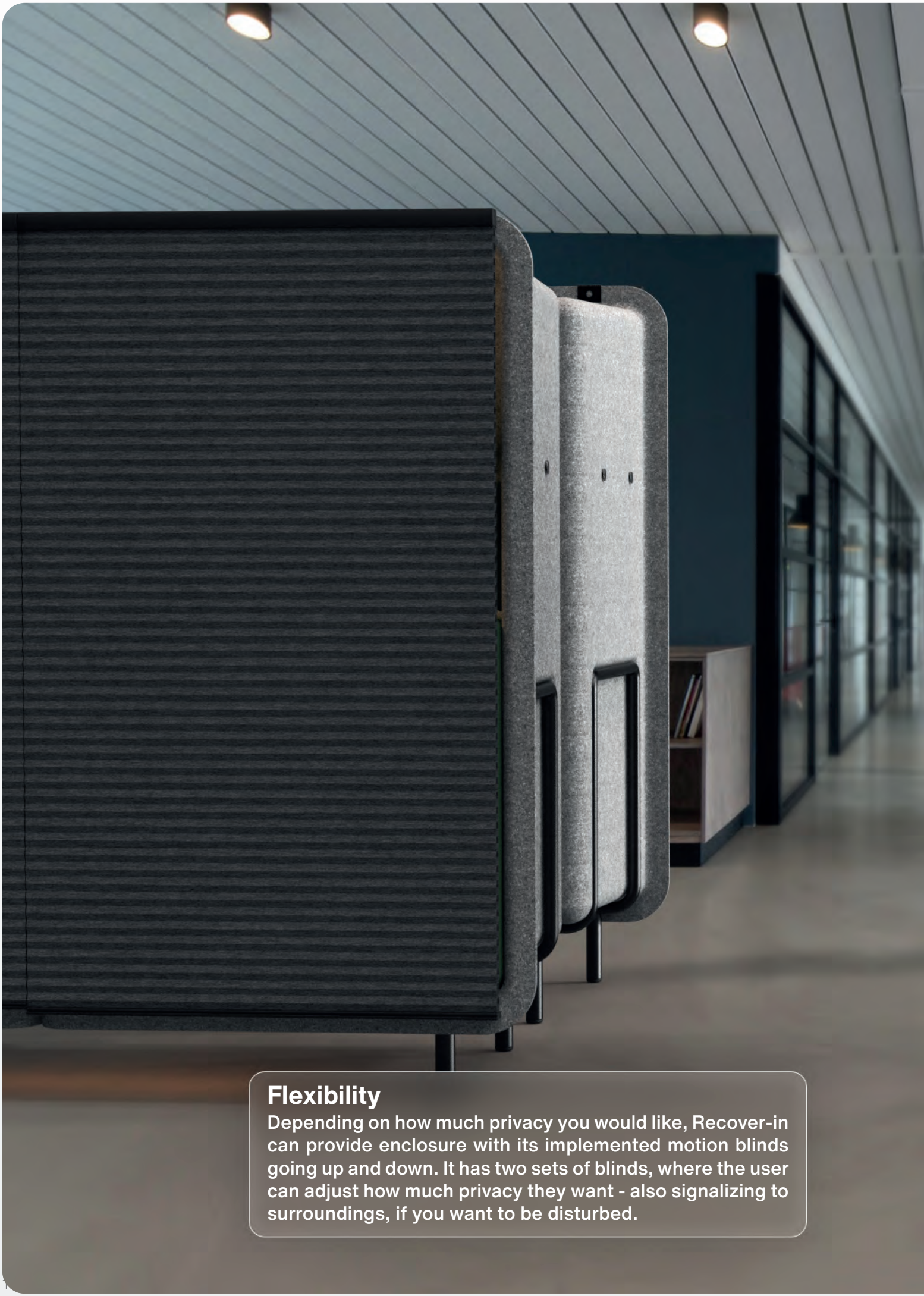
In the future, many office chairs and tables will be left empty. The workplace is now anywhere, and employees can work from wherever they want. The open space office is dying if not dead already, because the endless rows of chairs will be left empty by employees that is working from home. Instead we will in the future find office plans that look like club houses, or cafés with function-defined zones. Where there is room for inspiration, creative play and innovation. The office will become the core for innovation, professional back-and-forth and feedback for ideas, and if there is a need for more quiet and peaceful surrounding the employees can work from home.

The immersion people have been able to get at home, is better than the one at the office, even with kids running around at home. Therefore, the problem must be something with the way we design our offices. A sneak peak into a presumed future for office spaces is visualized on the illustration above.


WORKING AREA
An area where it is possible to sit down and plug in your working PC to one of the hybrid work stations
CAFE AREA
Area where it is possible to get a coffee, while working. Also an area where to grap a quick coffe to go after a meeting
GREEN LOUNGE
An area that is created for taking a quick break, to clear your mind before a big meeting or relax with your phone. whatever you need
CLUB HOUSE OFFICE

Take a break

Hereby, Recover-in was created. A furniture embracing bringing home to the office. It is a safe place for the employee, when they need a mental break and the surroundings are overwhelming.



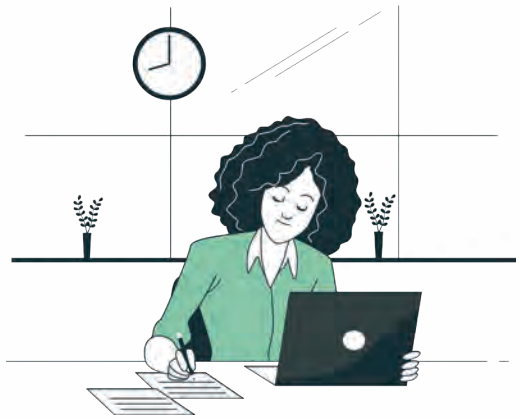
Flexibility

Depending on how much privacy you would like, Recover-in can provide enclosure with its implemented motion blinds going up and down. It has two sets of blinds, where the user can adjust how much privacy they want - also signalizing to surroundings, if you want to be disturbed.

Sanctuary

Recover-in can be installed many places within the office creating a personal safe space for employees, where there is room for a moment of privacy.

The user journey



Working

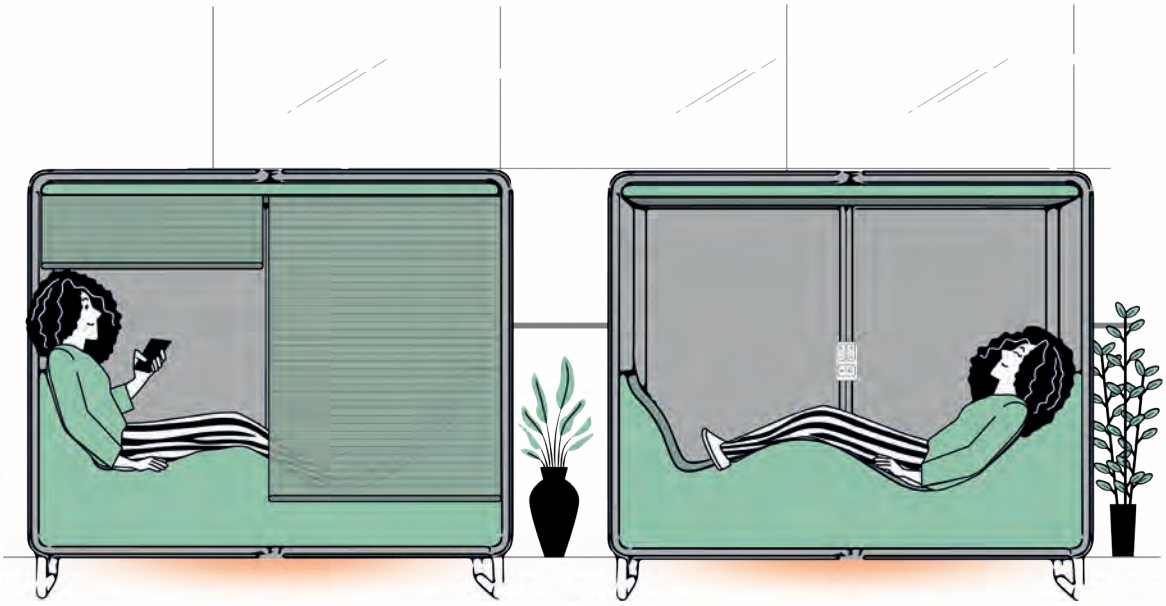
You are sitting and working at your work station.

Stressed out

During the day the inbox just keeps notifying with urgent mail and meeting reminders while your meeting did not go as planned.

Go - take a break

You need a break from the noisy surroundings and disturbances, but where do you go ?



Multi purpose

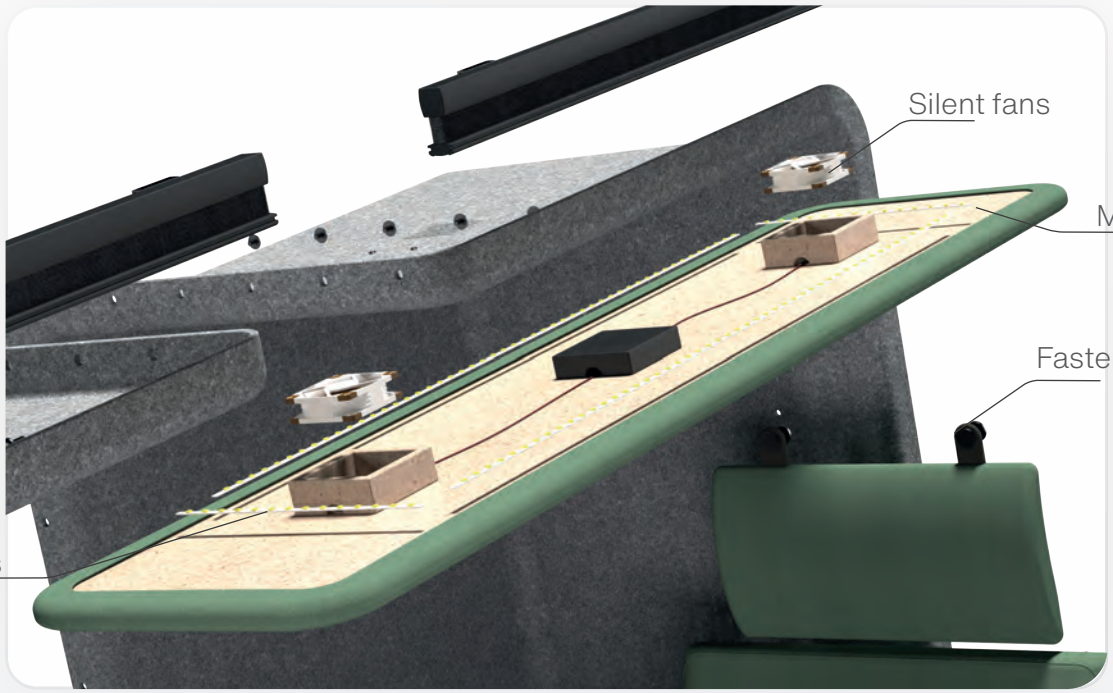
You go to Recover-in, to get some privacy and an immersive moment. Here you sit down and relax with your phone, watch some videos on Tik-Tok, or read the news. Or lay down, to take a little rest from all the problems at work and at home. After 10 minutes, you are ready to go back to work. You can alter the privacy as you like, using the remote controling the blinds and the light. An orange light will light up in the bottom of the product when entering, to show it is occupied.

Back in zen

After a little break you are now back, and ready to get back to work with renewed energy.

Product architecture

Recover-in is constructed for easy assembly and disassembly, where every part can be disassembled into material categories for more environmental disposal. This also benefits the business case as it is possible to easy add or remove product features.



Materials

PET felt

The felt is recycled from old plastic bottles. The felt sheets is then thermoformed into the shape of the two shells. The felt is a great material for acoustics, and sound absorption.

Fabric

The chosen fabric is a post consumer recycled polyester that is very strong, cleanable and durable.

Steel

The frame is bended steel tubes, with a powder coating for better resistance against environment.

Foam

There is two different foams used in the seating, one for support, and one for comfort.

Business strategy

The main customer for Recover-in is companies with an open space office plan. Internationally, this counts for 70% of all offices in the US and 60 % of the total offices in the UK.

Manufacturing

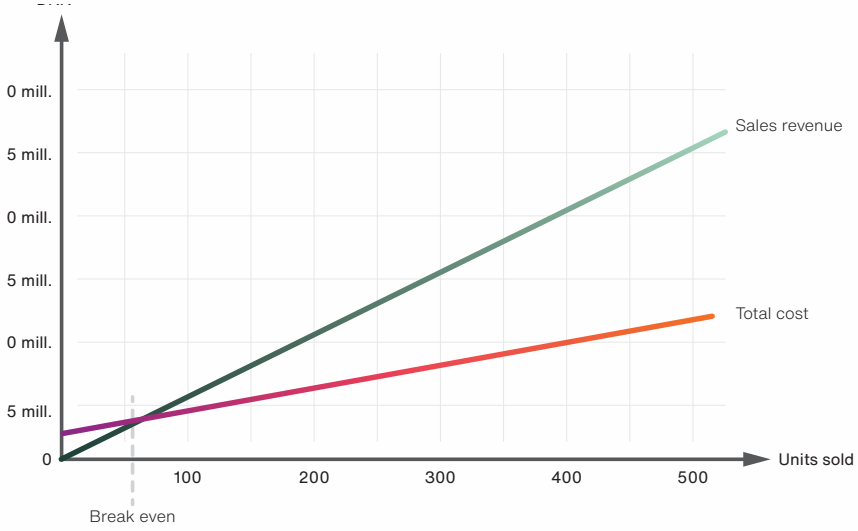
External suppliers and key partners will manufacture the parts of Recover-in and deliver them to our company.

Revenue streams

Recover-in will be sold from the company to other E-commerce partners B2B with expertize in selling office inventory. The product will be sold or have a leasing plan. Recover-in will be sold with a 100 days trial and right of return, to reduce the investment risk for the customer.

Market

The market for Recover-in is mass market offices, all over the world. The most important costumers are large corporations, such as Siemens Gemesa or LEGO.



Break even

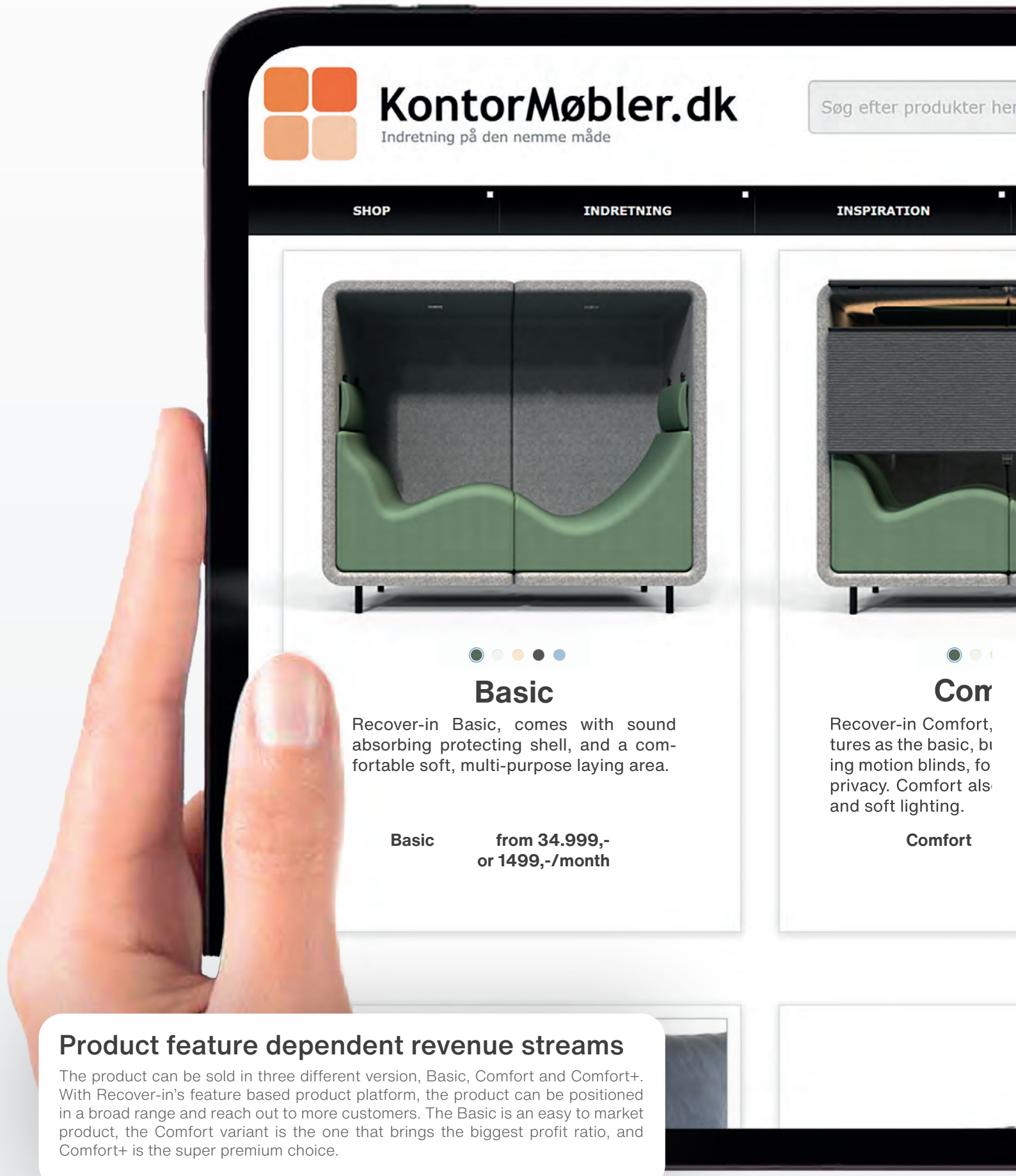
After selling around 20 units the break-even is reached, in a production size of 500 units. The profit per unit is 26.000,- The total cost of investment will be around 11,8 million. and total profit will be around 13,1 million.

Contribution ratio

52%

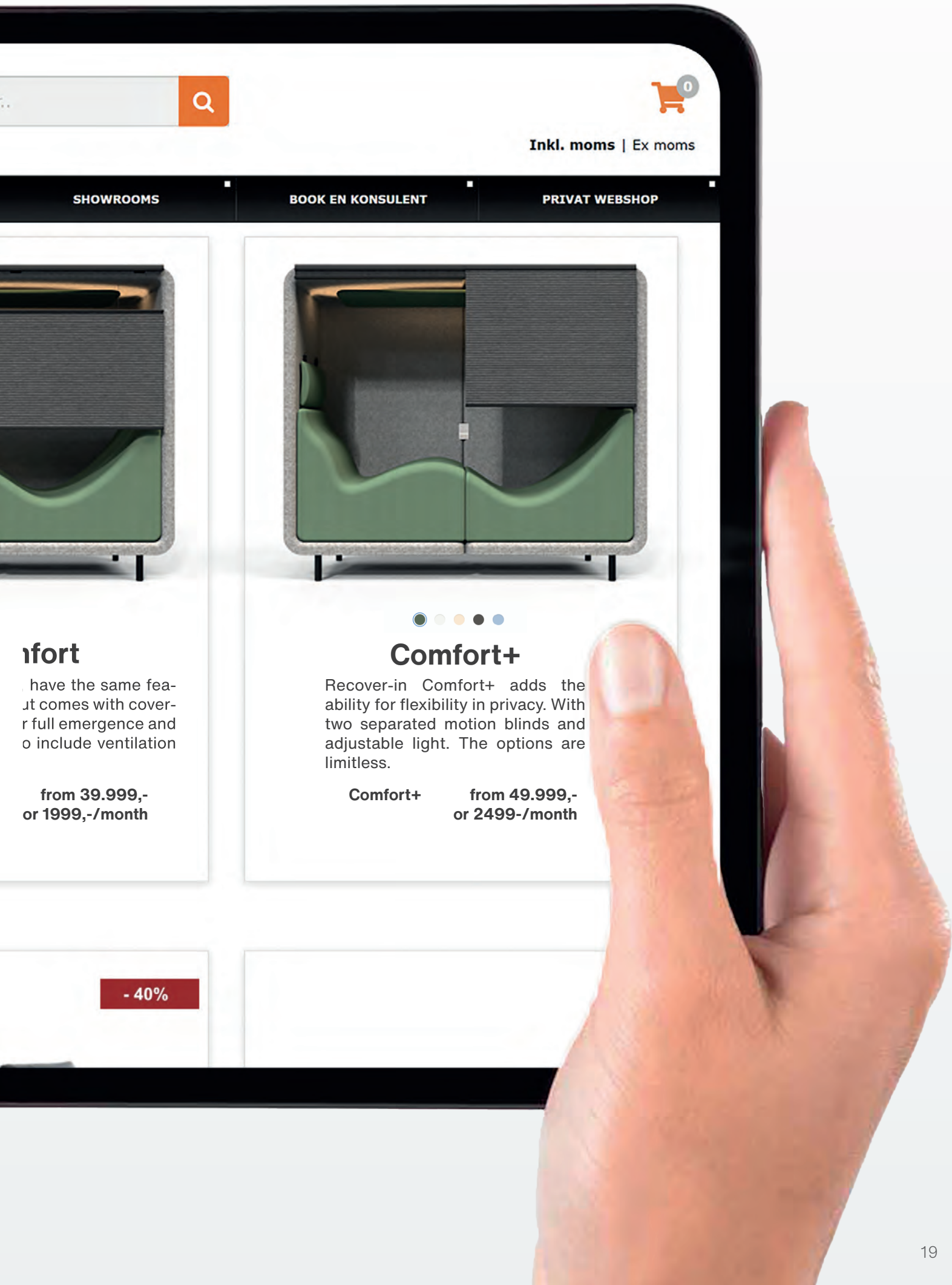
Production cost for Comfort+

22.485,-



Product feature dependent revenue streams

The product can be sold in three different version, Basic, Comfort and Comfort+. With Recover-in's feature based product platform, the product can be positioned in a broad range and reach out to more customers. The Basic is an easy to market product, the Comfort variant is the one that brings the biggest profit ratio, and Comfort+ is the super premium choice.


0
Inkl. moms | Ex moms
SHOWROOMS
BOOK EN KONSULENT
PRIVAT WEBSHOP
ıfort
have the same fea-
ıt comes with cover-
r full emergence and
o include ventilation
from 39.999,-
or 1999,-/month
Comfort+
Recover-in Comfort+ adds the ability for flexibility in privacy. With two separated motion blinds and adjustable light. The options are limitless.
Comfort+
from 49.999,-
or 2499-/month
- 40%

Airport

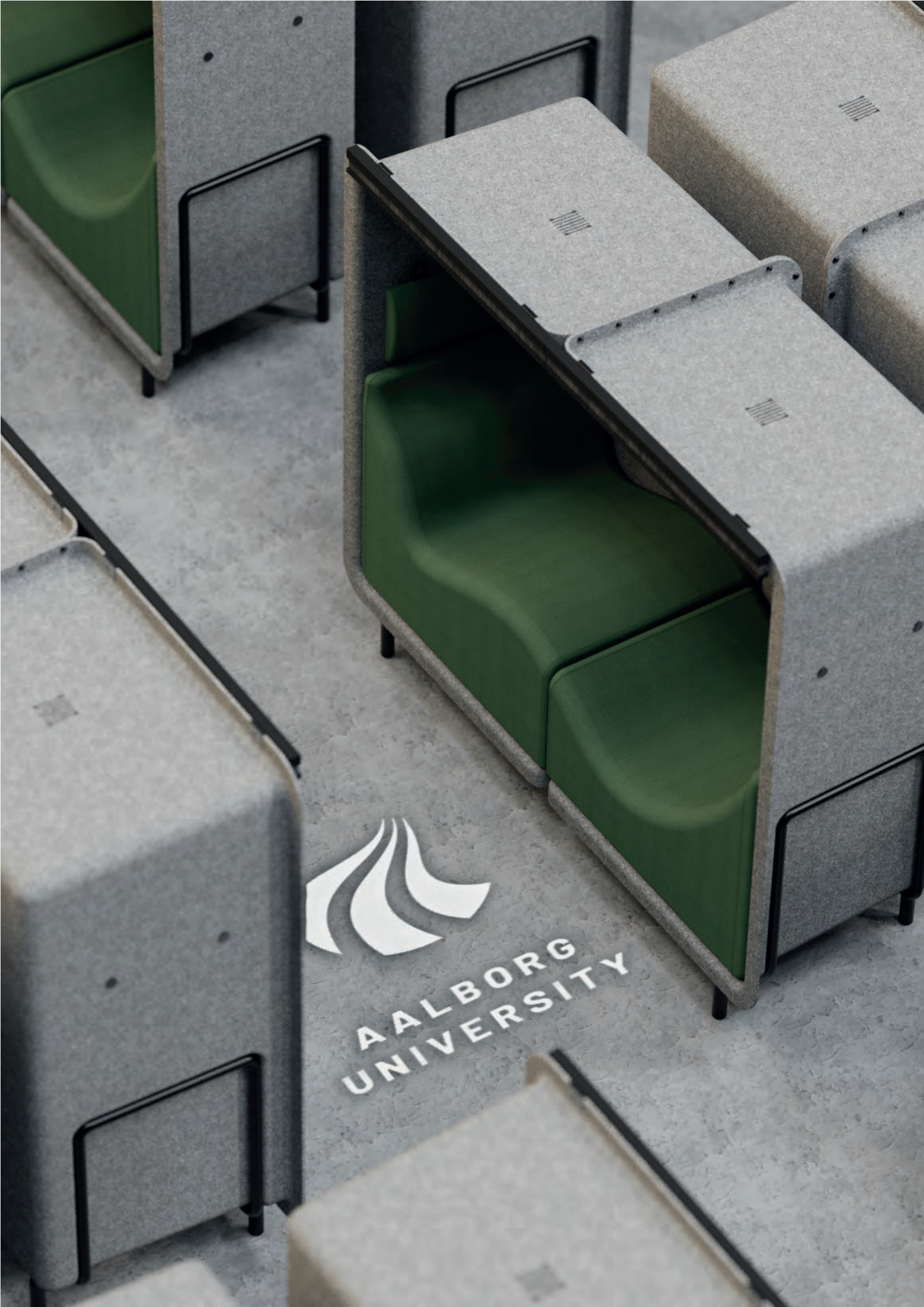
Hospital

Market potential

There is a great potential in expanding the market for Recover-in. The product can be expanded to other large, public contexts where a person would need a moment of privacy, such as airport, hospitals, malls, institutions or other indoor public places.

Product family

Recover-in is designed in such a way, that with a small investment, new variants can be created within the product family of Recover-in, in the future. Because of the product architecture the components can be mixed and matched to create new types of furnitures, or use the product in a new context.


AALBORG
UNIVERSITY

AAU

MA4-ID2 · JUNE 2022
INDUSTRIAL DESIGN

PROCESS REPORT

RECOVER-IN

DANIEL CLAUSEN · MAJA LOUISE CHRISTENSEN · PATRICIA OVERGAARD CHRISTENSEN

TITLE PAGE

TITLE	**RECOVER-IN**
THEME	**MASTER THESIS**
PROGRAMME	**INDUSTRIAL DESIGN, AAU**
PROJECT START	**FEBUARY 1ST 2022**
SUBMISSION	**MAY 25TH 2022**
PROJECT GROUP	**MA4-ID2**
MAIN SUPERVISOR	**MÁRIO BARROS**
CO-SUPERVISOR	**JØRGEN KEPLER**
PAGES	**104**
APPENDIX	**40**

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From left to right: Daniel, Maja and Patricia

III.1

Pre-phase & Acknowledgements

This project is a Master's Thesis in Industrial Design made by a team of three Industrial Design Engineer students. The time frame for the thesis has been 16 weeks until submission where the process of the development has been documented continuously finalised with a gathered process report and a accompanying product report.

The group would like to thank their main supervisor Mário Barros and technical supervisor Jørgen Kepler providing the group with guidance and continuing feedback.

The group also want to thank the participating companies Les Deux, Siemens Gamesa and KMD.

Abstract

The purpose of this project was to work with an ill-formulated problem, with no straightforward solutions, also typical called a wicket problem. For this, migraine was chosen as the subject to create a solution. Migraine is the third greatest disease in Denmark, and cost 1,2 billion a year in lost production and treatment. The project is framed towards migraine at work, because this is where a lot of patients have complications with the disease. It was discovered that workplaces are not aware of the disease, and therefore do not act upon it. The solution was framed to create a product for migraineurs at work. However, it was found that workplaces are not interests in having such a niche product and for the group to convince the framing of the product it was reframed to relate to workplaces existing interior, office furniture. Insight was gathered on a new working trend post the Covid pandemic, where hybrid work, and well-being of employees have seen an increased interest by employers. Therefore, a furniture design was developed where it is possible to take a comfortable break covered from the surroundings.

Reading instructions

First and foremost it is recommenced to read the report in two-page view to have a good experience of the project - if read on a digital device.

The thesis is divided into two separated reports. The project should be read in the following order; firstly the product report presenting the result of the project, and afterwards the process report, addressing methodology, reflections and conclusions for evidence of the project. An appendix folder containing worksheets that are referred to throughout the process report. The Appendix will be found in a separate assortment.

Dimensions and constructional details of the product proposal can be found in the Technical Drawings which are gathered in a separate folder as well.

Harvard referencing is utilized to cite all sources in the text itself presented as following: (Surname(s), Year, relevant page). Illustrations in the report is either made by the group and if not, the source can be found in the illustration list in the Epilogue (page 102).

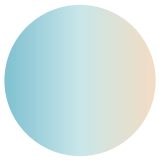
> This box is an indication of a quote sourced from interviews with participants in the project.

This box indicates that group has gained insight in relation to a investigation or a task, in which further investigation is required in relevance for the project.

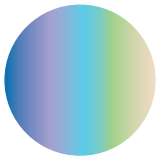
This box indicates that the group has found important knowledge resulting in new user need, requirements, or new opportunity relevant to the problem/solution.

Content.

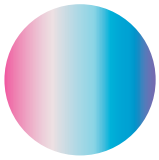
Table of content.



I. UNDERSTAND

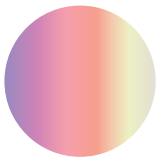


II. IDEATION



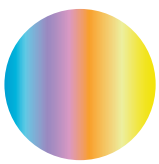
III. CONCEPT

IV. CLARIFICATION



V. CHANGING DIRECTION

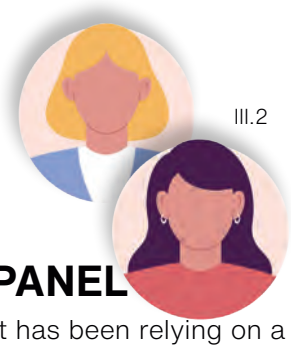
VI. DETAILING



VII. EPILOGUE

Introduction

This report represents the process behind the creation of Recover-in, a product that brings the home to the office. The proposal for the product had its origin from a wicked problem(Rittel, 1972); coping with migraine, starting with no clear solution field which was an intentional initial approach that the group found challenging. Throughout the process, data collection was crucial and a leading element for the decision-making creating the path for the project and how it progressed. However, the wicked problem, parallel to the collection of data, entangle the group and caused several iterations in ideation resulting in a variety of different concepts. Finally, a change in direction where the use of new methodology became essential for progressing with the problem of; Migraine at work. The process has its ending with a conclusion and a reflection facing the decision-making and approach to solution versus problem and clarify the response on managing shifting between extreme changes in ideation while failing smart throughout the process.

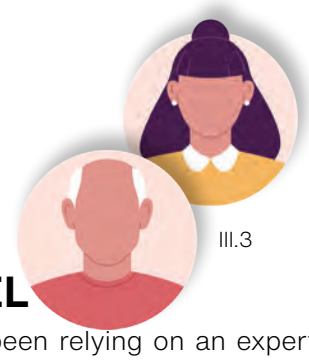


III.2

USER PANEL

The project has been relying on a user panel in order to gain insight. Below is a list with all the users that the group has been in touch with. These users all suffer from migraine in their daily life.

NAME	AGE
Dorte	46 years old
Isabella	24 years old
Lis	25 years old
Gitte	56 years old
Camilla	43 years old
Lone	46 years old
Ea	25 years old
Andrea	25 years old



III.3

EXPERT PANEL

The project has also been relying on an expert panel. The experts help with the understanding of migraine as a disease and a typical patient journey from an experts perspective. Below is a list with all the experts that the group has been in touch with. Alongside, a short introduction to their specialties.

Søren Due Andersen
Medical specialist in Neurology

Thomas Folkmann Hansen
Senior molecular geneticist
Researcher at the Danish Headache Center
Focusing on migraine genetics

Ana Maria Nan
Chief surgeon, neurology
Works at Aalborg University hospital,
Responsible for the headache outpatient department.

Guisheng Huang
Chinese acupuncture

Kirsten Nabe-Nielsen
Special consultant in Roskilde municipality and researcher at Copenhagen University (Public Health Science)

Christian Hansen
Secretariat director
Denmark's Patients association for headache sufferers

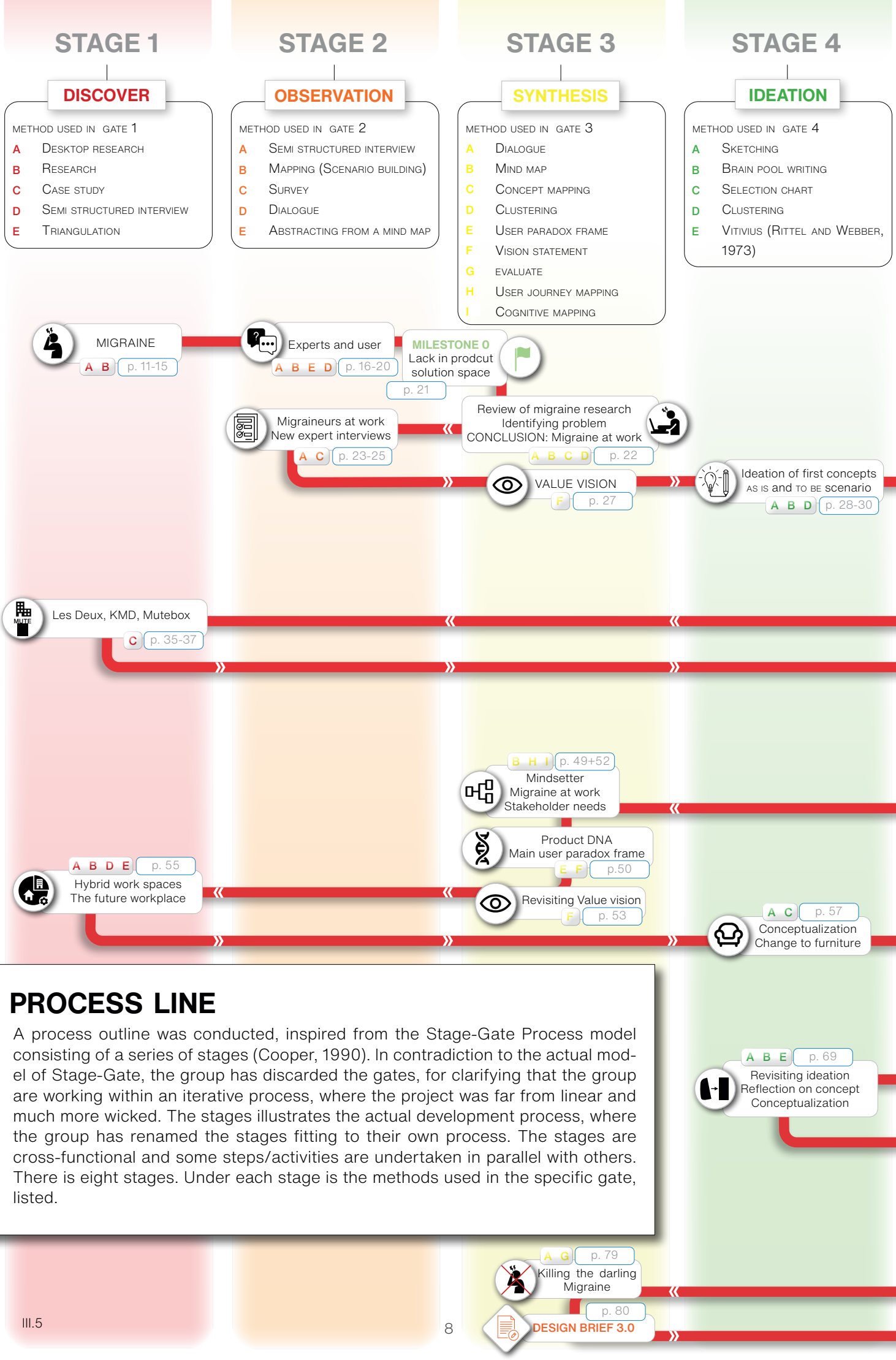
INITIAL THOUGHTS

III.4

One team member suffered as a child with migraine; on this basis the team had some pre-knowledge and experience with migraine before the project began. It provided inspiration and basic understanding of the disease.

Migraine is an underestimated and overlooked disease; In the 80's it was not considered a disease but only hysterical women's excuse for taking a sick day. Today, it is understood as a neurological disease that hits one out of seven Danes, but still the migraine patients meet prejudice, stuck in the Maude illusion from the Danish TV-series "Matador". The disease has a big cost both socio-economically and socially, but also for the patient's physical condition and well-being. In the worst cases, patients suffering with migraine get so invalid that they are forced to quit their job and apply for early retirement benefit.

Early on in the process, the team got in contact with different types of experts and migraineurs, where they identified a lack of understanding in the migraine patient's professional life and among different types of treatment providers, due to the stigma and invisibility of migraine. For that reason, the migraineur becomes the main practitioner on their own disease and takes care of oneself.



PROCESS LINE

A process outline was conducted, inspired from the Stage-Gate Process model consisting of a series of stages (Cooper, 1990). In contradiction to the actual model of Stage-Gate, the group has discarded the gates, for clarifying that the group are working within an iterative process, where the project was far from linear and much more wicked. The stages illustrates the actual development process, where the group has renamed the stages fitting to their own process. The stages are cross-functional and some steps/activities are undertaken in parallel with others. There is eight stages. Under each stage is the methods used in the specific gate, listed.

STAGE 5

DEVELOP

METHOD USED IN GATE 5

- A STYLEBOARD
- B 3D VISUALIZATION
- C SKETCHING

STAGE 6

RAPID PROTOTYPING AND VALIDATION

METHOD USED IN GATE 6

- A PROTOTYPING
- B MOCK-UP
- C ACTIVE OBSERVATION
- D ACTIVE PARTICIPATION
- E EVALUATES AND IMPROVES
- F SIMULATION AND ACTING OUT

STAGE 7

REFINING

METHOD USED IN GATE 7

- A 4P MODEL
- B VERGANTI'S DESIGN MODEL
- C PERCEPTUAL MAPPING
- D SKETCHING
- E 3D VISULIZATION
- F DESKTOP ESEARCH

STAGE 8

DELIVER

METHOD USED IN GATE 8

- A 3D VISUALIZATION
- B PRODUCT ARCHITECTURE
- C BUSINESS MODEL CANVAS
- D SUPPLIER CONTACT
- E LEAN START UP
- F NPV
- G PRODUCT PLATFORM
- H DESIGN FOR PRODUCT INTEGRITY
- I CIRCULAR DESIGN PRINCIPLES
- J PROGRAMMNIG
- K REFRAMING BUSINESS

DESIGN BRIEF 1.0 — p. 31

Development of thee concepts — B — p. 32

MILESTONE 1
Tree concepts
Research needed
A — p. 33

Light and noise
Ergonomic comfort
C D E — p. 38-40

Conceptualization:
Structural vs. organic
Big scale concept
A C — p. 41-42

F — p. 43
Prototyping

p.45 DESIGN BRIEF 2.0

Development of Mindsetter
A B — p.46

MILESTONE 2
Entangled
p. 47

Dimensioning
Sitting/laying surface
C D E F — p. 60

D E — p. 62
Defining requirements for aesthetics

Shape of body shell: Workshop
D E — p. 63

Frame
D E — p. 64

Enclosing
How to close the product
D F — p. 65-66

User experience
B C D E F — p. 67-68

Design changes
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p. 70

Development of Recover-in
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Brake trough
p. 76-77

A H I — p. 81
Product changes
Detailing

B G — p. 82-83
Product architecture and leverage

D E — p. 84-85
Materials
Production and manufacturing

J — p. 86-87
Durability
Calculations

A D — p. 88
Remote
For blinds and light

p. 89
Placement

C I — p. 90-91
Business model

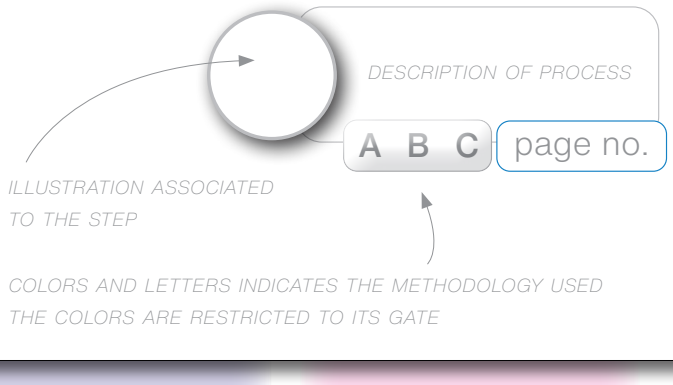
F — p. 92
Cost estimation

K — p. 93
Future

DESIGN BRIEF final
p.94-95

READING INSTRUCTIONS

The red line indicates the pathway to follow the process of the report. The arrows has to be followed ⟫. Every time a new step is meet by the reader the following is incorporated in each step:



I.

UNDERSTAND.

Chapter summary

This chapter will present initial research and understanding of migraine as a neurological disease, and analyses how patients are dealing with symptoms and general discomfort associated with migraine.
During the first two weeks of the project the group was in contact with eight different migraineurs and six different experts operating withing the field. This connection will be the foundation for the chapter.
All interviews can be found in Appendix 2 and 3. Furthermore, a realisation of that migraine holds a wide range of dilemmas where there are many unknowns will have the group to seek different directions, before finally proceeding with the direction: migraine at work.

Migraine

What is it?

Migraine is a complex neurological disorder characterized by frequent headache attacks occurring in a time frame from 4 to 72 hours. Typically, a patient with migraine is experiencing half-sided and throbbing headaches of moderate to severe pain (Ill. 6) (Nationalt videnscenter for hovedpine, 2020).

In conjunction to the migraine, nausea and vomiting can occur as side effects. Additionally, the patient can experience an extreme discomfort in bright light, smell and loud noises. Associated with migraine, is found the aura-phenomenon, which is characterized by a migraine with ephemeral disturbances, such as visual- and sensory disturbances, and in rare cases, impaired motor skills may occur (Danmarks Patientforening for Hovedpineramte, 2022). The most prominent and inhibiting are the visual changes associated with the aura-phenomenon; zig zag patterns, flashing lights, blurred vision or patches of shimmering light that arise from altered function in the occipital lobe in the brain.

EXPLAINING

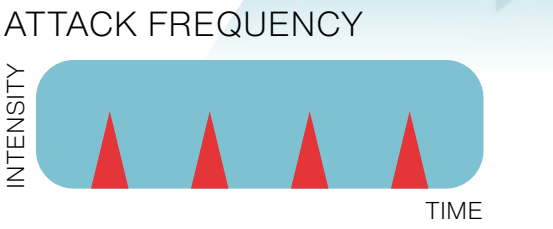
Research is still ongoing, but migraines are thought to likely be caused by a phenomenon called cortical spreading depression (CSD) (Ill.7). This is a process that happens in the brain, more specifically the cortex, when these brain cells are over-stimulated.

There is substantial clinical and imaging evidence for changes in cortical activity associated with migraine (Charles & Brennan, 2017). The cerebral cortex, which is the outer surface of the brain, is associated with higher level processes such as consciousness, thought, emotion, reasoning, language, and memory (Guy-Evans, 2021)(Ill.7). Migraine is associated with a variety of symptoms that can be attributed to changes in cortical function.

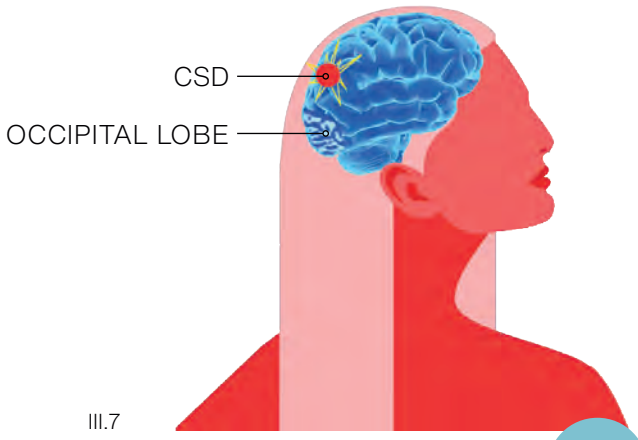
The most prominent among these are the visual changes associated with migraine with aura that arise from altered function in the occipital lobe. The occipital lobes, located at the rear of the brain receive sensory information from the retinas of the eyes (Guy-Evans, 2021) (Appendix 4). Migraine patients may also experience cortical sensory, motor, language, or other cognitive dysfunction. These symptoms are typically described in the context of migraine with aura (Charles & Brennan, 2017).

TREATMENT

Knowledge regarding migraine has increased substantially on how to effectively treat its symptoms.
A migraine is treated with medicine either with over-the-counter medicine or migraine seizure medication. The patients who experience frequent and prolonged migriane attacks are in need of preventive medication (Appendix 05).



Ill.6



Ill.7

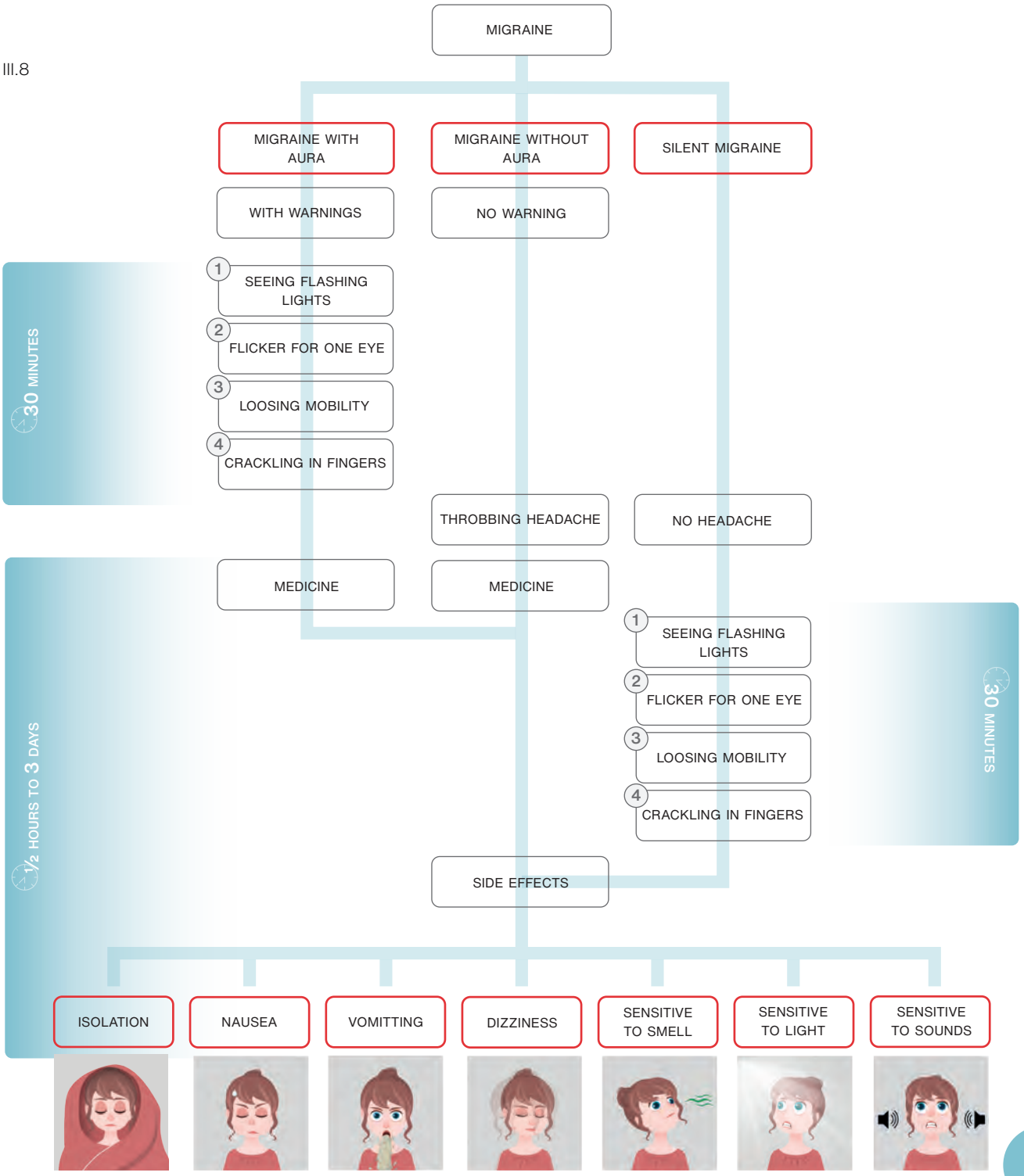
- ! Migraine is a neurological disease, occurring as severe and frequent headaches
- ! There is two types of migraine; with and without aura (visual disorders).
- ! The most normal side effects are: vomiting, nausea and sensitivity to: light, noises and smells.
- ! There is three types of medication: non-prescription-, seizure- and preventive medicine.

Migraine

Types and symptoms

There is two types of migraine; with and without aura. (Described on page 11). Additionally, there is a third form of migraine; silent migraine, which is a rare type of migraine with the same ephemeral disturbances as migraine with aura(Appendix 3a). These tree types of migraine has been mapped out to identify the time frame of a migraine attack, illustrated hereunder. (III.8). The map is based on semi-structured interviews with users and experts(Appendix 2-3) as well as desktop research.

III.8



! Migraine with aura have a warning before the pain, migraine without does not.
! A migraine attack can last from ½ hour to 3 days.
! Due to the side effects of having migraine, a patient needs to be isolated from **bright light**, **high noises** and **smells**.
! Needs isolation from other people and wants to be alone during an attack

Migraine

In numbers

Migraine is a problem, but how big? Research into migraine was conducted to get a better understanding on how big of an issue the problem is in Denmark. Not only from a user perspective, but also from a society perspective.

OVERALL NUMBERS

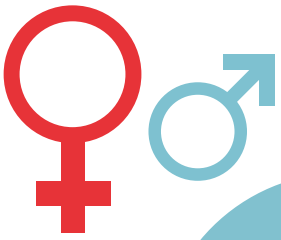
As mentioned in the previous section, there are different types of migraines. About 640.000 Danes have migraine. 80 % of the Danish population is dealing with tension-type headaches, where many migraineurs have both (Lyngberg et al., 2005).
Digging deeper into migraine, there is a difference in how many seizures a migraine patient has, and how many to be diagnosed with chronic migraine.
Over 2% (118.000 people) of the Danish population have chronicle migraine with more than 15 seizures a month. About 2 percent of those, is caused by overdosing (III.10) (Westergaard et al., 2016)

SOCIETY

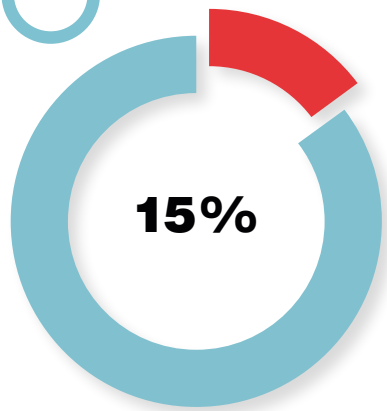
Migraine is not only a big problem for the patients the effect of migraine also influences our society.
People with migraine have on yearly basis, 1,7 million more visits to a general practitioner, which counts for 5% of all visits. Employed patients have 3,8 million more sick days than employed without migraineurs which counts for 14% of all sick days. Every year the cost of treating migraine is 420 million DKK. (Flachs et al., 2015).

! About 640.000 Danes suffers with migraine.
! Migraine has a big cost for the society both in terms of lost production and in healthcare

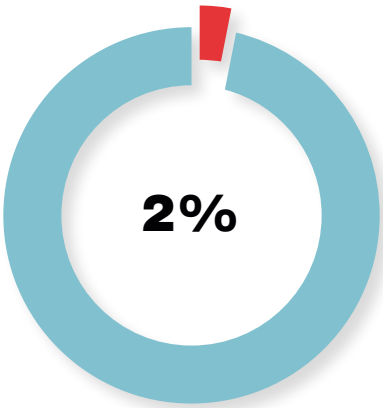
III.9



More women than men suffer with migraine

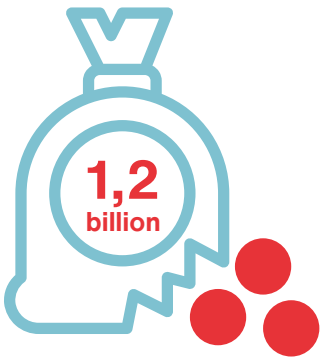


Have had a migraine seizure within a year in DK



Have chronicle migraine in DK
(15+ headache days a month)

13 out of 15 persons hide their disease for their surroundings afraid of losing their job



Every year migraine cost 1,2 billion in lost production every year in DK

(Migræne & Hovedpine foreningen, 2017)

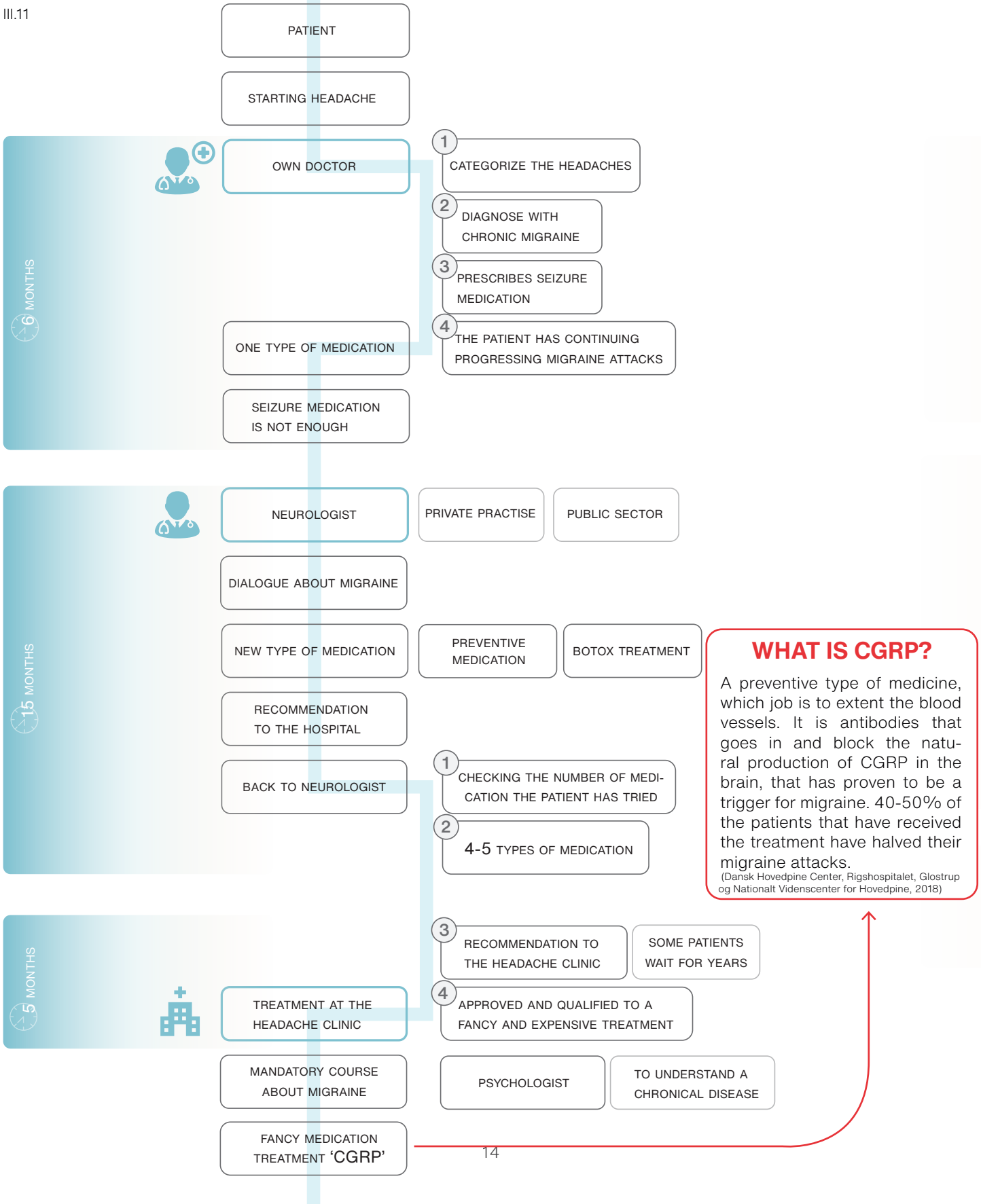
III.10

Diagnosing migraine

Procedure and treatment

In correlation to qualitative, semi-structured interviews (Interview guides and transcriptions can be found in Appendix 2 and 3) with migraineurs as well as neurologists and medical practitioners the procedure of diagnosing and treating a patient with migraine was mapped (III.11).
The significance of the time frame and the different phases the patient has to go through is highlighted in the mapping. Quotations from user interviews elaborate on the frustrations and consequences that is a part of getting diagnosed and finding the right treatment.

III.11

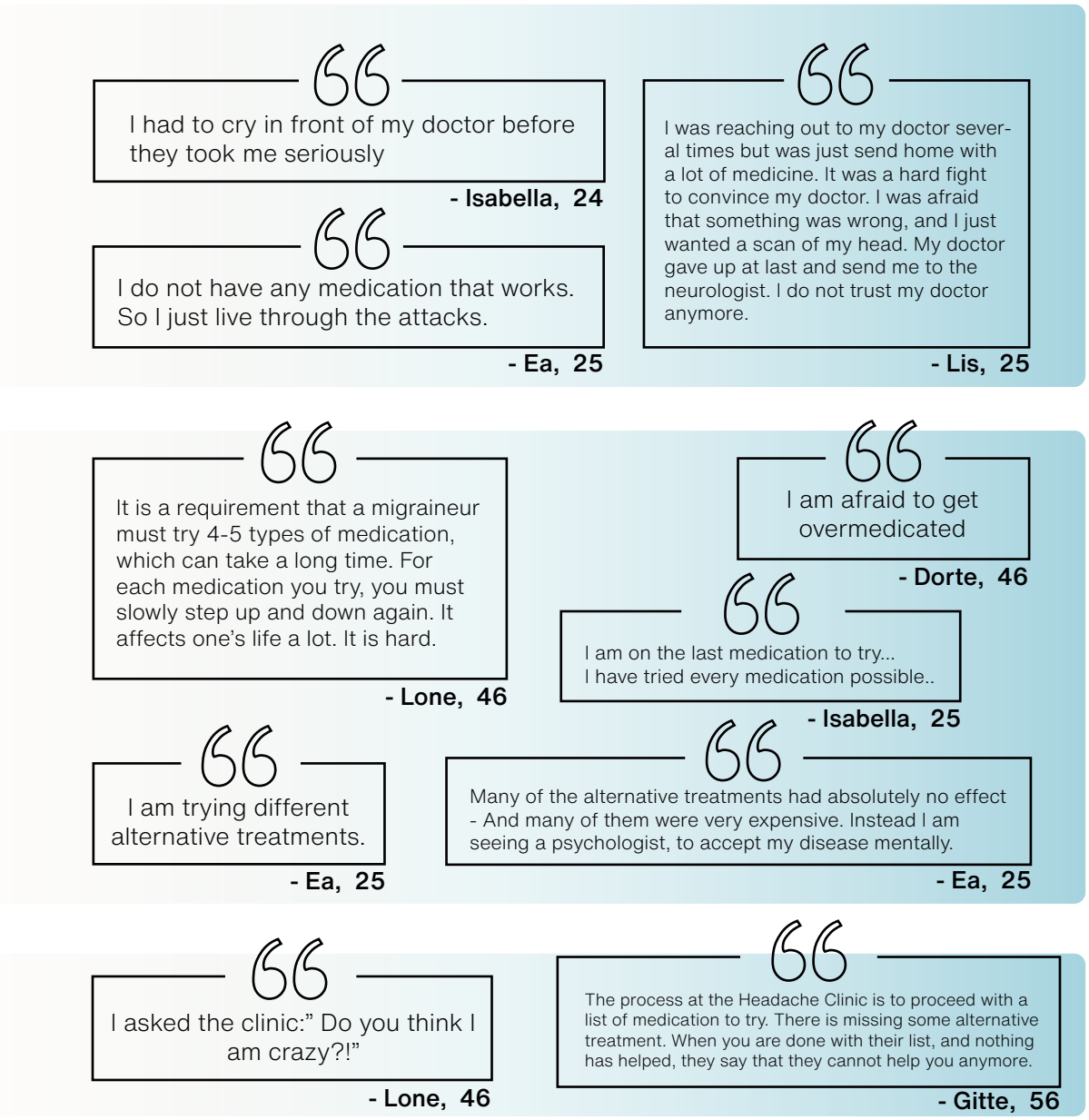


UNDERSTANDING THE DIAGNOSE JOURNEY

From the mapping it was clear that the procedure for diagnosing and treatment of a migraine can take more than two years.

Additionally, it became clear that the amount of medication is overwhelming for a migraine patient. The process of going through four to five different types of medication is necessary in order to be approved for starting the treatment at the Headache Clinic, if having chronic migraine. From the interviews it was clear that most of the migraineurs do not prefer to take medicine in order to cope with their migraine attacks, but they desperately want the best treatment available, and right now this map is reflecting the procedure for getting the CGRP treatment, which is considered as the most effective treatment on the market right now. For patients that do not have chronic migraine, they are just giving up upon if non of the medication you can get at the neurologist help. In the worst cases some cannot get diagnosed at their own doctor, where they get stuck and cannot receive the right treatment.

The interviews gave the group an insight in how it is to live with migraine and the journey of getting the right treatment and care. It was clear that the migraineurs were frustrated and in many cases, seeked for new alternatives to cope with the migraine on their own, when the society cannot help them anymore (ill. 11).



Conclusion

Getting the right diagnose and treatment can be both a physically and mentally hard journey, where you do not get the awareness and acknowledgement that you actually need. Instead the patients seek their own path to treat themselves, due to the long waiting time and continuous 'trial and error'. No user needs were defined out from this mapping, instead it provided the group with an understanding of the many obstacles of dealing with migraine.

Experts

Diverse perspectives on migraine

During the research phase, the team interviewed different types of experts, that somehow is dealing with migraine patients in their work. This was done, to understand how different types of practitioners treat and help migraine patients, but also how they in general understand the disease: migraine, and what consequences, it has for the individual patient. All interviews were conducted as semi-structured interviews, most of the interviews were held online, from a time-saving perspective(Martin & Hanington, 2012, p. 102). Hereunder, the different types of experts is presented together with the main takeaways from each interview, also divided into four themes: **treatment**, **well-being**, **work life** and **stigma**. The transcriptions can be found in Appendix 3.

III.12

Søren Due Andersen
Medical specialist in Neurology
Have daily consultations with migraine patients in his private clinic (have 200-300 migraine patients).

appendix 3b

TREATMENT
The most important is that the patients get better – if it is with pills or an expensive device. For me it is immaterial.

WORK LIFE
It is a stress factor for my patients that they have a lot of sick days every month, which can be a trigger for a migraine attack in itself.

WORK LIFE
I have patients that would wish that they could stay at work when they have a migraine seizure. If they could just lay down for an hour, it would help them and enough time for the medication to work. Furthermore, if they have aura, they cannot drive or bike home or just afraid of doing it.

WORK LIFE
Migraine is a frustrating and worried factor for the patient, if they have a meeting, presentations or going on vacation. They do not know when it is coming, where it can keep them awake a whole night. Their job could be depending on to perform well.

STIGMA
You cannot see if the person is ill. It can give a huge sickness burden where nobody else can see it. You need to be close to a migraine patient to really understand how they feel and how they are affected by their disease. As an outsider it is hard to understand.

III.13

Thomas Folkmann Hansen
Senior molecular geneticist
Researcher at the Danish Headache Center focusing on migraine genetics

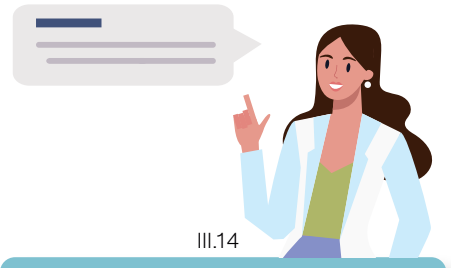
appendix 3a

WELL-BEING
Migraine is very complex and not easy to understand. It has a big social consequence – You cannot visit friends and go out in bright light.

WELL-BEING
It can also be side-effects that is affecting your migraine: if you are stressed in a period of time and are experiencing a lot of migraine attacks, you go get a massage and then you are feeling better. But it might be because it is helping on the stress and as you are less stressed, you are experiences less attacks.
Remember to take care of yourself – it is a part of the treatment.

TREATMENT
There is a gigantic rumour market for alternative treatments, as migraine and headaches are known for having the greatest placebo effect.

TREATMENT
It [CGRP treatment] is a very expensive treatment (40-50.000 DKK a year per patient). Around 200 patients in Denmark have tried it. For comparison 1 effective scleroses patient costs 1 million DKK per year. So, it is expensive for the migraine medicine as there is a big number of patients contra the amount of sclerosis patients.

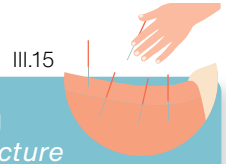


III.14

Ana Maria Nan
Chief surgeon, neurology
Works at Aalborg University hospital, responsible for the headache outpatient department.

appendix 3c

TREATMENT
The perfect medicine against migraine does not exist. There is a lot of side effects with the current. Migraine is so widespread, but at the same time,there is much we do not understand about it yet.



III.15

Guisheng Huang
Chinese acupuncture
Working with restoring the unbalance in the body that is causing the disease.

appendix 3d

TREATMENT
Acupuncture is: Transferring energy. From an area with spare energy to a area that is lacking of energy. The treatment origin in the temperature of the organs. I treat the organs that are connected to the migraine. The temperature of the organs needs to be balanced. If an organ is too cold or too warm, then the migraine can occur.
Migraine on the forehead = stomach
Migraine on the temples = gall bladder
Migraine on the back of the head = bladder
Migraine on the top of the head = lever
Migraine from the eyes = kidney

III.16

III.17

III.18

Conclusion

TREATMENT

Migraine is still a field within the medical world where there is many unknowns. The current types of medical treatments are insufficient and the effect of alternative treatments (as acupuncture) are very much affected by placebo effect. As there is not giving much money to migraine research, it is very few patients that are offered the newest type of treatment.

WELL-BEING

When having migraine it affects both your personal and social life. You need to structure your whole life and cancel appointments in the last minute, if having an attack. Furthermore, if you do not remember to take care of yourself, the migraine will get worse.

WORK LIFE

Many migraineurs are afraid of losing their job, as they never can predict when having a migraine attack. Also the conditions at work will only make the migraine worse (bright light, noises, high temperatures and smells). Just the thought of maybe getting a migraine attack at work when having an important appointment, can trigger one.

STIGMA

There is a lot of stigma following with migraine, as it is an invisible disease. If you have not had it, you cannot understand it. Many are just seeing it as a normal headache but that is far from the real case.

? The impact of stigma
? How the patients treat themselves, both in terms of medication and coping strategies

! The patient needs to lay down during an attack

III.19

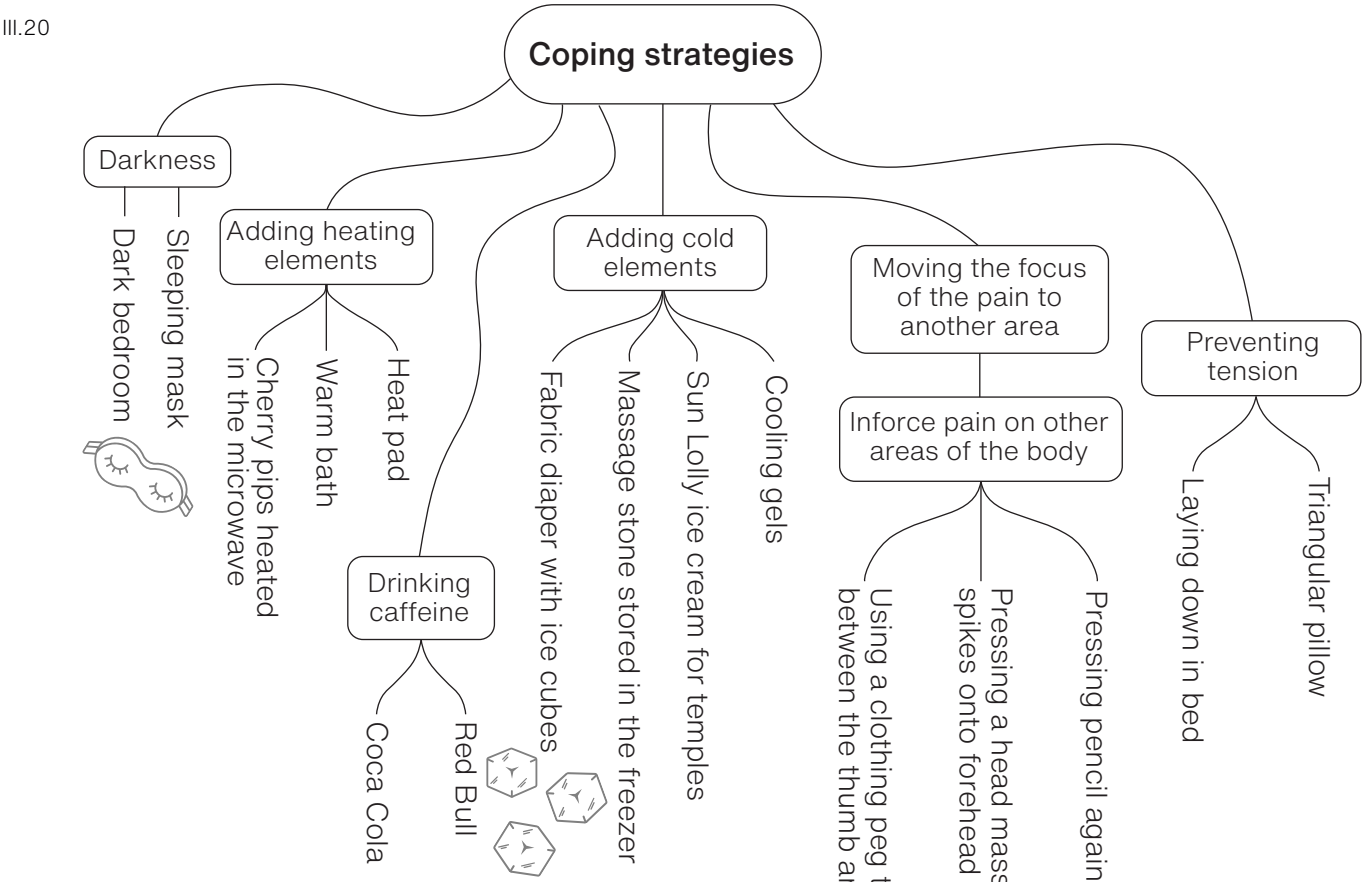
Coping strategies

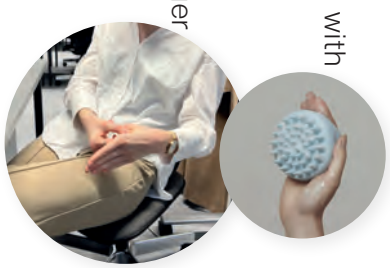
What do the patients use now

To understand what the migraineurs use now to cope with their migraine attack, beside medicine, the interviewed migraine patients were also asked to describe how they treat themselves under a migraine attack. After the user interviews, their coping strategies were presented to the neurology experts to understand the reasoning behind.

The coping strategies are mapped and categorized into themes(III.20). In the bottom the reactions of the experts are described.

III.20





https://www.magasin.dk/scalp-massage-brush/p8309622vmb.html

III.21

- Søren Due Andersen & Ana Maria Nan appendix 3b+c

Experts explain..

ENFORCING PAIN TO OTHER PARTS OF THE BODY ..... *It is the same principle as when a child falls and you blow on their wound. You then activate some other nerve pathways, that overrule the first pain. By distracting, the perception of the pain is changed.*

COOLING THE BODY DOWN ..... *Pain in general is feeling worse when we are warm. It is a sensitivity syndrome from the central nerve system.*

DRINKING DRINKS WITH CAFFEINE ..... *It is because of the caffeine. This is also in Treo (the most common non-prescription medication). It is a very good migraine remedy.*

Existing products

What do the patients use now

A desktop research was conducted to investigate what type of products are on the market right now for treating migraine. The product range can be divided into two sub-categories: Low-tech (III.22-28) and high-tech (III. 29-34) products.
The products are mainly wellness and fitness products with either compression, cold/warm functions, comfort, darkness or acu-pressure. For the high-tech products their common working principle is nerve-stimulation by electro-magnetic pulses, where some of the devices also have incorporated darkness, music etc. In both categories the items are designed for home use and would not be something to wear in public. A reasoning for this may be that most migraine patient seek for the home when having a migraine attack, where it would not be make sense to bring the products with you.

COMPARISON TO USER INTERVIEWS
Comparing these products with what the interviewed patients used, only a few of them was something they actually owned, e.g. The Sleeping mask and different shapes of cooling gel pads. Instead of buying function specific products, patients with migraine "hack" it, buy using what they already have in the home (ice, tea towels, blankets, clothes pegs, pillows etc.)(Appendix 2). Concerning the high-tech products they are not yet something that you can buy in Denmark, where many of them still are in the testing and implementation phase.

Low-tech products


III.22

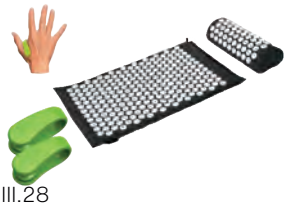

III.23


III.24


III.25


III.26

III.27


III.28

High-tech products


III.29


III.30


III.31


III.32


III.33


III.34


- Søren Due Andersen
appendix 3b
III.35

Expert feedback on products...

The high-tech products:
You cannot get economical support for these types of products and some of them may be quite expensive. I do not recommend any products – the patients must do their experiments with these products. But you need to be aware of the large placebo effect within this field. Also, you must not get blinded by these kinds of gadgets because there is a lot of money in it. The purpose is to earn money, like TV-shop.

The low.tech products:
I do not know if my patients are afraid of telling their doctor that they use alternative treatment. I am pretty sure that it is because people do not use it. People just do themselves what the products on the market can do.

! Coping strategies:
- Adding heat/cooling
- Distracting with other pain
- Darkness

! Patients with migraine hack what they have a home instead of buying a specific product for the same purpose.
! Migraine is very individual - you prefer different conditions.
! The current products for migraine are for home usage.

Migraine stigma

It is not just a headache.

Migraine is a disease related to a consequential socio-economic impact. People with the disease often experience stigma where a social attitude towards migraine has a substantial impact on life chances, behaviour, and quality of life. Furthermore, stigma is an additional burden on individuals having migraine, that is isolating them from a society that is supposed to be supporting them (Young, et al., 2013).

Stigma in conjunction to migraine is correlated strongly with inability to function (Appendix 6). Stigma manifests both in rejection and prejudices from society towards people with migraine with the consequent repercussions on their state of mind and quality of life.

MIGRAINE IS A HIDDEN DISEASE

Migraine is a hidden disease, meaning that people with migraine are experiencing symptoms manifesting as both physical and physiological conditions impacting their day-to-day life (page 11). The migraine attacks often induces inability to function normally during an attack. Hence, that even the people with migraine who are able to remain physically present may be absent in other ways.

Absenteeism can be measured, but it is much more difficult to determine and measure if someone is present - when one is physically present but is not really performing as expected. The disease of migraine leaves many people feeling unseen and unheard living with an invisible illness (Danmarks Patientforening for Hovedpineramte, 2020).

MIGRAINE IS NOT JUST A HEADACHE

Understanding the essence of migraine can be difficult and based on assumptions, if you have not experienced it. Every person that has suffered from a migraine attack, can relate to the impossible task of communicating what an attack feels like.

> Migraine doesn't care what's on your agenda.

> My surroundings do not know anything.
> **- Dorte, 46**

> There is a tabu about: "why can't you just take your pills and get going?"
> **- Gitte, 56**

> It's about acceptance. Do not take it as a sickness but a part of the everyday life. Like you need to go pee every day.
> **- Lis, 25**

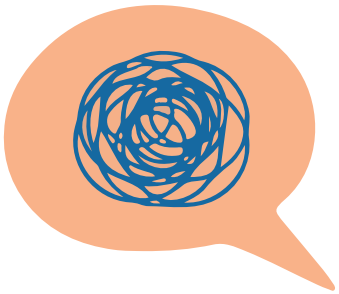
> Then you first got the headache disease you felt very much alone with your pain and experiences, isolated from the outside world.
> (Danmarks Patientforening for Hovedpineramte, 2020)

> I am still human. Show respect.
> **- Lone, 46**

Appendix 2 and 7

!

- ! There is a substantial stigma associated with people having migraine impacting their daily lives and well-being.
- ! People with migraine needs to advocate themselves. They are the only ones who know how their disease are affecting them.
- ! The solution must not signal that the user is sick



III.36

Picking a context

Milestone 0 and clustering

Though the research chapter, various studies covering the aspects of suffering with migraine have been presented. From the initial start of the process, the team did not know much about migraine, why the core problem of the project was not clear at this point. At Milestone 0 (a small project presentation, Appendix 8), it was presented how migraine affects the population in Denmark and individuals. Additionally, the research on migraineurs and interviews with patients and experts were presented in terms of creating the scope for the project.

FEEDBACK FROM MILESTONE 0

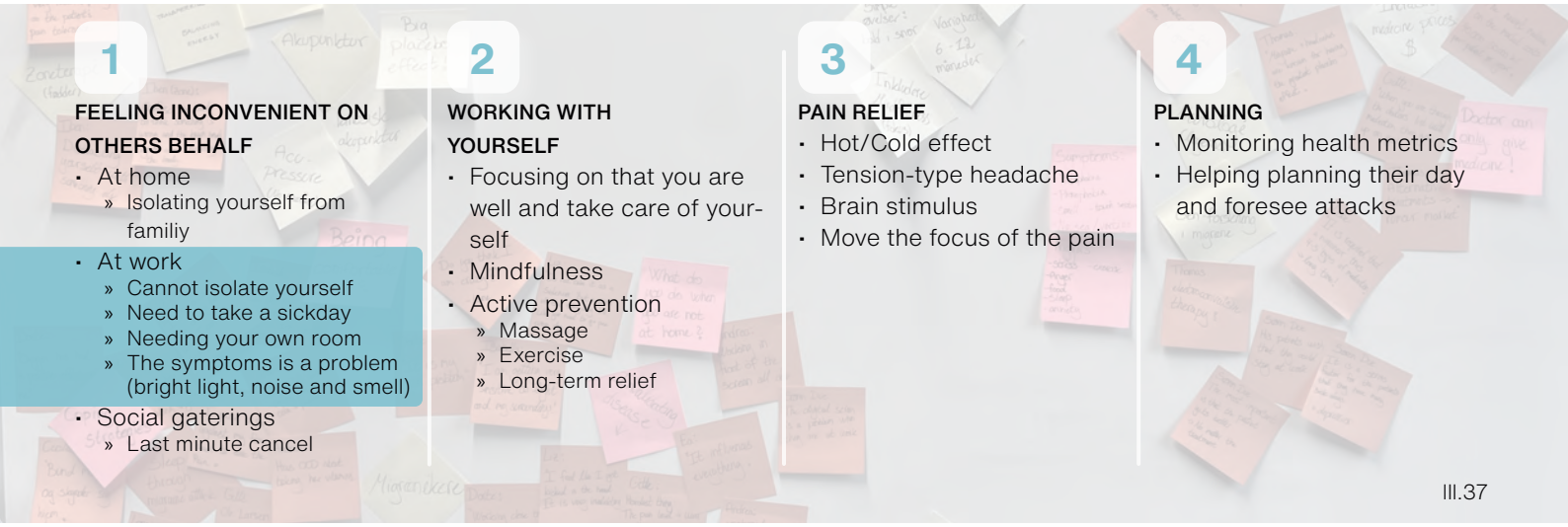
The feedback revolved around how a product could be developed without just making a new one within the existing market (Page 19). It would just be another product, that will not be bought or used. Therefore, the scope needed to be narrowed in somehow, as the group did not succeed in explaining why this topic, for certain was a design-problem. The gab in the market needed to be pointed out.

PROBLEM SLICING - PICKING A CONTEXT

After the project presentation, the team went back to take a closer look on their data. For reducing the complexity of the collected data, Clustering was conducted (Kolko, 2011)(Appendix 9).
Quotations from patient- and expert interviews were filled out on post-it notes and spread out on a whiteboard. Hereafter, several rounds of clustering were done to identify different patterns across of categories and origin of the data.

POTENTIAL PROJECT THEMES

After identifying interesting patterns from the clustering, a description of interesting themes were listed up, to understand the different problem spaces:



III.37

CHOOSING THE CONTEXT: “AT WORK“

The team found the patients’ dilemmas at work very interesting(the blue highlight), as prior research showed that people would not use money on products for the home, as they would just hack it themselves. Another concern was that theme 2 and 4 were very personal oriented, where the solution not for certainty is a design project. The barriers for theme 3 were the different pain tolerance and sensory perception among migraine patients. The interesting challenge in choosing the context of the workplace was, that the patient has no opportunity for controlling and personalizing their working environment, as they can at home; for the purpose of recovering and get though a migraine attack.

! The framing of the project was narrowed down to focus on **migraine at work**

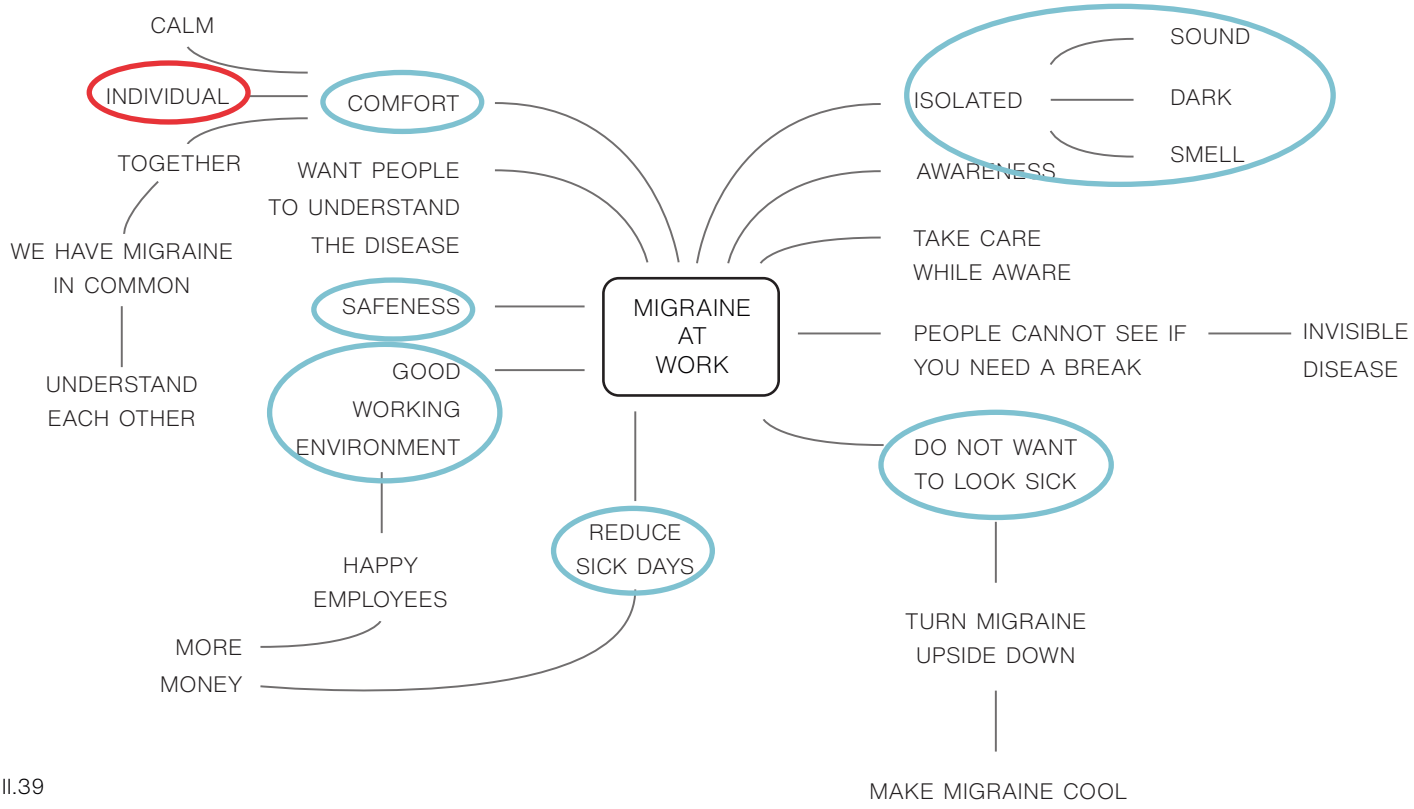

III.38

21

Picking a context - continued

Mind-map and problem formulation

A mind-map (III.39) on “Migraine at work” was made, followed up with an abstraction on the self-same, for extracting essential key words to formulate a problem statement (Tollestrup, 2004, p. 283).



III.39

After creating the mind-map and abstraction, several phrases for the problem where iterated and listed up. The team ended with the formulation:

It was important to incorporate “safeness”, “isolation” and “comfort” in the formulation, unified in the word “safe space”, where the solution can make it possible for migraine patients to stay at work and recover from an attack instead of taking a sick day.

The team knew that one of the core dilemmas in working with migraine is that it is a very individual disease and therefore it will not be possible to help everyone. Therefore is the problem narrowed down to only focus on those migraine patients that have effective medicine and the duration of the migraine attack is around 15 minutes to two hours, where it is possible to take a break at work. Compared to, those with chronic migraine having day-long attacks, who would take a sick day no matter what (see page 10).

After defining the problem formulation, several questions arose, that needed to be investigated:

? If the product is meant to be placed at the workplace, it most likely would be a product the workplace buy (a B2B product). How can the solution be made attractive for the employers?

? How does the context of a workplace look? And in which types of workplaces would the product fit in? Work trends?

? What does the migraineurs have now at work for recovering from their attacks?

? What is the requirements for the solution, so they fit the conditions of the migraine patient?

? Do any current products tap into this problem?

! The target group is narrowed to only focus on those migraine patients that have shorter migraine attacks (15 min.-2 hrs.)

! Must be integrated at a work place

! Must fit into working spaces aesthetically

Migraine at work

The survey

A survey was conducted in order to quantify and identify the journey and conditions when a migraine attack occurs at work. Quantitative data was obtained through self-completed questionnaires formed by the group, to specify the surroundings and individual conditions during a migraine attack (Martin & Hanington, 2012, p. 172).
The quantitative approach provided opportunities to gain knowledge about conditions that can be measured and quantified by numbers. The sample size of the survey was 73 people with migraine having different occupations and working tasks. All questions and answers can be found in appendix 10.

CONDUCTED DATA

The first question was:

How much time do you spend on transport to your workplace (in minutes)?(Appendix 10)

This question was asked to gain insight in their possibility to go home when having a migraine attack. Additionally, another question was asked;

How do you get to work?

As previous mentioned, the migraine has side effects that can influence the physical condition and eyesight of a person, meaning that the person is not able to go home when an attack occurs (Page 11). Therefore, the ability to get home safe and not being a danger to others is questionable, when people use cars and bikes to work(Appendix 10).

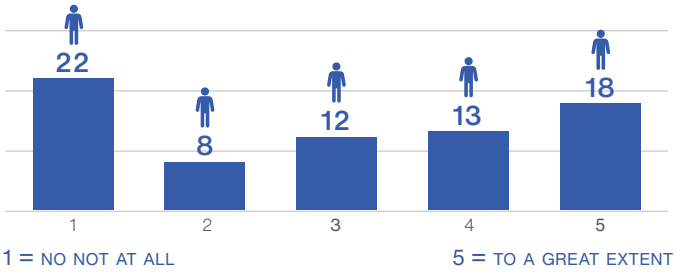
Previous interviews concluded that a person experiencing migraine prefer to be in a place where they feel isolated from surroundings and relaxed(Page 12). However, another question asked was;

Do you feel that your workplace show consideration for your migraine? (III.40)

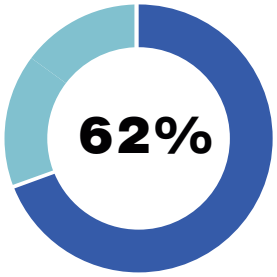
and in coherence a question;

Would you stay if the workplace provided a place for you to recover? (III.41)

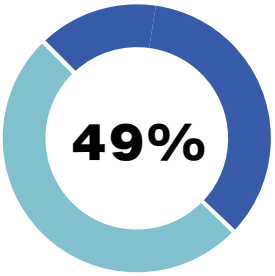
The results indicated (III.40 and III.41) that the answers differentiates a lot. 22 people thinks that their workplaces are not having considerations to their migraine, being the result of keeping the company and co-workers in suspense alongside with self-managing the migraine. However, 18 people thinks that their workplace has considerations for their migraine to a great extent indicating that the workplace has awareness of migraine.
62% answered that they preferred to stay at their workplace to recover, indicating that if the workplace could provide a place for a person with migraine to recover during the attack, the employee would not have to go through the struggle of going home and instead staying at the workplace and avoiding another sick-day.



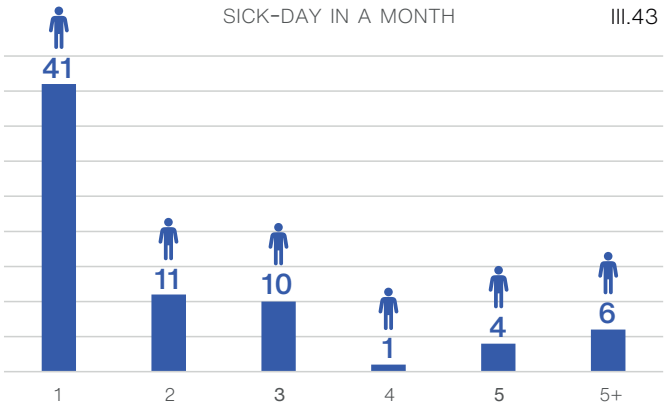
III.40 DO YOUR WORKPLACE SHOW CONSIDERATION FOR YOUR MIGRAINE?



III.41 WOULD STAY IF THE WORKPLACE PROVIDED A PLACE TO RECOVER

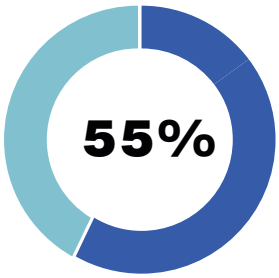


III.42 HAVING MORE THAN SEVEN HOURS PER DAY



In the survey it was important to clarify how many working hours they have on a daily basis in relation to how many sick-days (III.43) they have in a month. Around 50% is working more than seven hours per day (III.42), which correspond to a normal working routine (IDA Career & Legal Advice, 2022). However, the amount of sick-days differentiates from the normality. The neurologist Søren Due explained that if a person has more than two sick-days a month with headaches, it is an indication of migraine(Appendix 3b). The data showed that most people with migraine have 1-3 sick days in a month.

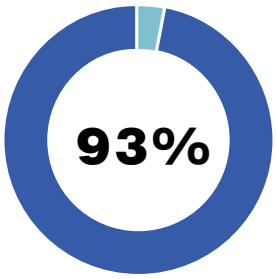
The survey also addressed the amount of migraine attacks one person is experiencing in a month (Ill.44). The data is diverging, but a great percentage is within 5-15 attacks per month. Alongside with these attacks, a question was asked if they take medications for their migraine; here 93,2% are taking either preventing or relieving medication to cope their migraine(Ill.45) signifying that apart from differentiation in types of migraine and side effects, all the people are taking medication for their migraine when being at work.



Ill.44 HAVING 5-15 MIGRAINE ATTACKS IN A MONTH

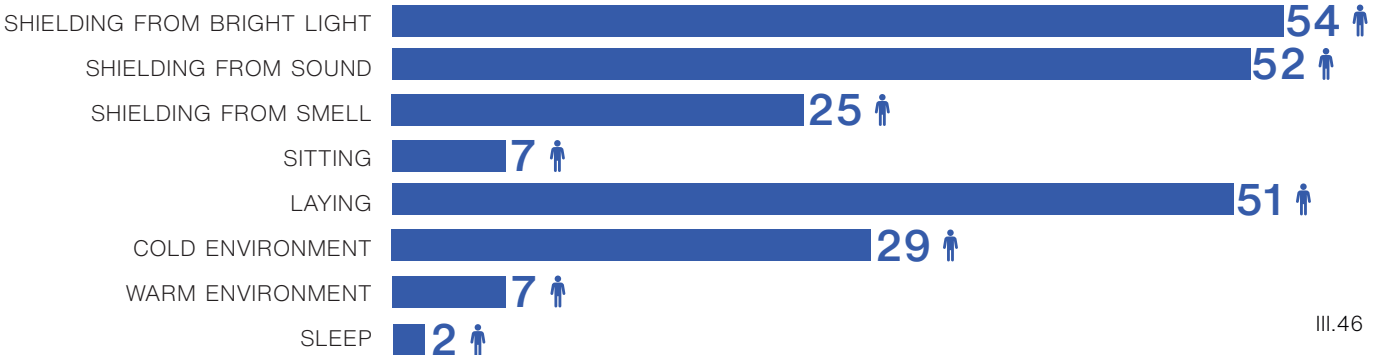
In order to gain a deeper insights in individual coping strategies when having a migraine attack, the following question was asked:

What is the most important conditions when you are having a migraine attack in order to recover and reduce discomfort?



Ill.45 TAKING MEDICATION FOR THEIR MIGRAINE

The data reveal a similarity in needs when experiencing migraine (Ill.46). A cover from bright light, smell and loud noises was highly preferred(the same concluded on page 12). Additionally, the data showed that they wish to lay down during an attack while being in a cold environment.



Ill.46

Conclusion

From the results of the survey, a dilemma occurs if a employee experiences a migraine attack at the workplace concerning if they are able to go home to recover - and if it will be safe to do so. Additionally, people with migraine wish to stay at work during an attack and recover if possible. However, the surroundings in a workplace does not always have the right conditions for the ideal recovery.
It was brought to the team's attention that having migraine at work can be tackled. Although, recovering from it, requires awareness from the workplace, where the needs of the migraineur are taken into account; a cover from bright light, smell and loud noises, and laying down during an attack while being in a cold environment. By involving these needs in a possible product proposal, it will allow the employee to stay at work and avoid a sick-day.

!

- ! There is a need for a place to recover at work during a migraine attack
- ! The solution must provide a cold environment.
- ! The solution must block out light while using it.

Migraine at work

Contacting new experts

At this point, the group questioned whether their data from prior qualitative interviews and the survey were valid and reliable enough. It sowed doubt about, if any workplaces show consideration for patients with migraine and if they are aware of the related issues influencing work flow and job satisfaction. Therefore, the team reached out to new experts on this area. Here, they got in contact with two persons, who had both scientific and practical experience with migraine and the ability to work. Two semi-structured interviews were conducted, with the purpose of getting their the hypothesis: "*There is a need for a recover solution at workplaces for patients with migraine*" confirmed or disproved (transcription can be read in appendix 3e and 3f).

KIRSTEN NABE-NIELSEN:
In January 2022 Kirsten Nabe-Nielsen(Ill. 47) published a paper about "migraine at work" (Nabe-Nielsen, 2022). The paper set focus on how migraine affects the ability to work and its consequence on productivity and sickness absence. According to Nabe-Nielsen, the employers need to be able to create a more flexible and personal work flow for the migraineur, where there is space for breaks and working in your own pace. When interviewing Kirsten Nabe-Nielsen, she agreed and confirmed the group's hypothesis:

> *When I worked with spreading knowledge about this problem[migraine at work], I only faced employers that said, "We do not have that problem here", while I sat with all the statistics, that documented how extensive a problem this is. I simply could not get through to them.*
>
> *It is interesting that you[the group] started with an underexposed problem, because people do not know that it exists and its extent, and for that reason, you cannot sell it that way and needs solve it in another way.*

Furthermore, the interview focused much upon how we should frame and tackle this problem. Kirsten Nabe-Nielsen challenged the team and came with relevant questions that needed to be further investigated:

? What are the barriers for using your[the group's] solution, in a professional environment, where you lay down and look sick?
? How are you [the group] going to clear the way for this type of product and provide something 'more' than just solving the problem? To make it more sellable.
? Investigate existing office products for other purposes; meditation, power naps, breaks at work and something like that.
? We could extent the palette and target group – is there other purposes it also could be used for?
? Remember when being place in public, how can you clean it?

CHRISTIAN HANSEN:
When patients contact Christian Hansen (Ill.48) and his colleges, they are a source where the patients can share their frustrations about the long waiting time at the neurologists and job centres. Or they just need a good advice on getting diagnosed. When asking about his experience with the dilemmas of having a job and dealing with migraine at the same time, he told about patients experiencing stigma at first-hand, confirming the group's hypothesis:

Ill.47

Kirsten Nabe-Nielsen
Special consultant in Roskilde municipality and researcher at Copenhagen University (Public Health Science)
Have researched in psychosocial exposures in the working environment, stress and health outcomes (hereunder headaches and migraine).

Ill.48

Christian Hansen
Secretariat director
Denmark's Patients association for headache sufferers
Helps migraine patients with counselling, psychological help and companion in social cases.

Ill.49

> *Going on work with migraine do not balance well. Patients are too nervous to stand forward, afraid of loosing their jobs - So instead they live with headache and migraine in secrecy, where many choose not call themselves in sick.*
>
> *Especially, office work can worsen your migraine.*
>
> *It is almost related to have a mentally illness, you do not dare to talk about it and furthermore you cannot see it on the outside.*

Lastly the team asked Christian Hansen, what and how they help patients to make their employer more aware of the disease. Here they are helping with setting up a meeting with the employer and have a dialogue about the employee's needs:

> *For example, we can help with providing a resting room with darkness and a bunk bed to lay on. This is done in consultation with the patient, to find out what you need to balance work and migraine better.*
>
> *It is not something the companies do themselves, we provide with counselling for the employers in how to secure the employees, when the employees are too afraid to confront the employer themselves.*

! The team's data and hypothesis were verified.
! You cannot make workplaces aware of migraine - they simply do not believe in.
! The team cannot sell their solution as a "migraine" product and needs to find a new marketing strategy
! The solution needs to be integrated in the working environment, where you cannot be pointed out as sick and needs to look professional.
! Migraineurs would rather go to work with headache, for keeping their job instead of taking care of themselves
! Some migraineurs have a resting room at work

II.

IDEATION.

Chapter summary

The following chapter will present the initial ideation of the project alongside with the Value Vision. Throughout ideation the group visualised the first potential concept ideas. The chapter will be concluded with Milestone 1 where three concepts were presented.

Value & vision based concept development

In order to create the playing ground for the first ideation a value mission and interaction vision was formulated(Tollestrup, 2004). The procedure for the exercise had its basis from the method of 'value- and vision based methodology' starting with the project's problem formulation;

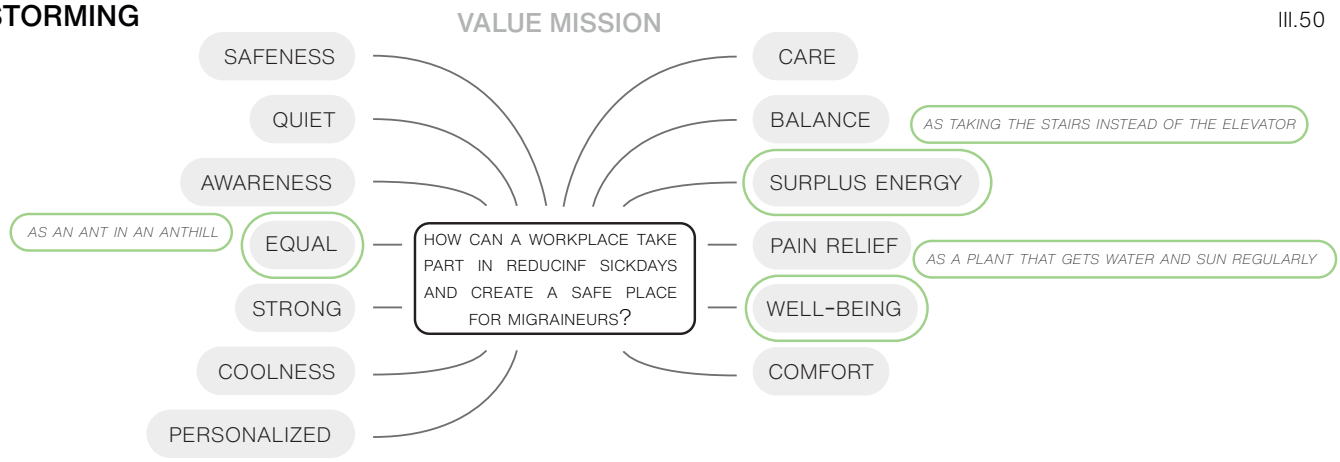
How can a workplace take part in reducing sick-days and create a safe place for migraineurs?

(defined on page 22)

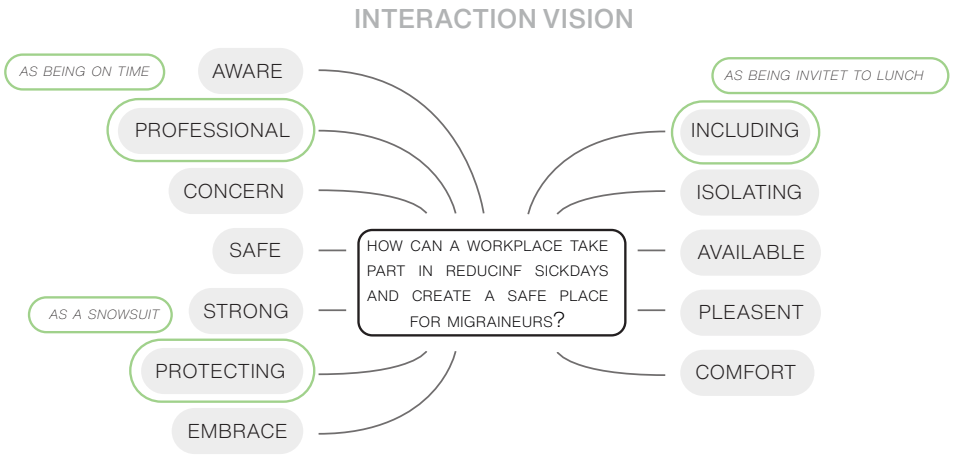
A brainstorm was made on value words for the **value mission** based on the Problem Formulation. When abstracting from the brainstorm, three value words were chosen, where the meaning was qualified with a metaphor and a picture for each word. (ill.52-57)

Another brainstorm was made on keywords for a **interaction vision**, describing the behaviour and personality of the product, using the same approach as for the value mission by utilizing triangulation.

BRAINSTORMING



III.50

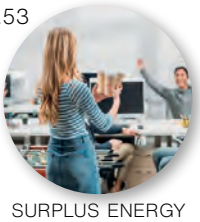


III.51

III.52

EQUAL

III.53



SURPLUS ENERGY

III.54

WELL-BERING

The product must give a feeling of **surplus energy** and **well-being** for the migraineur while creating an **equal** environment with co-workers

VALUE MISSION

III.55

PROFESSIONAL

III.56

PROTECTIVE

III.57

INCLUDING

The product must fit into a **professional** environment while being both **including** and **protective** for the migraineur

INTERACTION VISION

Conclusion

After defining the value vision and interaction vision, the next step is to start ideating process. The value vision might be updated later according to new information.

Initial ideation and evaluation

Developing first concept ideas

For the first ideation a brain pool sketching session was initiated (Tollestrup, 2004, p.284) followed by a clustering round(Kolko, 2011), for visualizing and categorizing the first ideas. The ideation created the foundation for three concept ideas, required for Milestone 2. All sketches can be seen in appendix 11.

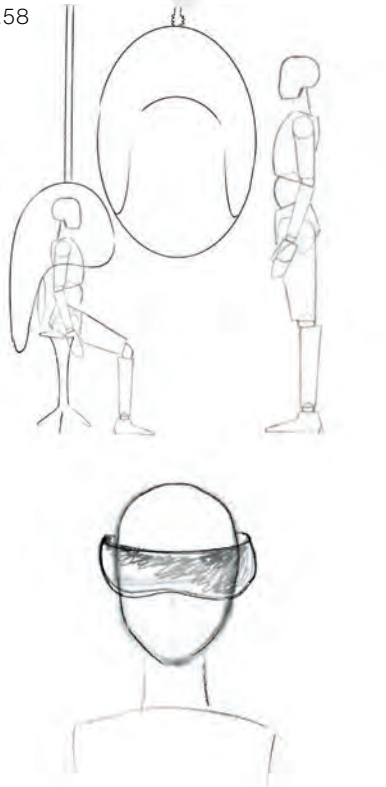
The process of the brain pool method started with a pile of small paper sheets (A5) on the table and a timer. The drawing session was time-boxed with two sessions of 10 minutes. When one has finished a drawing the group member put it in the middle of the table so the rest of the group could draw inspiration from them when being lost for ideas. After each session the different ideas were presented for the rest of the group. After the ideation the drawings were clustered and divided into themes: 1) ”Close to person” a personal device, 2) Flexible office furniture, 3) nest/cave feeling. For effectuating the ideation a second drawing section were done, in relation to the three new identified themes, for exploring the functional principles and product types within each theme. These are represented below.

01

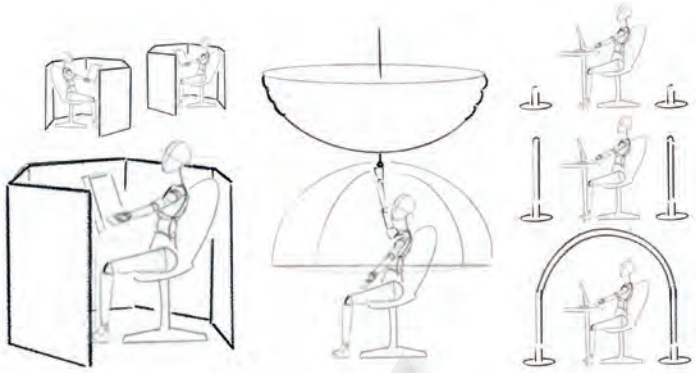
“CLOSE TO PERSON“ PERSONAL DEVICE

These ideas(Ill.58) was considered as being designed as a product close to the person, inviting the user to personalize it. Avoiding the need of signalling when the product is in use, because it is intended to be used only by the owner. Additionally, these concepts had futuristic and artistic traits in their aesthetics.

Ill.58



Ill.59



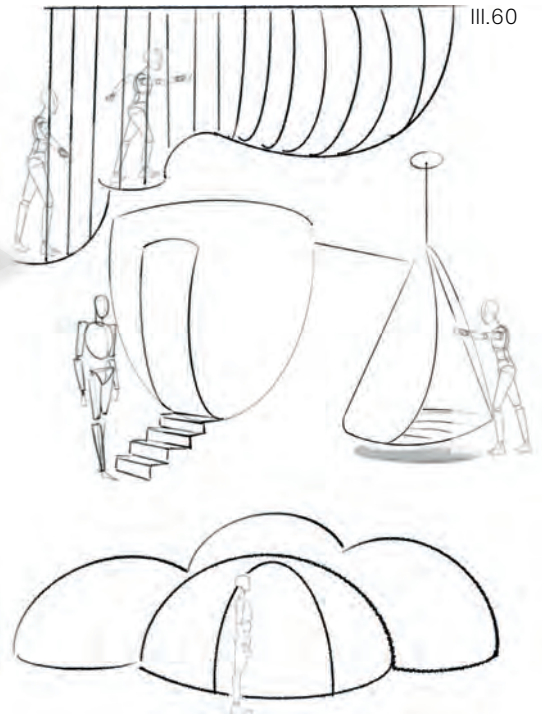
These concept ideas(Ill.59) were meant to be installed at all employees’ desk in the office space. Something that can be installed in relation to or a part of the work stations. It is not necessary to leave the desk for using it, categorized as a ‘flexible office furniture’, meaning that the concept is nearby when needed but additionally it has a purpose in other scenarios for e.g. privacy in a big office environment.

02

FLEXIBLE OFFICE FURNITURE

These drawings(Ill.60) were illustrating a single product placed in a company for several people to use. The location for the concept is located far from the office environment and the user would have to leave the desk to use it. The concepts are emphasizing a feeling of going into a nest to rest and indicating a wish for not being disturbed.

Ill.60



03

NEST / CAVE FEELING

EVALUATION / CHOOSING CONCEPT IDEAS

After the second drawing section, the solution room within the themes were evaluated according to user needs and the value mission + interaction vision (p. 27).

When taking a look on the “Flexible Office” category (Ill.59) it became clear that it contradicted with the group’s values as it is very important that the user do not look sick and with these ideas the product would only be giving to the ones with migraine - making them look “special“ which do not fit with the “equal“ parameter. At the same time these concepts could be used for other purposes than migraine. The solution field became too broad and for that reason this category was discarded.

The category “Close to person/personal“(Ill.58) was evaluated in the perspective of the stakeholder’s mindset. It seemed problematic financially as all on the workplace would need to have the unit installed by their desk, which would be quite expensive. Also, the user would not be “isolated“ from the surroundings as you still would be able to see them from the outside, where the value of “protective” would be lost. Therefore this category was also sorted out.
The last category “Nest“(Ill.60) had to a great extent the principles for accommodating the values. The concepts invited for the group to ideate on variation in terms of use principles, form, portability, function and craziness. It was important for the group to bring some “out of character” and crazy concepts to the Milestone.

Conclusion

The three chosen concepts a(Ill.61), b(Ill.62), and c(Ill.63) each had different principles for the reason of expanding the understanding of the solution space. However, all of the concepts were some kind of pods/units that stand for themselves away from the work stations at the work place and is not integrated at the personal workspace as this will not fit with the group’s value of the product.
The drawing sections helped to eliminate certain product categories and showed very clearly that the group were very much aware of the value of the product (isolated from the workspace but not initiating to cause the feeling of being an outsider).
The ideation helped understand the solution space and come with new consideration to the Design Brief and Value of the product. Also the group needed to be aware of the two users: Stakeholder, being the company investing in the product, and patients with migraine at work. As they have different requirements for the product.

The next step was to elaborate and draw further on the concepts so they could be ready for Milestone 1. Hereunder clarifying parameters as materials, overall architecture, installation and user scenario.

THE CHOSEN CONCEPTS

a

Ill.61

Structural principle / pavilion concept

This concept is a structural pod, where the user enters the open structure and close it down from the inside when they need to be alone. This unit is something that stands for itself and can possibly be used as a meeting space when being “open” with a great acoustic atmosphere.

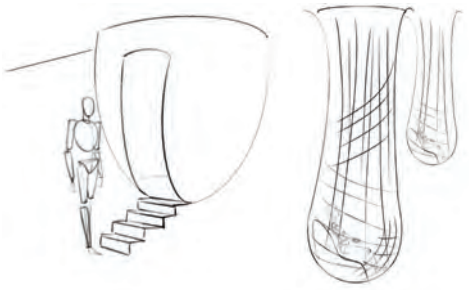
b

Ill.62

The movable concept / blow-up

The concept is a blown-up structure with an external soft look. It has a high collapse-ability and light look. But it must be investigated if the product can be blown up without creating noise.

c



Ill.63

The Ceiling Nest

The concept is a nest that hangs from the ceiling, where the stairs can be pulled up when you enters it. This makes it clear that it is occupied. It has a large cave vibe to it.

!

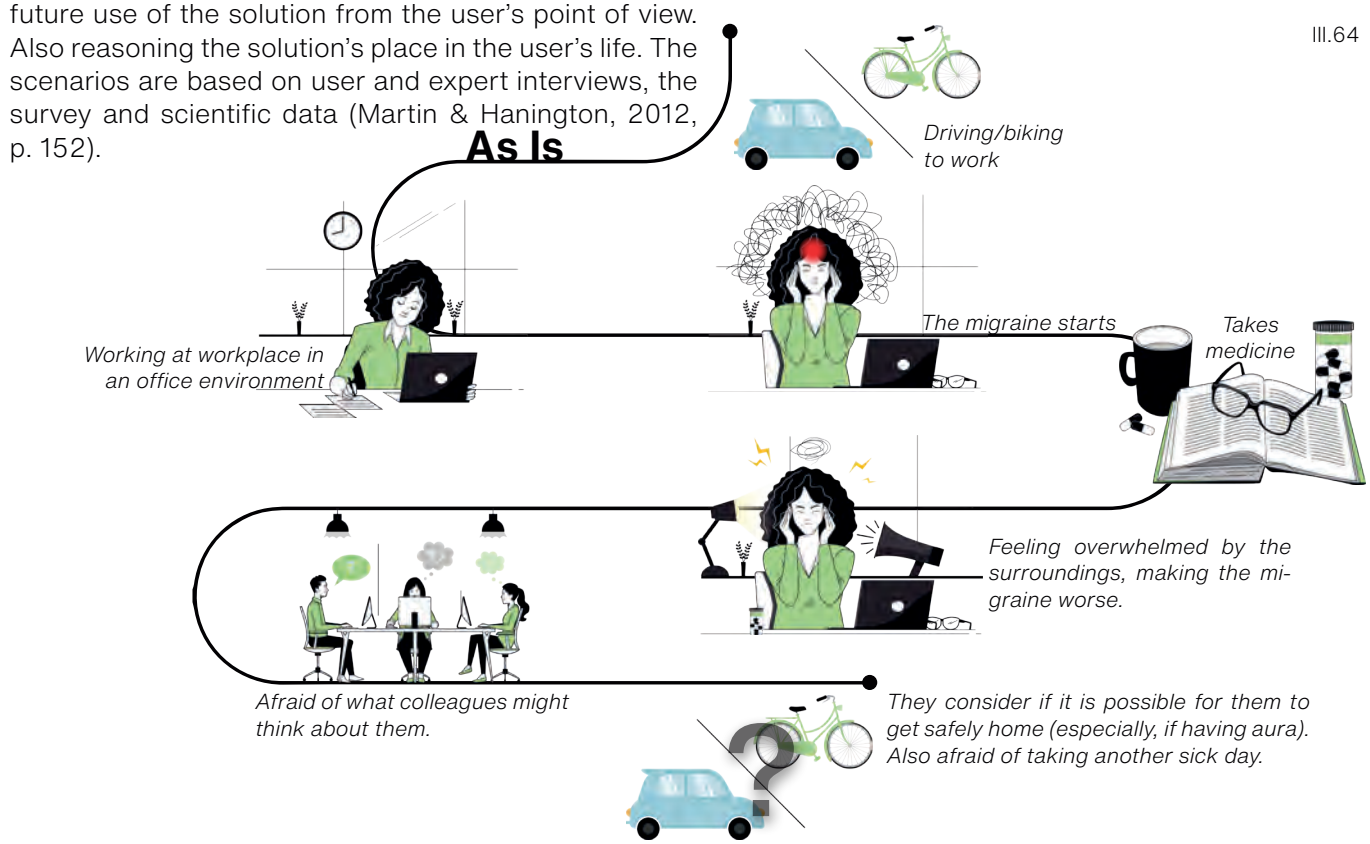
- ! The product needs to invite for everyone to use it.
- ! A cool factor should be enhanced in order to avoid the signal of a nursing product for sick people.
- ! The solution must be installed away from the working stations.

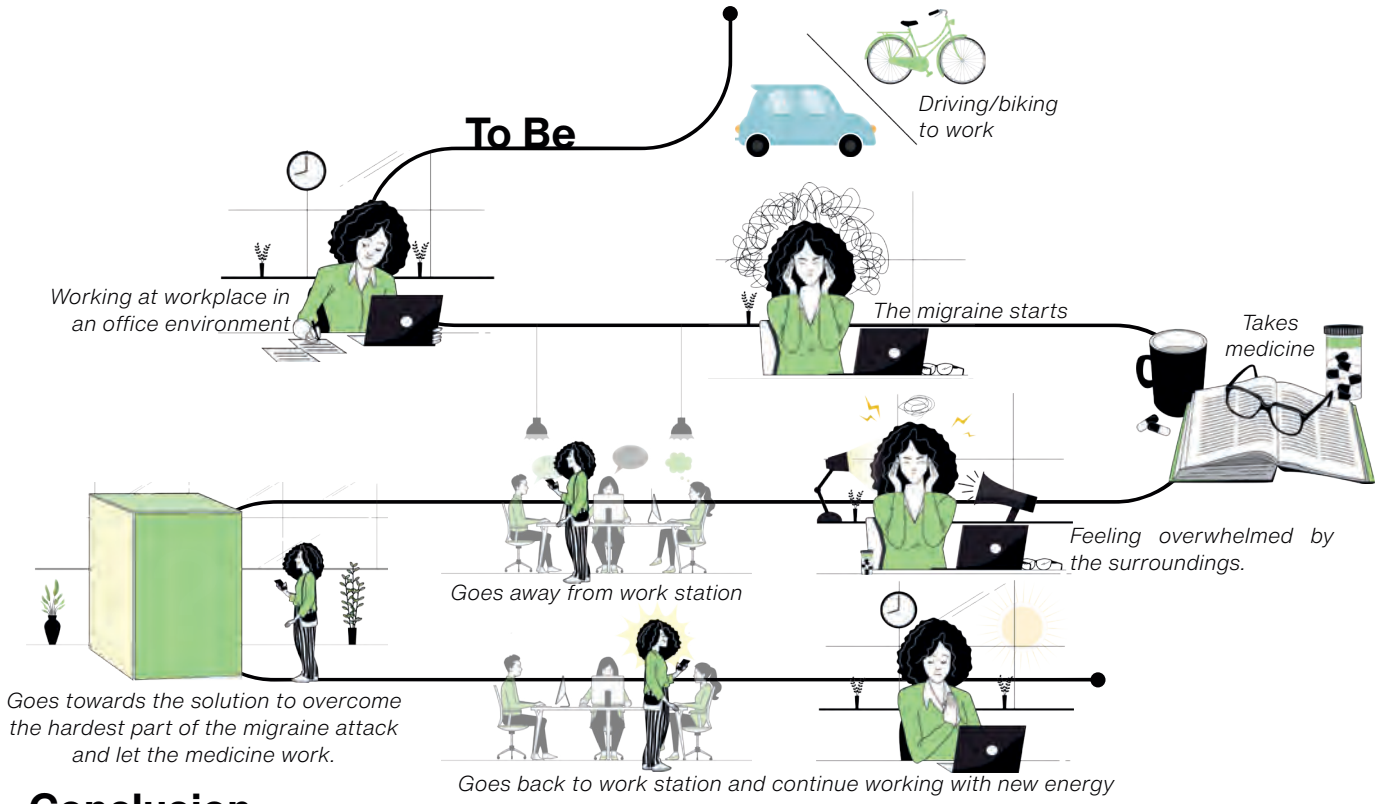
User journey

As is and To be Scenario

By illustrating an As Is and To Be scenario (Ill.64), the intention was to visualize the current problem and the future use of the solution from the user's point of view. Also reasoning the solution's place in the user's life. The scenarios are based on user and expert interviews, the survey and scientific data (Martin & Hanington, 2012, p. 152).

Ill.64





Conclusion

Narrating the scenario, makes it clear that the solution should be placed away from the work station. The ones using the unit must not look stupid or sick from the surrounding's point of view. The team cannot change the perception of migraine instantly. Instead the solution needs to disguised as something else than a "migraine pod". It must be something that can be integrated as the 'new normal' at the workplace. **The context of the solution is defined to be bigger office spaces.**

!

Design Brief 1.0

PROBLEM STATEMENT
How can a *workplace* take part in reducing *sick days* and create a *safe place* for *migraineurs* ?

CONTEXT:
Large office spaces

TARGET GROUP:
Patients suffering with migraine
Attack duration: 15 min - 2 hours

VALUE MISSION
The product must give a feeling of **surplus energy** and **well-being** for the migraineur while creating an **equal** environment with co-workers

INTERACTION VISION
The product must fit into a **professional** environment while being both **including** and **protective** for the migraineur

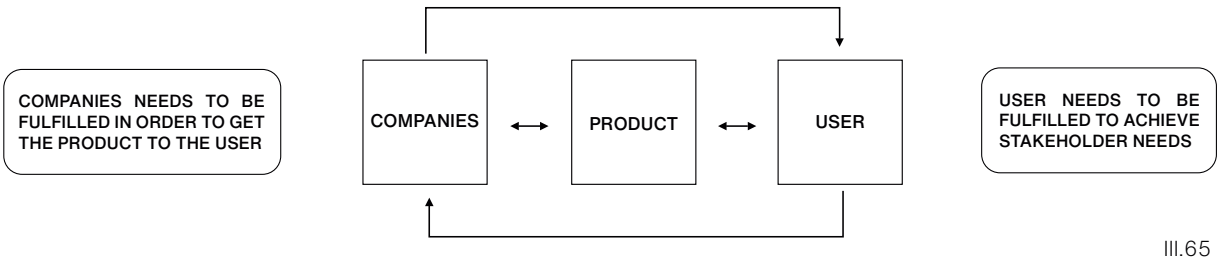
FUNCTIONALITY

	PAGE NO.	REFERENCE
Must isolate/block out light while using the solution	12 + 23-24	Common migraine side-effect
Must isolate from noise	12	Common migraine side-effect
Must isolate from smell	12	Common migraine side-effect
Must be able to lay down	16-17	Helps to recover during an attack
Must provide a cold environment	23-24	Helps to recover during an attack
Must be a one person product	12	Isolation from other people
Must be integrated at the work place	22/25	Defining the context of the project
Must be installed away from the work stations	29-30	Relation to ideation and As-is scenario
Must invite for everyone to use it (not signal a 'migraine' product)	25/29	It cannot be sold as a migraine product

AESTHETICS

	PAGE NO.	REFERENCE
Must not signal that you are sick	20	Stigmatizing to be pointed out as the 'sick' person
Must provide a cool factor to the product	29	Avoid the signal of a nursing product
Must fit into working spaces aesthetically	22	The context of a professional environment

CORE DESIGN DILEMMAS
Two different dilemmas emerged throughout the research. These are highly interdependent and will be kept in mind throughout the project (III.65).



III.65

Conclusion

For validation and specification of the requirements testing is necessary.

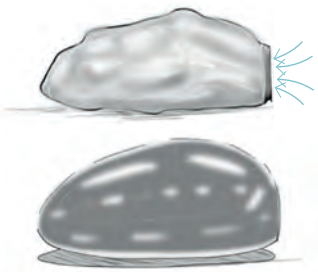
Three concept ideas

Explained

Based on the initial ideation and evaluation at page 28-29 and the Design Brief, three concept ideas were made for the purpose of expanding the solution space and presenting them at Milestone 1. The three concepts all had the same placement at the workplace, away from the work stations. However, they were all different in scale, functionality and aesthetics. With a wide range in craziness, concept 1(Ill.66) was the conservative guess and "close to reality", where concept 2 (Ill.67) and 3(Ill.68) were outside the box. The innovation focused on different type of mounting (the ceiling/air) and user experience.

Ill.66

Ill.67



Ill.68

1

Ill.69

THE AMADILLO POD

This concept was made to provide the user with a moveable solution inviting to take a break anywhere at the workplace. The concept had a mattress close to the ground to lay on and a closing mechanism that could provide a graduating isolation from surroundings. The concept also invited for the user to bring personal belongings as a pillow for creating own ergonomic comfort.

2

Ill.70

THE NEST / DROPPIN' NEST

This concept was providing the user with a stationary solution to take a break in a quiet place at the workplace. The concept was hanging from the ceiling for the reasoning of creating an association to a nest, where the user could feel distanced, literally, from the workplace. The material was flexible but yet creating stability to avoid oscillations.

3

Ill.71

MYVERSE / ANOTHER UNIVERSE

Likewise concept 2, this concept was a stationary space to take a break. However, this solution was significantly bigger in order to create another universe far from the working environment. A place for the user to personalize the seating by moving around and inviting for experiencing mindfulness. The concept was made in an inflatable material for the ability to create a diverse universe with different seating and laying areas inside.
This concept was also intended to have a wow-factor from the outside.

Milestone 1

Feedback and reflection

REQUIREMENT FOR MILESTONE 1:
The objective was to review the project's direction and current potential, hereunder problem, product specifications, scenarios, market position and development of at least three concepts (semester description).

The initial thoughts for Milestone 1 was to develop three concepts that each had different solution principles based on Design Brief 1.0 (page 31).

After the presentation not much feedback was giving directly to the concepts. However, there was a great attention towards how each concept accommodated personalization of a product, as this would be a key point for a person with migraine.

Another discussed topic was the stakeholders; The selling opportunity was questioned, as the company needs to be convinced to buy a 'migraine' product. Sowing doubt about; What do they want? Should it only be for migraineurs? Or should it be possible to use for other purposes? Most products in workplaces are enhancing the ability to work and what is new about this product? It was clear from the supervisors that a B2B selling strategy had to be addressed in order to convince the stakeholders.

The three concept varied a lot in dimensions, where it was important to consider the space available at a workplace. How big should it be? What is maximum relating to our requirements of laying down? Should you lay all down or more like a chaise-long? For clarification, testing was needed.
An awareness of fire restrictions was mentioned, as the purpose of the concepts were to isolate a person. This safe-manner could not be ignored. There is a dilemma in wanting to isolate a person while being included and seen (according to fire restrictions) at the same time.

Most of the feedback did not take the group by surprise, except for the fire restrictions. The group knew that the next step was to contact stakeholders realizing that this was something that they missed(The presentation brought for Milestone 1 can be seen in appendix 12).

THE NEXT STEP

- Read into fire restriction at workplaces
- Contact stakeholders
- Map out dimensions of solution
- Expand to other market potentials
- Personalization
- Map out Design dilemmas

Conclusion

The solution room had been widened by developing three different concepts to discover unknown unknowns (Communication Theory, 2021). The group decided to investigate how to create an association to a nest in a stationary concept alongside with creating another universe far from the working environment. Hereby, a combination of concept 2 and 3 were to be investigated in further concept development.

III.

CONCEPT.

Chapter summary

The third chapter starts by reaching out to different companies as case studies. Hereafter, several tests were conducted for specifying requirements. However, the reader should be aware that the group is going astray in the end of the chapter by developing and presenting a concept that entangled the group in a wrong direction.

Visiting stakeholders

Company sightseeing: Les Deux, Siemens Gamesa & KMD

When designing a product that needs to be integrated in an office environment, it was clear that a B2B selling strategy had to be addressed in order to convince the stakeholders to invest in the solution.
Investigating stakeholders lead the group to paying some of them a visit with the purpose of gaining knowledge about their working culture and initiatives for personalization of work-structure. Furthermore, the visit had the intention of giving the group a visual context analyses.

III.72

LES DEUX
The first company to visit was the men's fashion company, Les Deux located in Copenhagen. This company is representing a modern perspective on a work-structure. Their focus is to have awareness on the employees' well-being by providing them with different opportunities to personalize and structure one's work-flow. The company offers fitness, paddle tennis, yoga, and different interior installations inviting for taking a break. Whether it is on their basketball court or in the different spaces offering different modern and scandinavian furnitures for relaxing(III.72)(Appendix 13).

> *Work flows together with your personal life. Your friends are also those you work and exercise with. We embrace that we work differently, as long you meet the deadlines, you can work when it fits you best.*
>
> *For example, our marketing department works best in the morning, in contradiction to myself, I am most efficient in the afternoon.*

- Kasper Obel, Retail director, Les Deux

SIEMENS GAMESA
Another company that the group paid a visit was Siemens Gamesa, an international company producing wind turbines both for off-shore and onshore. The group got in contact to a new task-force within Siemens Gamesa called: "*Caring for colleagues*". In a Linkedin post they describe their goal as the following:

The purpose of the project is to work with strategic well-being on organizational, team and individual level.

Supporting and motivating the development of a culture to increase mental health awareness and self-care strategies, and decrease stigma associated with psychological suffering and help-seeking.
Siemens Gamesa offers a wide variety of benefits such as flexible working hours as well as home-office possibility for many colleagues, employer-funded pension, attractive remuneration package (fixed/variable) and local benefits such as subsided lunch, employee discounts and much more(Appendix 14).

III.73

Hereafter the group had an interview with founder of this task-force. In the interview they said that their goal was to prevent sick days, as their workplace evaluations showed that the commitment among employees had been falling. They wanted to prevent and handle sick days and absence in a good way. Also, creating a flexible working arrangement, where the employee works half from home during the week and the other half on the office, where they can innovate and talk with their team. They talked a lot about the "Hybrid" work life, where you are very effective at home and have good leadership and teamwork on the distance. »

SIEMENS GAMESA CONTINUED

After the interview with the task-force the group contacted an employee at Siemens Gamesa to gain insights on a personalized established work-structure. Here the group interviewed Dorte, who works at the office and takes part in the training and employment of new employees to the production line(Appendix 15).

Dorte elaborated, that there was a lot of noise in the office and not all people like to work in the open office space. However, she would not fit in an arrangement where she needed to work half from home, as she likes to talk and discuss with her colleagues during the day.

> *I have someone at the office I work very close with, so it makes sense for me to be out there [at the office] from Monday to Thursday and at Friday I work from home, to follow up on everything, where I can sit alone and concentrate on getting things done.*
>
> *[...]*
>
> *At the office there can be quiet noisy and a busy atmosphere. But it is the relationship and teamwork with my colleagues that is the most important; Being able to look each other in the eyes and see how you are doing.*

- Dorte, Siemens Gamesa

Ill.74

> *I am an active person and like to exercise, but I never have the right energy in the afternoon after work. Now I am instead taking a two hour break at noon, where I go down in our fitness centre at KMD to train for an hour and then go to lunch afterwards. To follow up with my deadlines I am meeting a bit earlier in the morning, compared to my colleagues.*

- Kristian René Hansen, Senior project manager, KMD

KMD

The last company to visit was KMD located in Aalborg (Ill.74). Here the group talked with Kristian René Hansen, functioning as project leader in the company. He gave the group a tour around the whole office, while discussion how they have changed their work structure after Corona. The job satisfaction and productivity have increased among the employees at KMD, after working from home during the lock-down, making it possible to have a more flexible workday. Therefore has KMD created 'KMD Life', to make sure that the employees actively use the tools they learned by working from home during lock-down. Here, they want to emphasis the freedom of organizing your own everyday life, by for example, taking a break in the middle of the day to walk their dog and continue working afterwards. In Kristian's case, he has made an agreement with his leader, that he can take one big break in the middle of the day, as he elaborates:

Furthermore, they are changing the design of the offices in Kristian's department, where some of the stationary work stations are changed into hybrid work stations, with a docking setup for the employee's pc, so everybody can use the same station. Kristian thinks, that more of his colleagues have chosen to work more from home due to the noise that can be in an open office with eight to ten people inside. There is no option for a moment of privacy if needed. However, is it possible to book one of their meeting rooms, but their main function is for meetings, so you want to favour those who need it for that purpose.

! As a result of Corona and working from home, companies have changed their working structure, where employees can personalize their workday and have a more flexible everyday life, as a part of the hybrid work trend.

MuteBox

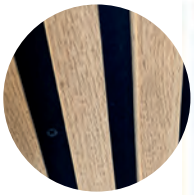
Optimization of workplace environment

In order to gain more knowledge about the existing market, the group arranged a meeting with a salesman from MuteBox. Additionally, it was an interest to know how sound isolation, light, inside environment, materials, and power-supply had been integrated in an enclosed product.

MuteBox is a Danish design company, selling meeting- and telephone boxes for use in open office landscapes; a workspace for meetings and immersion to create a better working environment in large work places (Appendix 16).

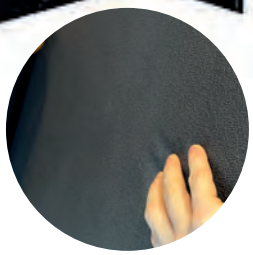
MUTEBOX'S DESIGN PARAMETERS AND SELLING STRATEGIES:
The boxes have a soundproofing of 30 dB, however, there is still an awareness around the surroundings. When a company orders the product, fitters come and help with setup. You can also order it and assemble it yourself with an app to guide you through it. It is assembled in such a way, that you can change the exterior of it, so the slats can be changed over time adjusting to new trends. A plug and play principle is integrated only needing an electrical outlet. Depending on how the company makes an investment they are not guaranteed to be used, MuteBox has the scheme as a business strategy that there is a 100 day 100% return right.
Another important factor to investigate and verify when talking with the salesman, was how MuteBox is avoiding to consider fire restrictions. The group discovered that if a box(like MuteBox) is under 8 m^2 it can be categorized as a freezing box, meaning that no fire restrictions has to be incorporated as design principles. However, the user needs to be able to hear and be aware when a fire occur or other reasons for evacuation, also being able to bring themselves to safety without extra help. (The fire restrictions are elaborated in appendix 17)

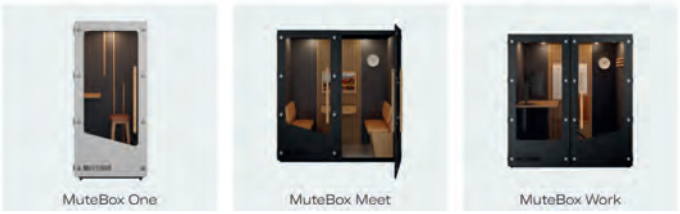
III.78


III.75 Acoustic slats on the side


III.79


III.76 Working station


III.77 Soft acoustic touch inside



III.80 Three variants of Mutebox

Conclusion

In order for the user to relax and recover, the product needs to be enclosed like MuteBox. However, MuteBox is made with the intention of productivity; a place at work that you can go into when being disturbed by noise or need to take a phone call. Furthermore, it would be beneficial to replicate MuteBox's selling strategy with 100 days return right, as this enables the buyer to try the product without any risk - also having a trial period where the employer can observe if the product is utilized at the work place. This is also a smart strategy, when introducing a new type of product to the market.

- ! The product needs to be less than 8m^2
- ! Must enhance personal flexible working structures like Mutebox.
- ! The user must be able to hear and be aware when a fire occurs or other reasons for evacuation.
- ! The outer look must be changeable for adjusting to trends.

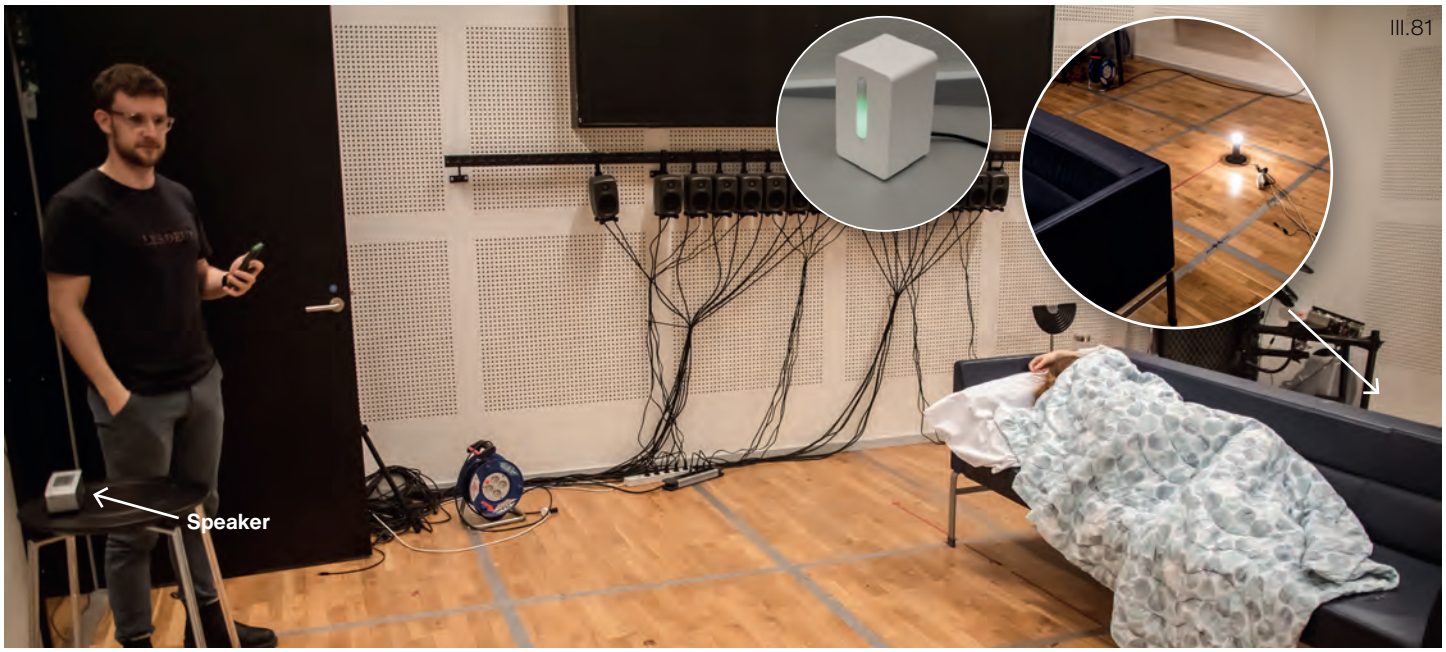
Light and noise experiment

What is the limit for a migraineur?

Taking a look on the first design brief (page 33), it was clear that many of the defined needs were indefinite, hereunder, light and noise level. The group wanted to specify the migraineurs' comfort range for light- and noise level. The group therefore rented the Sound Lab at the university; The Sound Lab is a type of music studio with good sound isolation, where it also is possible to darken the room totally.

THE SETUP

In the middle of the room a sofa was placed and an IKEA lamp with a dimmable light bulb was put behind the sofa, so the test person got an experience of diffuse and in-direct light. Also a small speaker was placed inside the room to create different noises. Furthermore, was the air quality measured with IKEA's air quality sensor inside the testing room, for making sure it would not be unpleasant for the test-persons before the actual experiments. The green color shows that there was a proper air quality inside (Ill.81).



Ill.81

THE EXPERIMENTS

A test person was placed on the sofa, where they could either choose to lay or sit. One from the group was with the test person while the other group member was sitting outside for creating an intimate and safe atmosphere. Six test person was involved in the experiments, all suffering with migraine.(Ill.82)

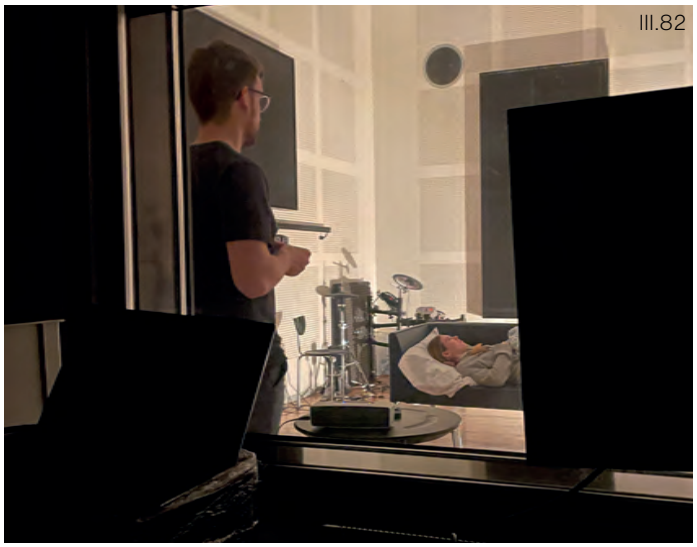
LIGHT EXPERIMENT

Firstly the test-person was told that they should have the mindset and experience of a migraine attack during the experiments.
Starting with testing the light setting, the room was initially blacked out and slowly the intensity of the light was increased. The test person would continually give feedback on whether it was comfortable or not. Then they should say stop when the light was too much. The color of the light was also tested; shifting between cold, neutral and warm light, the test-person also would provide with feedback on this.

NOISE EXPERIMENT

After the light test, noise level was tested.
The speaker was used to play "office" sounds, starting on the lowest volume level. The sound level was tested with a Decibel measurer on a phone. The room was measured before hand for detecting the "natural" noise level.

While the group member continuously turned up the volume of the noises, the test-person was told to say "stop" when the noises were too much for them. When the test-person said stop the decibel level was detected and noted.

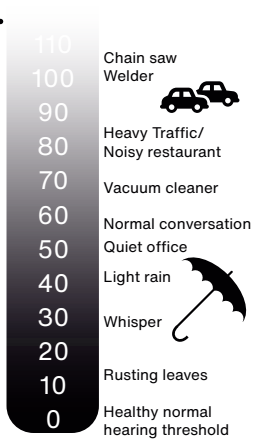


Ill.82

RESULT

Participant no.	Minimum **Light** tolerance (No. of click on IKEA remote)	Maximum **Light** tolerance (No. of click on IKEA remote)	**Light** color (warm/cold)	Maximum **Noise** tolerance
1	1 click	3 clicks	Warm light	35 dB
2	Total darkness	Maximum clicks	Warm light	35-40 dB
3	1 click	4 clicks	Warm light	35 dB
4	1 click	3 clicks	Warm light	40 dB
5	Total darkness	3 clicks	Warm light	32-35 dB
6	Total darkness	4 clicks	Warm light	38 dB

Table 1



III.83 *Decibel scale*

LIGHT RESULT

It was not all who wanted total darkness because it gave a claustrophobic feeling, but all liked the lowest setting of light. The maximum light was three click on the IKEA remote, after this the light was too much for the majority of the test-persons. For the solution, it would be smart to make the light setting adjustable, for personalization. Everybody wanted warm light contra blue light. In the manual of the used IKEA light bulb, the warm light setting is defined as 2200 Kelvin (IKEA, 2022).

If moving the light bulb within the test-person's visual field, the direct light instantly felt very uncomfortable for the them.

NOISE RESULT

The neutral room sound was around 25-29 dB, where the test-persons could tolerate 35-40 dB (Table 1), which is around the sound of a refrigerator, light rain or a quiet office (Berg, 2020)(III.83).

OTHER OBSERVATIONS

The transition from the Sound Lab and out to the hallway was experienced by all test-persons very harsh and uncomfortable, as they got overwhelmed by the light outside.
Another ting was the feeling the test-persons had right after the test. Everybody talked about a relieved, calm and relaxing feeling, because of the ambient light and quietness inside the Sound Lab.

TRANSLATING REMOTE CLICKS INTO LUMEN

IKEA remote click converted to lumen:
Total lumen / Total clicks = lumen change per click
806 lumen / 7 clicks = 115 lumen/click
3 click * 115 lumen/click = 345 lumen

III.84

The following, prior requirements have been specified:

- ! The maximum noise inside the product must maximum be 35-40 dB
- ! The light source must not be visual for the user
- ! The light temperature inside the product must be warm (around 2200 K)
- ! The light inside the product must be adjustable (from 0 to ~ 345 lumen)
- ! A transition is needed when entering and leaving the solution for avoiding a harsh transition
- ! A power supply is needed

Ergonomic comfort

Testing laying position

In order for the group to determine the ergonomic comfort and how to relax your body properly, it was necessary to do some testing(the whole test can be found in appendix 18). Initial thoughts on ergonomics was that the product should provide a comfort to the user in order to relief tension in the body. Also, it was important to clarify that the comfort should not be encourage for sleeping, but only provide comfort in the manner of feeling relaxed in a comfortable position. Hence, the testing had its starting point at the 'zero gravity' position.

ZERO GRAVITY POSITION

NASA developed this position to maximise comfort for astronauts heading into space. The zero gravity position alleviates extreme pressure on the astronauts body and keeps the them comfortable until they are out of orbit into space (Comfomatic, 2022)(Ill.85).
The position will reduce stress on your lower back and eases circulation, whilst your upper back and head remain anatomically supported. Fundamentally, **pressure is removed from painful parts of the body.** Which leads to heightened relaxation and a better quality of sleep. Furthermore, the position can **improve blood flow**, which reduces swelling too. Eventually, the position improves **circulation, reducing back and neck** pain.

ADJUSTING THE COMFORT

Although, the 'zero-gravity' position seems like the most convenient, it was important to test the position. A test was done in the open group room with a hospital bed with possibility of adjusting the feet positioning and upper body. As a start, the positioning of the bed was adjusted to be as similar to the "zero gravity" position as possible (Ill.86, 87).

RESULTS

The zero gravity positioning did not work good in practice, people was feeling that they were sliding down in the bed and at the same time they felt "locked" in the position, as there was not option for laying on the side or any other change of position without feeling uncomfortable. Other wanted the head position lower to feel less sliding down. Tall people had problems being in the bed as they slid to the end of the bed. Most of the test-persons liked the support under the knees. However, most test-persons liked the positioning of having their feet lifted with a lower head support. Many of the women liked this position because their butt then was supported and they could not slide anywhere. Overall people had different opinions on the "perfect" positioning. Also, people had different opinion on the position in relation to its purpose: sleep, nap, powernap or relaxing. If they wanted to sleep most wanted to lay flat.

Ill.85

Ill.86

Ill.87

Conclusion

It was concluded that the zero gravity position is not suitable for the solution. However, the test-persons wanted to have their feet lifted up in order to relief the pressure on the body, having coherence to the zero gravity position. Although, it was preferred that people had the option to personalize and adjust their lying positioning for example with pillows. However, the starting position needed to assist the comfort. Moreover, it is important to distinct between sleeping position and relaxation/nap position. To reflect on the test, the group learned that all people is different when it comes to the "perfect" laying position. The next step was to investigate and ideate on how a personalization and adjustment can be incorporated in the solution.

! Need for personalization in the laying position

Conceptualization

First round

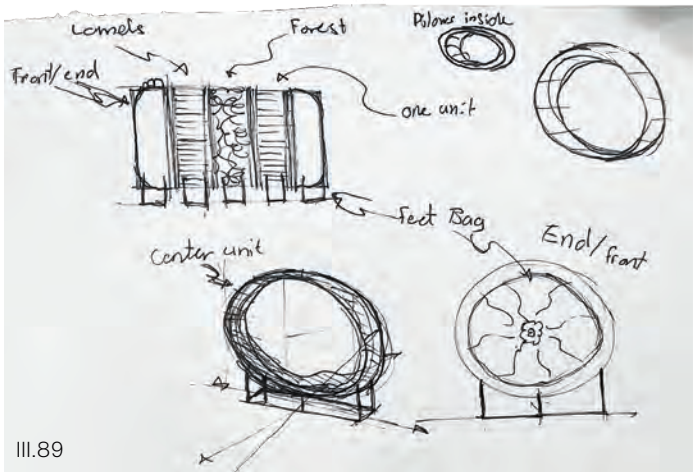
After the first ideation round(Page 28-29 + 32), the group had not come closer to a concept. Except, they still wanted to emphasise the “cave”/”nest” feeling. Since the last ideation round, the group had gathered much more insights on the stakeholders and a more in-dept understanding of the migraineurs’ needs. This sketching round was therefore focusing on the new stakeholder insights, but also having the feedback from Milestone 1 in back of their minds (Page 33).

The agenda of the sketching round was free, for encouraging each group member to get the stuck ideas out on paper and get inspiration from others. The round was split into two sections, with space for feedback and inspiration. Also a styleboard was created to describe the experience the group wanted to achieve inside the product(Ill.88) (see all sketches in appendix 19).

RESULT

The sketching round opened up for a path of working with a circular shape for enclosing the person inside, with possibility of adjusting the laying position with different types of pillows or changing the physical form.
The opening/closing of the product would be a part of enhancing a softer transformation with either an enclosing movement or closing functionality (Ill. 89 and Ill.90).

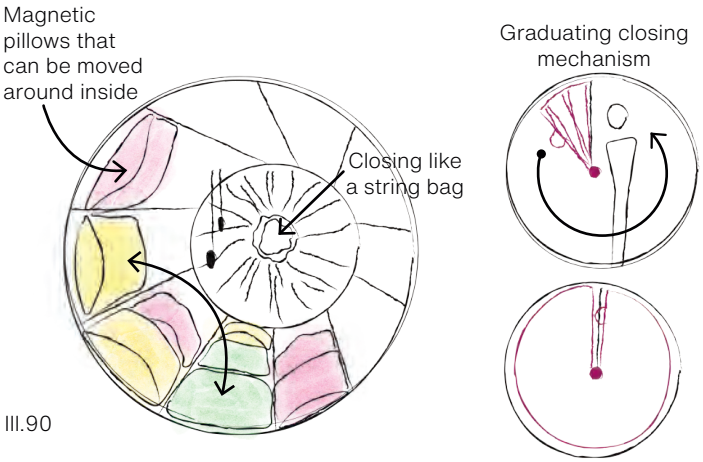
The outside look of the product would be interchangeable in some way to customize to different working contexts and future trends. However, was direction for the outside shape still missing at this point.



Ill.89

A circular concept, where it is extend-able, divided into modules, where its outer appearance is changeable (one with plants, slats, fabric etc.) Here the closing mechanism is inspired from a string bag.

Ill.88



Ill.90

A round shaped cave, where you can lay inside. The pillows are magnetic and can be moved around for the perfect comfort. Two suggestions for closing off: a string bag mechanism or a graduation slider system following the outer shape.

! A direction for the outside shape was still missing.
! The group wanted to create an experience of a “cave“ and laying in a window ledge “feeling“ inside the product. Where the outside must be interchangeable so the company can customize it.

Conceptualization

Second round - outer appearance

At this point, the concept was just separate pieces and not a full concept. The core of the concept was missing. The group members ideated on the outer aesthetics and function of the concept, based on the below styleboard; Describing the wished aesthetic for the outside of the product(Ill. 91).
The question that needed to be answered:
What is the outside of the product and how does it co-relate with the circle and core of the product? (Page 41)

Ill.91

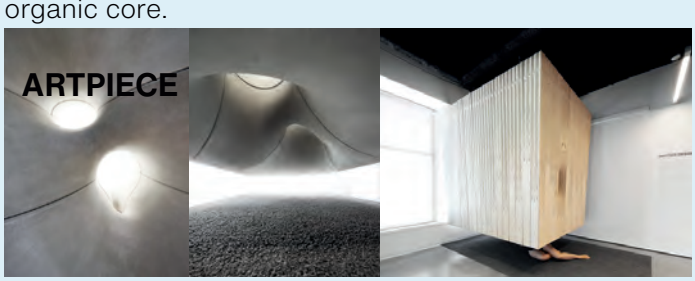
Ill.92

RESULT
The drawing session was very locked by the circular shape of the inside, as many of the ideas resulted in a very heavy cylinder with some light legs or structural bottom; looking like a sauna or horizontal barrel(Ill. 92). At the same time, it lost its outer professional value and instead had a more funny, spacey and outdoor value(all sketches can be seen in appendix 20).

Therefore the group changed their approach instead of focusing on a locked inner-circular shape, they took basis in the outer look and how to create a 100% simple look.

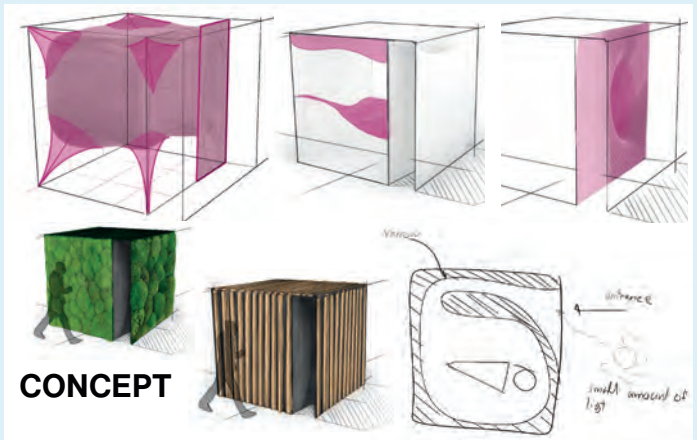
New concept idea

The result of the new focus was a whole new concept idea inspired by an artpiece with a wooden box and an organic core.



Ill.93

The concept is a simple square form from the outside, where the entrance has a graduating shape. While you go into the product it will narrow down, reaching a point where you can sit down and take your shoes off and from there, crawl into the laying space. The inside has an organic form language; a kind of sock that is stretched and fasten in the outer construction to create an organic form. The concept is a kind of art-piece and an experience, as you get a surprise when entering it(Ill.93).



Ill.94

Conclusion

The first part of the activity did not provide much outcome as it locked the creativity and innovation. Hereafter opening up the solution space and killing the darling of the circle helped to see other solutions. The next step was to investigate this concept with 3D drawings and with physical models to determine the dimensions contra the experience of the room.

Prototyping

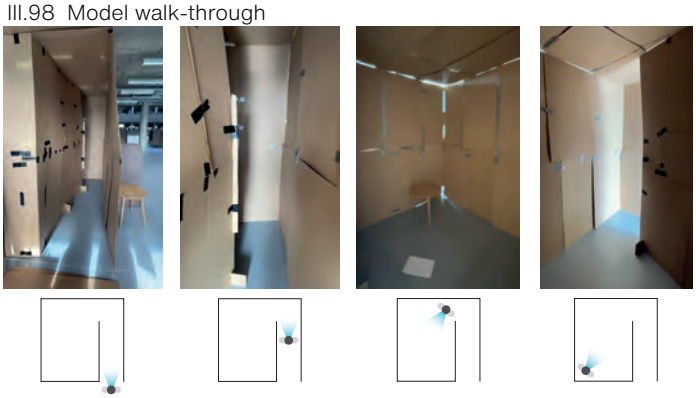
After finding a concept idea, the group needed to investigate the dimensions in full scale, by prototyping low-fi models in cardboard (Martin & Hanington, 2012, p. 137). The intention was to understand the 3-dimensional experience of the solution. How big is the product and can it be made smaller? Also how much space does it take in a room?

Ill.95

Ill.96

Ill.97

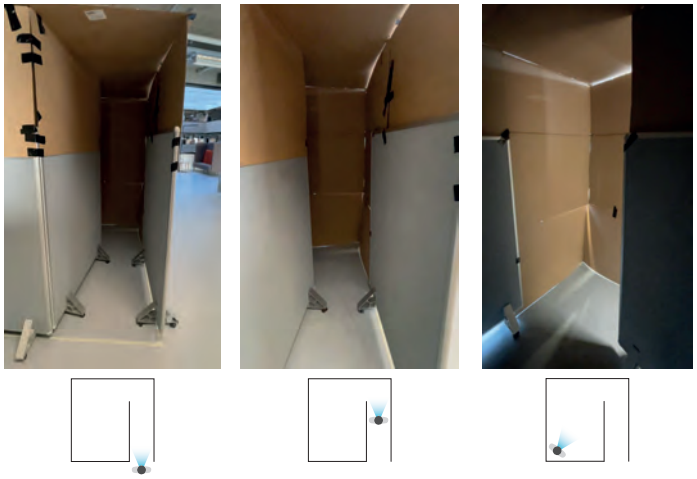
Ill.98 Model walk-through



MODEL NO. 1 (SCALE 1:1)

Firstly, the group built the biggest possible size =
W: 2,8 m x L: 2,8 m x H: 2,4 m (Ill.95, 96, 97, 98)
According to the defined fire restrictions (Appendix 17) The prototype was build only with big pieces of cardboard and duck tape, with stabilization from sofas.
While building the first model, it quickly became obvious that the proportions where off. The group needed to build something smaller, as these dimensions would not fit inside a normal office.

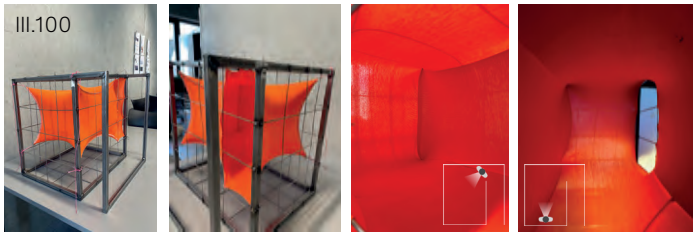
Ill.99 Model walk-through



MODEL NO. 2 (SCALE 1:1)

After discarding the first model, a new cardboard model, with stabilization from pin-up boards, was build in a smaller scale than the first one =
W: 2,1 m x L: 2,1 m x H: 2,2 m (0,6m entrance)
(Ill.97 and Ill.99)
Here the dimensions where more suitable for the concept. Another thing was temperature; it quickly became really hot inside the cardboard model, and the group members could only bear to be inside for 5 minutes at a time. Confirming that an air-cleansing system was needed for keeping a comfortable environment inside of the solution.

Ill.100



MODEL NO. 3 (SCALE 1:5)

Upon prototyping the outer dimensions in 1:1, the same needed to be done for the inside of the product. To test the “sock” principle (mentioned on page 42), a 1:5 model was build (Ill.100) based on the outer dimensions of model no. 2. A sock, sown out of stretchy jersey fabric, was mounted to a metal construction with wires and cords. It was hard to control the shaping of the inner room with the “sock”. Also with this mounting method it was hard to fully utilize the space within the construction, resulting in a lot of wasted space. The model did not provide with any answers on how the inside experience and comfort would be like. This needed to be considered with another approach.

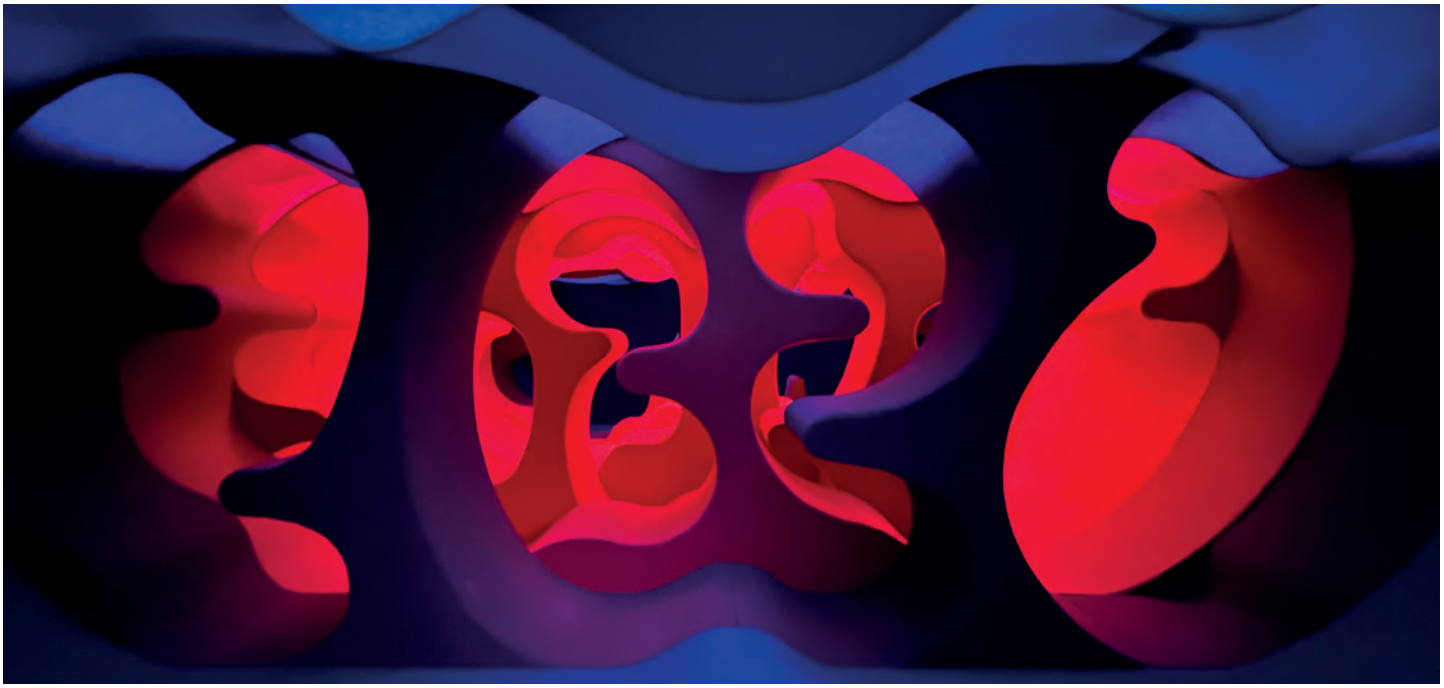
Conclusion

The next step was to consider how the concept should be constructed and how the outside appearance would relate to the inside. Retrospectively, the group should have challenged the scale even more, as the proportions of model no. 2 still was questionable in relation to fitting inside an office space.

Visiting the museum: Trapholt

Case study on Verner Panton

Ill.101



With the intention of experiencing Verner Panton's universe with organic shapes and color, the group visited Trapholt, a museum of modern art and design, located in Kolding. Here a whole exibition was made to present the colorful world of Verner Panton. The group wished in particular to experience Panton's work "Fantasy landscape" and trying his sofa "living tower" (Pictures from the trip can be seen in appendix 21).

The meaning of colors was not something the group had considered earlier in the process, but after the visit it was considered that it could be a way of strenghening the atmosphere inside the product.

Most of Verner Panton's projects and exhibitions had focus on creating social gathering spaces and how we interact socially. So the group needed to distance themselves from this, as they wanted the opposite - to be private and covered from your surroundings. Also the furniture and the exhibition invited for user movement and interaction, where the group wanted to invite for relaxing and laying down in one place.

Furthermore, the visit inspired the team to challenge the laying surface shape, as the many different curvatures and laying surfaces within the "Fantasy landscape" installation invited for different types of seating positions, which could be an advantage when defining the group's own laying surface within the product (Ill.102).

! The group needs to investigate the impact of color.

! The group should challenge the shape of the laying surface for inviting to specific types of seatings.

Ill.102

Design Brief 2.0

PROBLEM STATEMENT
How can a workplace take part in reducing sick days by offering a time-out/energizing place for migraineurs?

CONTEXT:
Large office spaces

TARGET GROUP:
Patients suffering with migraine
Attack duration: 15 min-2 hours

VALUE MISSION
The product must give a feeling of **surplus energy** and **well-being** for the migraineur while creating an **equal** environment with co-workers

INTERACTION VISION
The product must fit into a **professional** environment while being both **including** and **protective** for the migraineur

FUNCTIONALITY & FEATURES

	PAGE NO.	REFERENCE	UNIT
Must have adjustable light from 0 - 345 lumen	38-39	Light test	Lumen
The light source must not be visual for the user	38-39	Light test	Generic
The light must be warm (2200 Kelvin)	38-39	Light test	Kelvin
Noise inside the product must maximum be 35-40 dB	38-39	Noise test	dB
Must isolate from smell	12	Common migraine side-effect	Generic
Must be able to lay down	16-17	Helps to recover during an attack	Generic
The laying position must be adjustable for personalization	40	Ergonomics test	Generic
Must have a good indoor climate with air flow and ventilation	24	Helps to recover during an attack	°C
Must be a one person product	12	Isolation from other people	Generic
Must be integrated at the work place	22/25	Defining the context of the project	Generic
Must be installed away from the work stations	29-30	Relation to ideation and As-is scenario	Meters
Must invite for everyone to use it (not signal a 'migraine' product)	25/29	It cannot be sold as a migraine product	Generic
A transition is needed when entering and leaving the product	38-39	Light and noise test	Generic
The product must warn/aware the user when a fire occurs or other reasons for evacuation	37	Mutebox interview	Generic

AESTHETICS

	PAGE NO.	REFERENCE	UNIT
Must not signal that you are sick	20	Stigmatizing to be pointed out as the 'sick' person	Generic
Must provide a cool factor to the product	29	Avoid the signal of a nursing product	Generic
Must fit into working spaces aesthetically	22	The context of a professional environment	Generic

STAKEHOLDERS

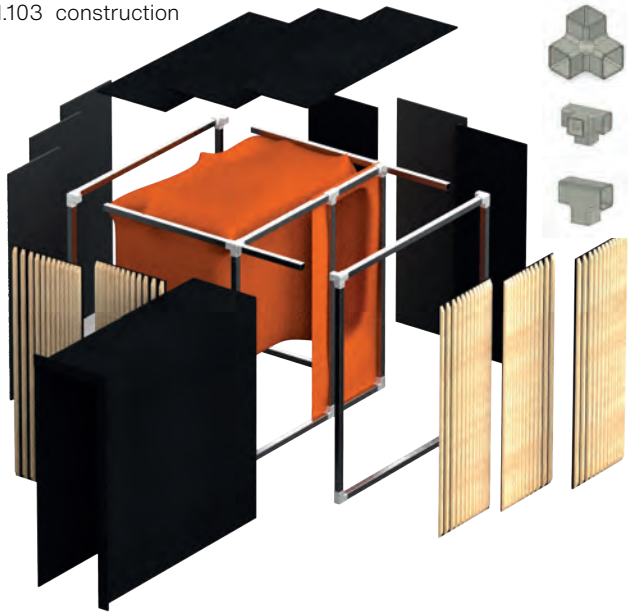
	PAGE NO.	REFERENCE	UNIT
The outer look must be changeable for adjusting to trends	37	Mutebox	Generic
Must maximum cover a ground area of 8 square meters (2,8 x 2,8 m)	37	Fire restrictions	Meters
Must enhance personal flexibility work style	37	Mutebox	Generic
Must tap into the Hybrid Working style	35-36	Visiting companies	Generic

The box concept

mind**SETTER**

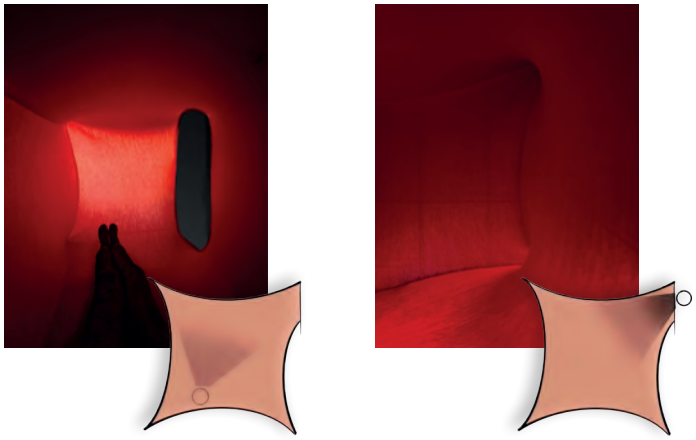
On the basis of previous conceptualization and prototyping, the concept 'mind**SETTER**' was developed. A concept that was intending to be a contrast to the ordinary. A box with an inside alternative universe. Between the prototyping phase on page 41 and the final concept presented at Milestone 2, several iterations were made, regarding construction and assembly details; This process is elaborated in appendix 22.

III.103 construction



III.106

III.104 Point of view insigt



III.105 In context

The concept had a distinctive look with its contradicting aesthetics; an organic and soft core versus structural exterior.

The concept was constructed with a squared frame functioning as the main frame of the whole concept. The frame was made of standard steel profiles and gatherings. Likewise, it was also the steel construction that distinguished the outside from the inside.

The steel construction was covered with changeable panels, for adjusting to future trends and giving the stakeholder the opportunity to custom the outer appearance with: plant walls, acoustics panels, slats etc. The panels were mounted with screws to the main frame.

With a long entrance between the entrance and the inside of the product it was possible to create a soft transitioning from the outside world to the core of the product. Inside you will meet a completely different universe. A soft, colourful fabric where floor, walls and ceiling is one thing. The fabric is fixed to a number of anchor points in the main frame to create an organic atmosphere and shape with an embracing feeling. Furthermore, the anchor points would stretch the fabric to an extent where it created a fixed laying area. The inside was very much inspired by the atmosphere from Verner Panton's Fantasy Landscape (Page 44).

Milestone 2

Feedback and reflection

REQUIREMENTS FOR MILESTONE 2:
The solution space is expected to be much narrower and the work to include more concrete demands and specifications for use, functionality, construction, manufacturing, etc. (semester description)

The initial thoughts for Milestone 2 was to develop a concept enhancing a contrast to the ordinary inside while accommodating the workplace and the need of a place to recover from migraine at work.

After the Milestone the group was frustrated and confused. They did not get the feedback on what they were hoping for, as the presentation lacked on information and a clear fly-in to the project. Therefore, it was hard for the group to reason if there was something wrong with the concept or if it just was a bad presentation (the presentation can be seen in appendix 23).
Some of the highlights from the feedback session were:

- Be careful on not to focus only on the organic inside (the cocoon). Do not get blinded by that it is a "cool solution" and trying to force it down on your project.
- Right now it express your medical condition – can it be used for something else than laying down with migraine? So you cannot point out the sick people, it is something everybody can use.

In the middle of the frustration, the group concluded to change mindset from thinking the product as a room to see it as a piece of furniture, forcing to the group to scale down. Here the group also considered changing direction; From focusing on migraineurs to creating a more general "time-out space". But the group was still in doubt if this was the right path to go. Therefore they also contacted their supervisor for a second opinion.

SUPERVISION

The group laid out their experience and thoughts about the Milestone and current concept. Here their supervisor could clearly see that the group was entangled in different problems. He recommended the group to zoom out for a second and see the whole picture as the group was seeing the current situation from a narrow perspective. Utilizing methods as the 'Product DNA model' (Haase & Laursen, 2018), as well as creating a user journey map and cognitive mapping (Martin & Hanington, 2012, p. 30+196), might open up for an understanding of the framing and the most important working principles of the concept.

THE NEXT STEP

- Re-framing and clarifying project
- Mapping the user journey in the current concept (MindSETTER) in order to analyse which parameters end needs are accommodated.
- Creating different cognitive maps to understand different user experiences and social interactions within the problem scenario.

IV.

CLARIFICATION.

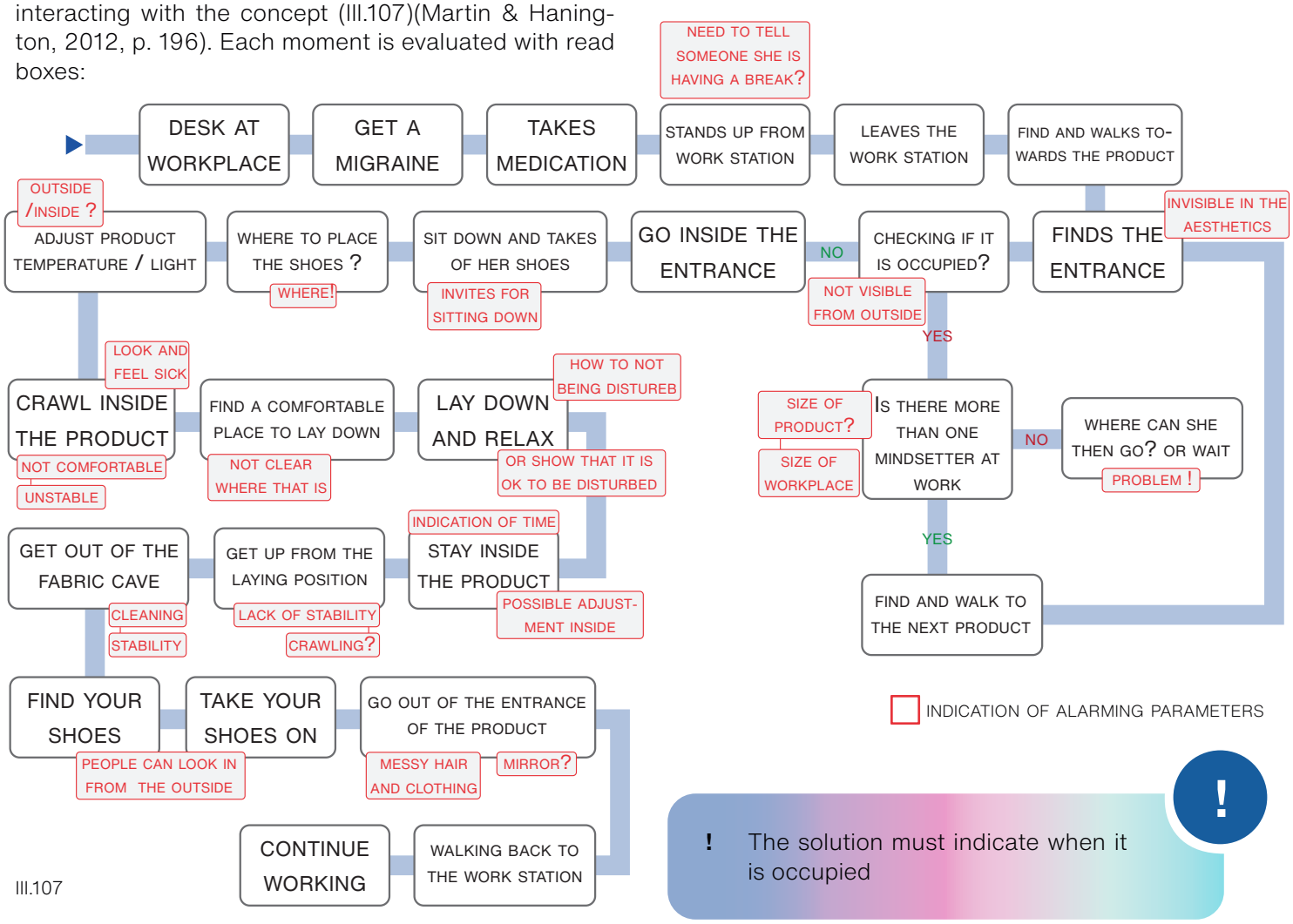
Chapter summary

This chapter introduces a realization of that the project was going in the wrong direction. Clarification was needed. The group had to zoom out by mapping previous understandings of the scope and revisit the Value vision.

Mapping mindSETTER

User journey map

In order to finding direction after being entangled in problems for moving forward in the process, a user journey map of the current concept MindSETTER (page 46) was conducted for visualising the experience a user has interacting with the concept (III.107)(Martin & Hanington, 2012, p. 196). Each moment is evaluated with read boxes:



III.107

Conclusion

After creating the user journey map of the concept 'mindSETTER', it became clear that the group only had focused on the inside experience; the scenario of laying down inside and not what happens before and after in the user interaction. Therefore, several crucial requirements had been ignored and forgotten in the concept(referring to Design Brief 2.0 p. 45), hereunder:

- Not looking and feeling sick while using the product. You need to crawl into the product. This is a problem as migraine is a invalidating disease where it might not be possible for them to get inside the product, while having an attack.
- It is not possible to see if it is occupied from the outside.
- If it is occupied, the workplace need to have more than one MindSETTER. Then there is a dilemma between the size of Mindsetter(2 m x 2 m) contra the size of the workplace.
- Getting out of MindSETTER was also the contrary to looking professional. The risk for wrinkled clothing and messy hair will be high when coming from a fabric cave.
- Adjustments of light and temperature was not at all considered. Nor was a cold environment - which wew the most important requirements from the users.
- Lastly, the shape and experience of the laying position inside would be critical, as it would be hard to anticipate if it would support the body in the right places with a stretchy construction.

The Product DNA model

Defining main user paradox frame

In order to approach 'wicked problems' a model of framing the product DNA was utilized (Haase & Laursen, 2018). the purpose 'product DNA model' is to make sense of all of the designer's insights and create a basis for a decision-making in the concept development. For reasoning of the project, the group will organize their insights, aspiration, and working principles by phrasing one-liners according to different aspects formulated as frames of the project (as product experience, expression, interaction, market position etc.).

III.108 The definition of a frame (Haase & Laursen, 2018, p. 5)

The outcome of the framing was metaphors explaining the reasoning for the aspired value, frame and working principle. This is summarized in the following model (III.109):

III.109

FOCUS ON THE USER - MIGRAINEURS

MAIN USER PARADOX FRAME

"Like bringing home to work"

INSIGHT	ASPIRATION	WORKING PRINCIPLES
Migraineurs would like to reduce their sick-days. However, they cannot stay at work, when they get an attack even though the attack can be over in an hour. Staying at work will only make it worce due to that the sorounding enhance the symptoms.	*To create a place where migrainers have time to recover from their attack, staying at work, and have less sick-days and uphold the workplace relationship.*	*A product that can cover from sound and light and create an enclosed comfortable place to lay down, be alone, and not disturbed without signaling they are sick.*

FOCUS ON THE CUSTOMER - EMPLOYEES IN GENERAL IN A WORKING OPEN OFFICE ENVIRONMENT

MAIN USER PARADOX FRAME

"Like bringing home to work"

INSIGHT	ASPIRATION	WORKING PRINCIPLES
Employees working at a open office workplace environement have no where to go when they need a quiet place to take a time-out.	*Create a place where you can relax, having privacy, to enhance productivity.*	*A product that can cover from sound and light and create an enclosed comfortable place to lay down, be alone, and adjust the level of privacy.*

MAIN USER PARADOX FRAME

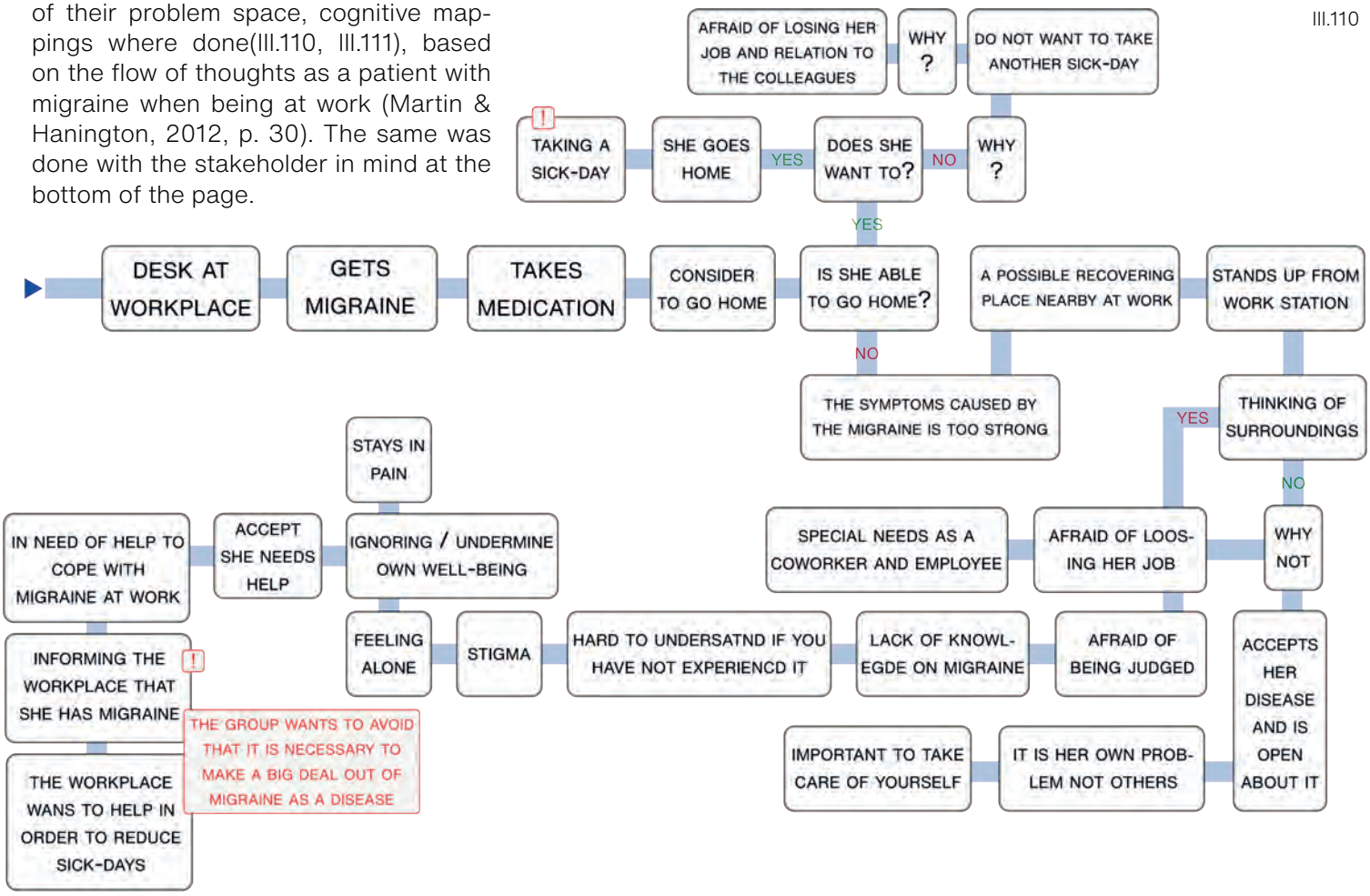
"Like bringing home to work"

EXPERIENCE FRAME	INTERACTION FRAME	EXPRESSION FRAME	MARKET FRAME
"Recovering like taking a nap. Relaxing like reading a book"	*"Own private bubble in a professional environment"*	*"Versatile comfort with discrete covering"*	*"A part of office inventory"*

COGNITIVE MAPPING: MIGRAINE AT WORK

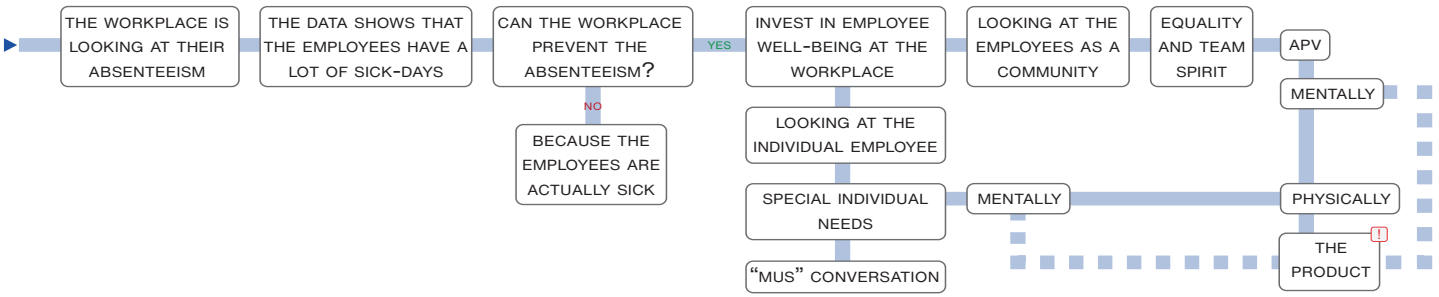
To visualize how the team make sense of their problem space, cognitive mappings where done(III.110, III.111), based on the flow of thoughts as a patient with migraine when being at work (Martin & Hanington, 2012, p. 30). The same was done with the stakeholder in mind at the bottom of the page.

III.110

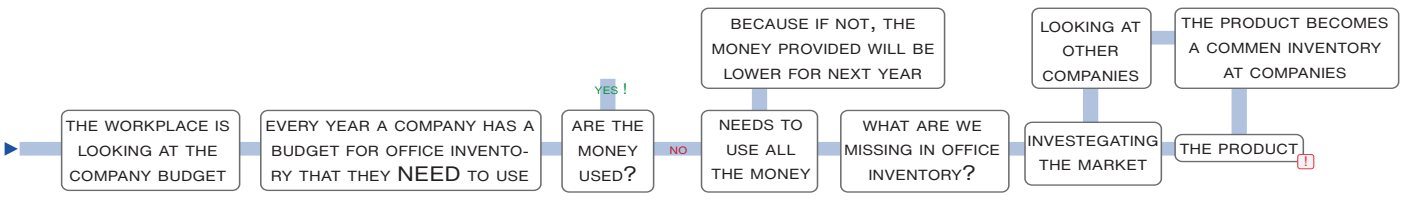


COGNITIVE MAPPING: STAKEHOLDER BASED ON SICK-DAYS

III.111

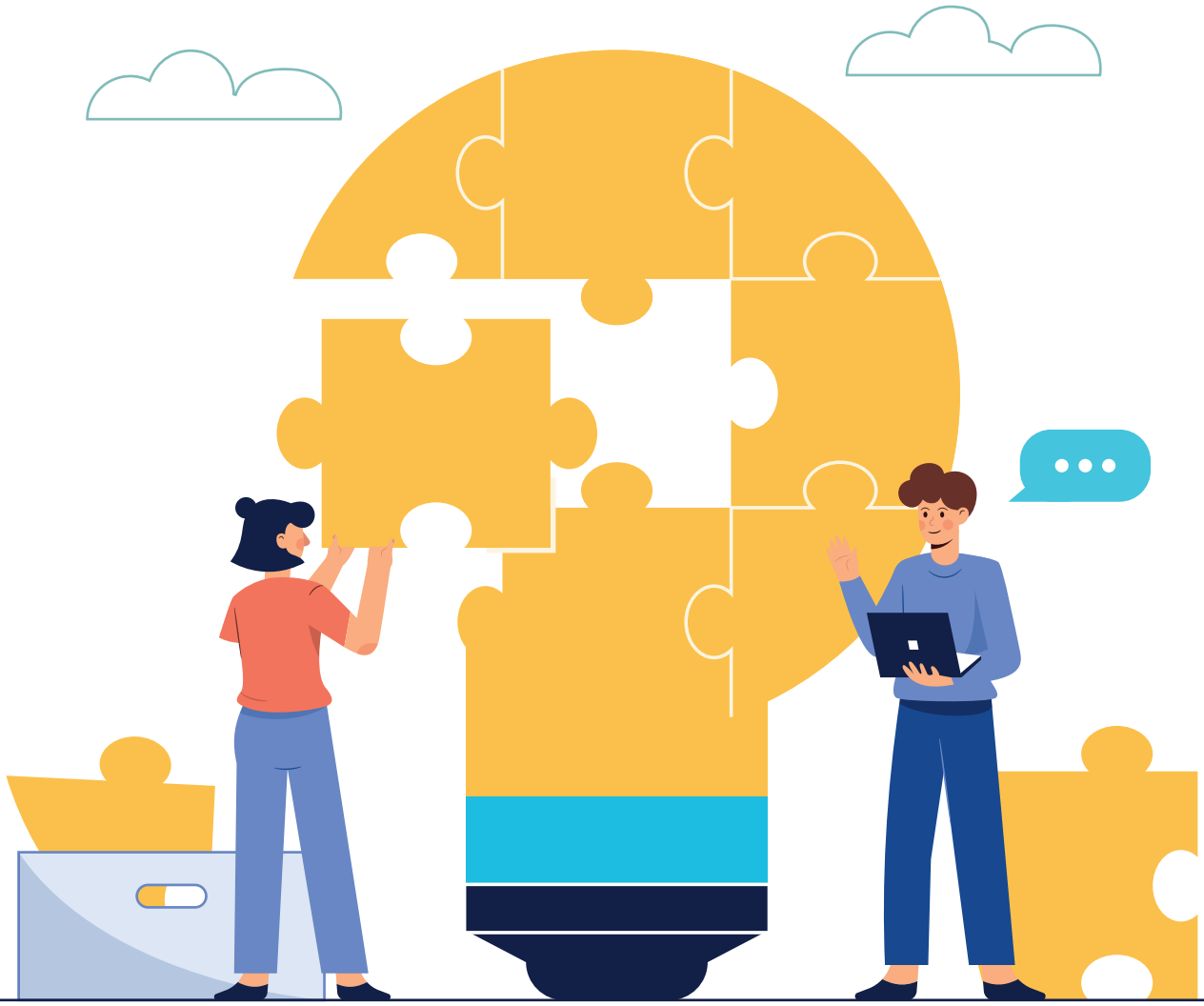


COGNITIVE MAPPING: STAKEHOLDER BASED ON BUDGET



Clarification

After analysing and evaluating the concept ‘mindSET-TER’, the group decided that they where headed in a wrong direction. The concept did not accommodate important requirements and the newly defined product DNA.
Creating a deeper cognitive mapping of “Migraine at work” than the first (p. 30), clarified the depth and the consideration behind the project. Also, how much the group actually knew at this point in the project. Therefore an update with the insight from the stakeholders was necessary. As it was not possible to have the scenario for migraineurs alone as the stakeholders also is important for understand the scenario, as they will be the ones buying the product for the office space.



III.112

Conclusion

After mapping out the user journey and cognitive mapping, it became clear that the group had great knowledge about the project at this point. The mapping of migraine at work revealed that in order for a migraineur to avoid all the dilemmas and thoughts described, that the solution for the product needs to be incorporated at their workplace as *a 'furniture for everyone to use'*. But at the same time, still fulfilling the requirements that a migraineur needs doing an attack. In coherence, the two mapping regarding the stakeholders showed that the company has an interest in reducing sick-days by optimizing the employees well-being at the workplace. Also, it is known that a company has an amount of money to spend every year to spend on office inventory, which invites for a possible market strategy potential.

From here the group needed to ideate again based on the defined product DNA(p. 50) and the cognitive mappings. Most importantly, the requirements from the design brief 2.0 (p.45) has to be priorities higher. A main focus for further conceptualization should be: cover from noise and light, cover from the surroundings, laying down and a clear occupation affordance.

Revisiting Value vision

The project's value mission and interaction vision had to be reconsidered (p. 27). However, the focus was still the atmosphere at work and how to create the best conditions for the patient with migraine when having an attack. The value mission remained the same, but new value words was incorporated in the interaction vision: *private* and *flexible*. New metaphors were made in order to clarify the understanding of the new words describing the interaction vision. Additionally, pictures were found to support the value words as a part of triangulation.

Ill.113

PRIVATE

As your own calender

The product must fit into a **professional** environment while being **private** and **flexible** in usage for recovering and taking a break.

INTERACTION VISION

Ill.114

FLEXIBLE

As a height adjustable desk

V.

CHANGING DIRECTION.

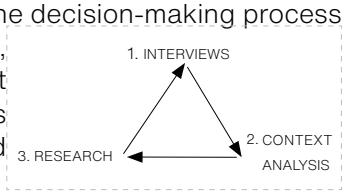
Chapter summary

This chapter introduces a change in direction where hybrid work creates the foundation of new conceptualization rounds also initiating multiple tests. However, the reader should be aware that yet another iteration on the concept proposal will create a minor change in direction, right before Milestone 3. As the group was struggeling with balancing function, aesthetics, and construction according to strict requirements and at the same time switching between solution- and problem spaces.

Hybrid work spaces

The future workplace

Previous interviews (Page 35-36) clarified a work-trend having a flexible working structure, which is identified as “hybrid work”. In further clarification of this the group used triangulation to qualify and verify the trend with the aim of gaining certainty in the decision-making process (Kongsholm & Frederiksen, 2019, p. 336-337). Context analysis and research was used to examine the trend further(Ill.115).



Ill.115

HYBRID WORK

DEFINITION:

“Hybrid work is a mix of working in the office and from other locations as well as the combination of working virtually and meeting physically.”

(Secher, 2022)

After Corona, many employers have seen the advantages in the hybrid work model, that offer a more flexible work life. With more time for immersion and less disturbances; the efficiency of the hybrid work style has changed the way of how the workplace and workday can be pieced together - a new way of structuring our work life. Therefore are the companies also forced to rethink and anticipate the work life of the future. The perception of the traditional open-plan office is getting outdated, where the arrangement of the office calls for innovation and transformation(Hansen, 2021).

But there are nuances in Hybrid Work that needs to be taken into considerations. Especially, in Denmark, the employees enjoy meeting physical at work, where the social relations and the innovative dynamic in-between colleagues are essential for high productivity and job satisfaction (Hansen, 2021)(Erichsen, 2021).

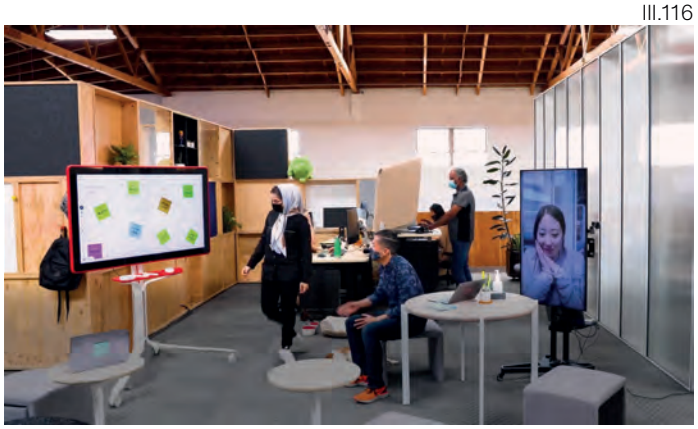
> *Immersion was a new feeling, that those who worked at home during the lock-down had. It amazed us. When employees can concentrate better at home, even if they have children who need to be home schooled, it calls for reflection. It must be because we have not arranged our workplaces optimally.*

- Jane Walbum, interior consultant, Kito & Co

Disturbances and noises are still a problem, which should be integrated when designing for the office of the future. One strategy Jane Walbum mentions is, to make the office zone- and activity based; Focusing on creating flexible and multi-functional rooms that meet the employees’ needs with function-defined zones, as quiet-, active- and meeting zones, inspired from Google’s reinvention of office spaces(Ill.116,117,118) (Lumholt, 2021)(Wakabayashi, 2021). »

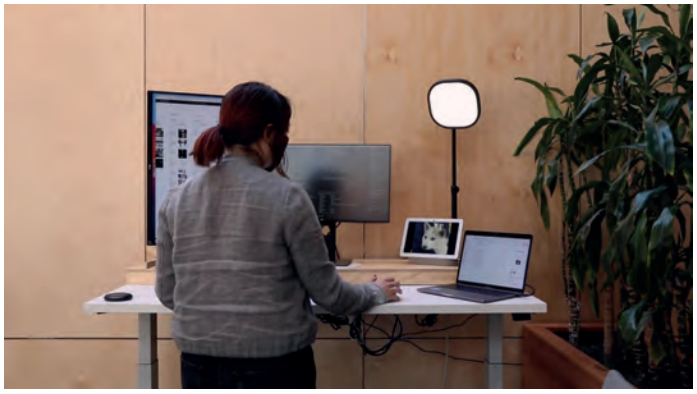
> *HK Stat [Danish labour union] conducted a survey among its members earlier this year, and here almost 50% answered that they feared disruption and noise nuisance; they were happy to be back in the office again, but very aware of the challenges it would entail to face physically at work.*
>
> (Hansen, 2021)

Ill.116



With a study of how “Generation Z” socialize and learn, Google tried to imagine what future workers would want. The answer seemed to be Ikea meets Lego. Instead of rows of desks, Google is designing “Team Pods.” Each pod is a blank canvas: Chairs, desks, whiteboards and storage units on casters that can be wheeled into various arrangements (Wakabayashi, 2021).

Ill.117



Google has built a prototype desk that adjusts to an employee’s personal preferences with a swipe of a work badge — a feature for workers who do not have assigned desks because they only drop into the office once in a while. It calibrates the height and tilt of the monitor, brings up family photos on a display, and even adjusts the nearby temperature (Wakabayashi, 2021).

Ill.118

Google has also developed a robot that looks like the innards of a computer on wheels and is equipped with sensors to detect its surroundings comes over to inflate a translucent, cellophane balloon wall when situations require more privacy (Wakabayashi, 2021).

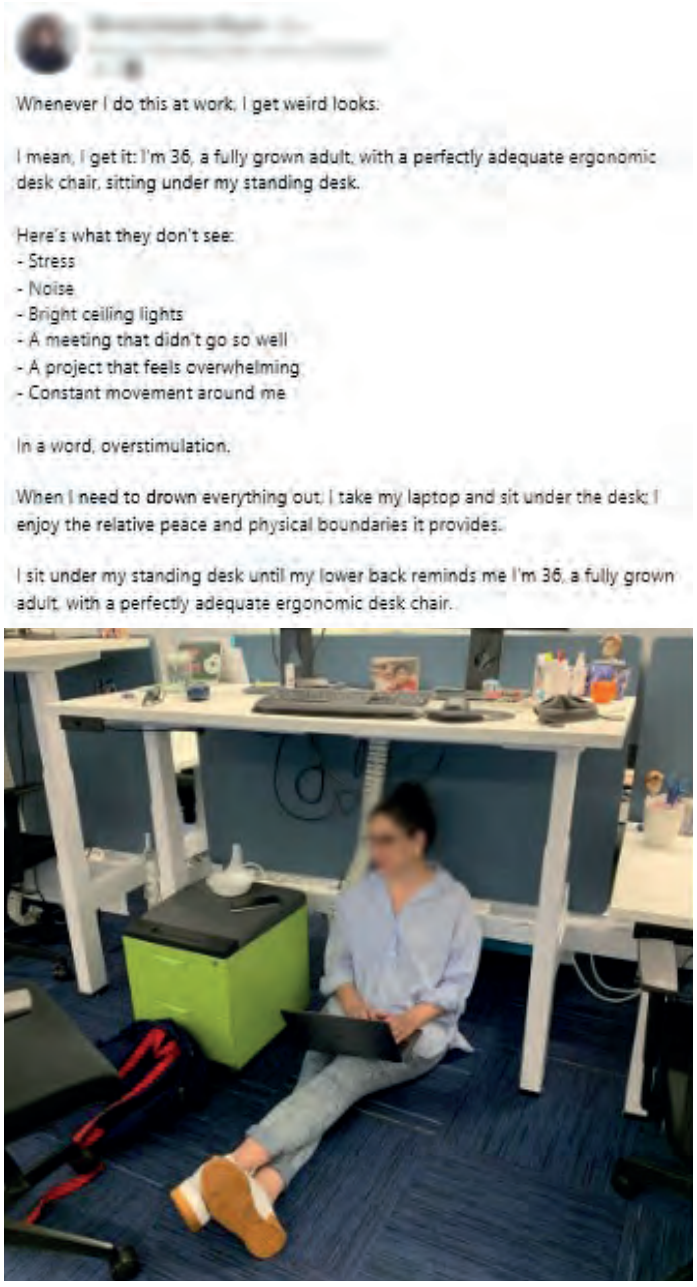
Hybrid work spaces

Continued

EVALUATION

It is clear that Hybrid work has come to stay, which calls for a radical change in how companies design their office spaces. Hereunder, avoiding noise nuisance and interruptions while meeting individual needs for maintaining the employee's sense of belonging to the workplace. Meanwhile during this research, a very relevant post was shared on Linked-in, where a woman wrote about the current dilemmas of working in an open office, tapping into some of the same dilemmas of having an migraine attack at work; overstimulation from surroundings and need for physical cover(III.119).

- ! It was confirmed that the hybrid work model is a trend, where companies have changed their work procedure to enhance a more flexible and individual work life.
- ! The traditional open-plan office is on its last legs, where the office needs to be re-designed with new strategies, as function-defined zones and interchangeable work pods.
- ! There is a need for new types of office inventory that meet this change in work style, the strategy Google is working on.
- ! The dilemmas of working in an open office tap into the same problems patients with migraine have = overstimulation.



III.119

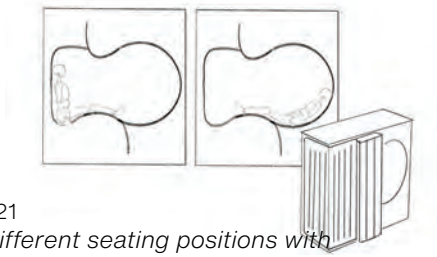
III.120

New concept development

Including evaluation

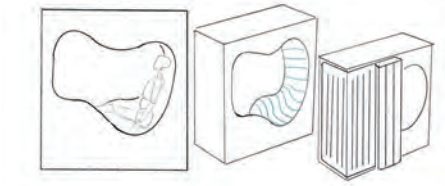
The intention for this concept development was to get closer to finding a new concept idea enhancing the change in direction from making “room” to instead creating a piece of furniture (p. 52-53). This was done with a time-boxed sketching round, where the the primary focus was to ideate on how comfort and enclosing could be integrated in a piece of furniture.

CONCEPT 1:



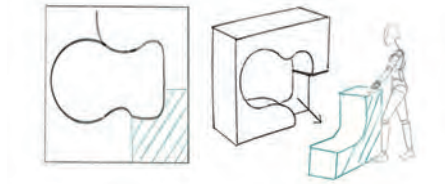
III.121 *2 different seating positions with foldable magnetic enclosing*

CONCEPT 2:



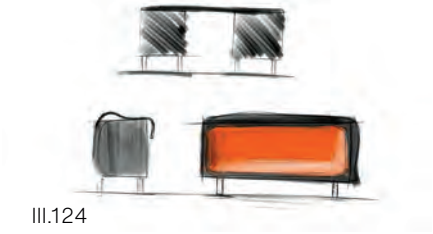
III.122 *Embracing and hugging feeling, same closing as no. 1*

CONCEPT 3:



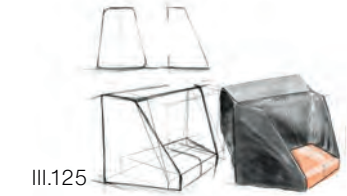
III.123 *Separating into new features*

CONCEPT 4:



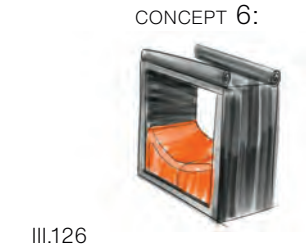
III.124 *The coffin, contrast from inner to outer*

CONCEPT 5:



III.125 *Inviting entrance by leaning it back.*

CONCEPT 6:

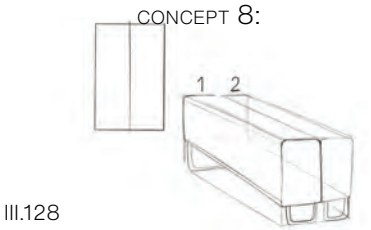


III.126 *Roll down from top to close off with curved mattress*

CONCEPT 7:

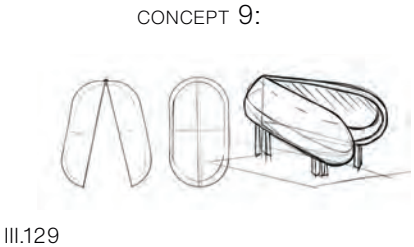
III.127 *The cabinet, simple open and close*

CONCEPT 8:



III.128 *Closing by using 2 of the same product*

CONCEPT 9:



III.129 *The sea shell, open and close with hinge.*

The ideation started close to all over after discarding the old concept and changing focus and framing. But after starting over, the low maturation of the ideas did not match with the highly specified requirements level. The goal was to avoid to make the same mistake that the group did in the last concept development, forgetting the requirements.

For evaluating the concepts the first intention was to rate their sufficient level compared 1:1 with the requirements list, as the approach in “Engineering Design” (Pahl et al., 1996, pp. 170-171). But owing to the fact that the concept drawings were not that specific and at this point not covered all requirements after changing the direction a parametric assessment was applied instead, formulated as “Evaluation criterias”. Ten criterias were created out from the requirements list (p. 31) and the product DNA framing (p. 50). »

EVALUATION CRITERIAS

1 LAYING DOWN
2 INTEGRATION OF LIGHT
3 COVERING FROM NOISE
4 SHOW IF OCCUPIED
5 PHYSICAL COVER FROM SURROUNDINGS
6 OFFICE AESTHETICS
7 INTEGRATION IN A WORKING SCENARIO
8 CALMING EFFECT(COLORS, SHAPE, MATERIAL, ETC.)
9 EASY CLEANING (LEVEL OF CLEANING: AS VACUUM CLEANING A COUCH)
10 NOT SIGNAL THAT YOU ARE SICK

EVALUATING PARAMETERS

“()” means: solves it half or to some point but not fully.

SELECTION	CRITERIA
(+)	YES
(-)	NO
(!)	CHECK REQUIREMENTS LIST
(?)	LACK OF INFORMATION

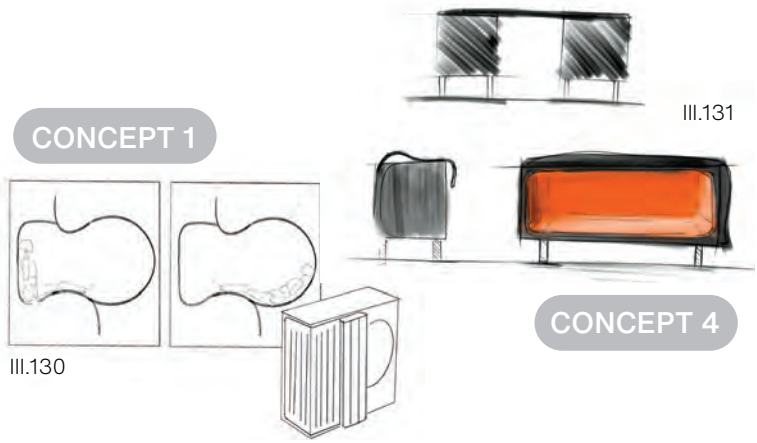
New concept development

Including evaluation - continued

Selection chart

	CRITERIA 1	CRITERIA 2	CRITERIA 3	CRITERIA 4	CRITERIA 5	CRITERIA 6	CRITERIA 7	CRITERIA 8	CRITERIA 9	CRITERIA 10	ALL +
CONCEPT 1	+	+	-	+	+	?	+	?	+	+	7
CONCEPT 2	+	+	-	+	+	?	-	?	(-)	+	5
CONCEPT 3	+	+	-	+	-	?	+	?	+	+	6
CONCEPT 4	-	+	+	(+)	+	+	-	(+)	+	-	7
CONCEPT 5	-	-	+	(+)	+	+	-	-	+	-	5
CONCEPT 6	+	+	+	(+)	+	-	-	-	(-)	-	5
CONCEPT 7	?	+	+	+	+	?	?	?	?	?	4
CONCEPT 8	-	+	-	-	-	?	-	?	?	-	1
CONCEPT 9	-	+	-	-	-	?	-	?	?	-	1

After evaluating the concepts in relation to the criterias, the two highest scoring concepts was taken aside in order to clarify the criterias that was evaluated as a "+". Here the group was focusing on mentioning the good design parameters for both concepts avoiding to get stuck in what the concepts did not fulfil - having in mind that these concepts only were the start of a longer ideation.



III.130 III.131

CONCEPT 1 - Explaining the "+" scores

The criteria for laying down is fulfilled because the user get the support needed accommodating the test result from the ergonomic test (p. 40). In terms of integrating light, the concept has possible room for implementation the required lighting. The concept is showing that it is occupied with the possibility to close on both sides. Additionally this also provide cover from the surroundings. The criteria of being integrated in an working environment is related to the possible sitting area where the user can bring work to the concept. For easy cleaning the concept is one unit with no narrow areas to reach. Lastly, the product is a tall furniture that the user can access with a professional posture(III.130).

CONCEPT 4 - Explaining the "+" scores

The criteria for integrating light seemed also possible for this concept. Covering from noise was considered as durable by the perception of the concept being acoustic it self with only one side that needs to be covered to close the concept. Likewise, the criteria for showing it is occupied would only require closing one side, which accommodated a faster transition in use. Alongside this also fulfilled the criteria for cover from surroundings. The concept was considered to be fitting in office aesthetics due to its simplicity and squared shape. In order to provide the user with a calming effect, the concept had an inside colour appealing to a warm core in contrast to the outsides colder color plate. Lastly, the shape of the concept and the simplicity appealed for an easy cleaning (III.131).

Conclusion

Concept 1 and 4 scored the highest (score from 6-9 out of 10 criterias).

By formulating evaluation criterias, it provided the team with a better understanding of what is important for the concept after all the research. In retrospect, what could have been done differently using this method was to give the *evaluating principles* a priority rating for a more precise results, meaning e.g. rating the *level* of easiness of cleaning or rating the solution for laying down. A rating system with levels from 1-3 could possibly have giving a more precise answer and rating of the concepts.

Summing up this concept round the following need further development and investigation:

- A closing mechanism within reach when laying down/sitting inside
- The closing mechanism must be an integrated and discrete solution
- Sitting/laying height
- Must not be a elongated box (has relation to a coffin or bed) - avoiding a claustrophobic feeling
- Colour contrast between the outside and inside
- S-curve laying position (as concept 1)
- When not in use: open and inviting // in use: closed and discrete.

Continuing conceptualization

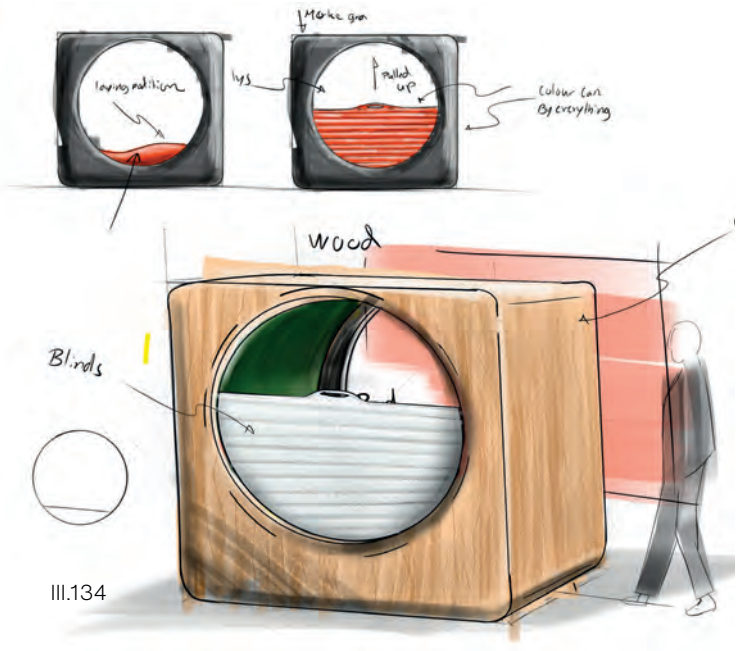
After the evaluation the conceptualizing continued. As mentioned earlier previous evaluation was focusing on good design principles integrated to accommodate the listed evaluation criteria. However, enclosing a furniture still seemed difficult for the group, to enhance as a design feature. Alongside, the overall aesthetics of the concept was challenging.

For enclosing a person inside the concept the initial thought was creating a closing mechanism integrated in the furniture. Here inspiration was found from old roll-front cabinets in an office(Ill.132). This mechanism would create a great way of enclosure without adding volume to the furniture. To look closer into how this could look like, a deeper research into this system was initiated, and Norman Copenhagen had a great reinterpretation on this system (Ill.133)(Normann Copenhagen, 2022).

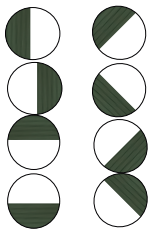
Ill.132

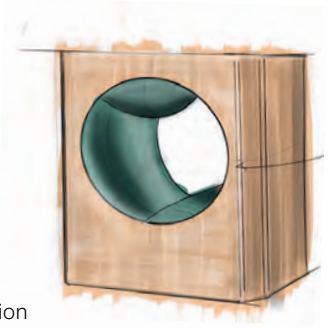
Ill.133

The research turned into principles sketches on how this could be integrated, while also simplifying the overall shape. The expression of the concept with the tambour mechanism was geometric on the outside with a organic inside core containing the laying area. The blinds was made from soundproofing materials.



Ill.134



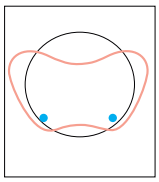


Ill.135 Blinds direction

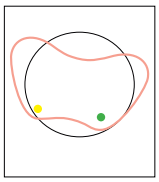
With the specific shape of the furniture in relation to its size, it was brought to the groups attention, that reaching the blinds from inside of the furniture depended on where the starting-point of the mechanism came from (Ill.135). Not all possible direction was accommodating an optimal user interaction.

SEATING POSITIONS

Until this point in the process, the laying shape has not been developed further since the ergonomic test (p. 40). To iterate on the laying area an idea of creating two different seating areas with one curve was proposed; making a place for both laying and sitting (with references to the visit at Trapholt p. 44). Addressing the concept to both people having a migraine attack, and others just wanting to use the product.



Ill.136



Ill.137

- SITTING (LEANED BACK)
- SITTING
- LAYING

First the curve was maintained symmetric, but this only created the same seating in both sides; slightly leaned back (Ill.136). Changing the curve by tilting it, created an optimal laying- and sitting position inviting for bringing a book or a computer inside the solution. (Ill.137). The dip in the shape in the top was incorporated to make a visual separations of the two seating positions.

Conclusion

Attention to the enclosure of the product helped to clarify where ideation needs to be conducted. The conceptualization indicated that testing was necessary to proceed with the concept. The newly front design with the circle needed to be tested in relation to the user scenario and seating positions. Material choice and exploration of the exterior aesthetics needed to be defined to come closer to a outer shape.

!

! Enclosure with minimal requirement for extra volume.
! Having both a laying- and sitting position.
! Contrast in outside and inside aesthetics.

?

? How is it to enter/leave a furniture with a circular front in correlating with the two seating positions.

Dimensioning and prototyping

Detailing on sitting/laying surface

After conceptualizing on the new direction, several principles needed to be tested and specified:

- Dimensioning the sitting and laying height
- Testing the entering and leaving scenario with a circular front (according to the concept idea on page 59)
- Dimensioning the depth of the seating
- Prototyping the first iteration of the seating curvature (referring to the seating positions on previous page)
-

The testing was made with active observation and participation, alongside with evaluation for improvements. Furthermore, simulation and acting out was necessary to gain valid results (Merit & Nielsen, 2006, p. 40-49).

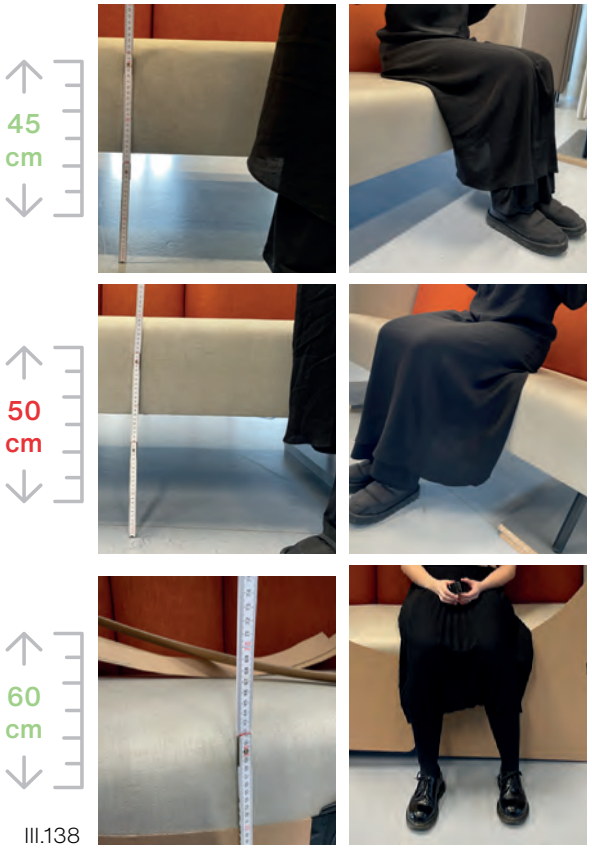
Test 01

Dimensioning the sitting and laying height

The purpose was to define the height of the sitting and laying positioning. This was done by comparing the height of existing office furniture and changing the height with big plates that could be placed under the furnitures.

The goal was to keep a professional posture and avoid a “bump” and the feeling of dropping when sitting down. Before the test a short desktop research on standard heights was conducted, this concluded that:
Sofas have a seating height of 43-46 cm.
Office chairs have a seating height of 45-60 cm

RESULT
The height of the sitting position was concluded to be in a scale of 58-63 cm over the ground. The dimension was defined within a scale, as this should be further tested with people in different heights. At this point it was only tested with persons within an average height scale: 170-180 cm.
Also, the lowest seating point in the laying position was concluded to be 45 cm above ground, with relation to a normal couch.



Ill.138

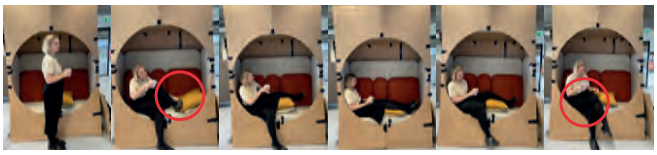
Test 02

Testing the circular front

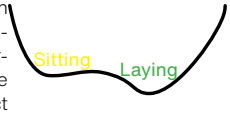
The purpose was to test the relation between the circular front and the curve of the laying position when you enter and leave the product, as a part of the user scenario. A circle was cut out of cardboard and mounted to a couch. The couch was placed in a 60 cm seating height, for testing the scenario for the maximum height, from previous test.

RESULT
Because of the seating/laying curve and the scenario for using the product with the inviting positions, the front circle does not make sense to incorporate as a feature. In order to keep a professional posture, while using the product, the product needs to be transparent to clearly show how the user can sit/lay in the product (And not hide it with a front).

Ill.139



There was placed a pile of pillows in the middle of the couch to simulate the high point of the curve of laying surface. When the group member entered the model, she needed to move the pillows to get in, because the circle was in the way for sitting in the left side. The same problem occured when leaving the product where the legs bump into the cardboard model of the circular front.



Ill.140

Another group member also tested the circular front with a smaller diameter and without the pillows. Here, he had to pull himself in and out of the position to get in/out at the middle of the circle; The only place where he would not collide with the edges of the front.

Test 03
Dimensioning the depth of the seating

Here the intention was to define the inner-depth of the product. The goal was to create a space with freedom to move hands and elbows inside the solution, in order to be able to close the product around the person inside, without feeling tight and claustrophobic.
Different dimensions of the depth was tested with both existing couched but also cardboard models.
Tested depths: 46,5 cm, 58 cm, 80 cm, 90 cm,

After building a 1:1 scaled model of the size, the width of it seemed too large for the purpose and had associations to a bed. Hereby, a chance in the with of the product need to be made.

RESULT
The depth was determined to be 70 cm. The dimensions was accommodating the goal and had a more furniture appeal. However, must it be verified with a new prototype.

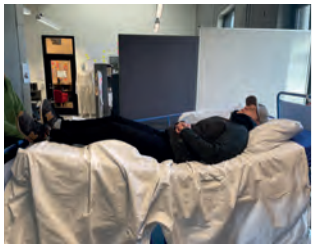
III.141


46,5 cm


58 cm


80 cm

III.142


90 cm bed

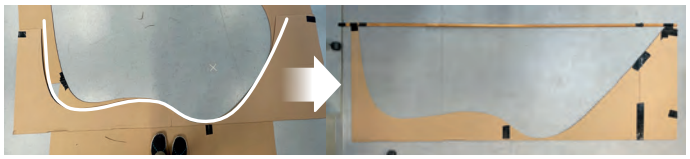

1:1 model D: 80 cm

46,5 and 58 cm seemed too small when enclosing the product on both sides. A depth of 80 cm was also tested, in order to make enough room. Also, it was important to not make the width 90 cm to avoid associations to a bed. The aim for the product was to strive for a furniture and not a bed.

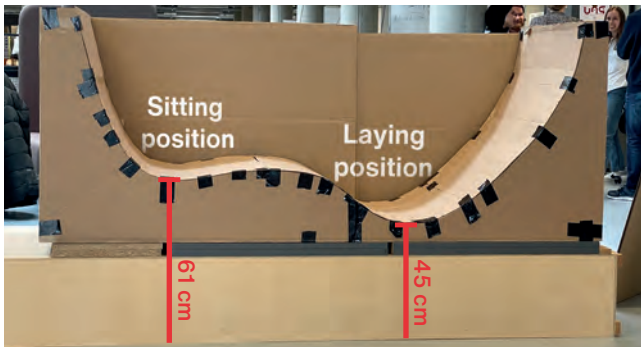
Test 04
1:1 Prototyping the curve of the seating

In the last test the curvature was simulated by sketching each others bodies in 1:1 on cardboard with the dimensions of the height in mind(test 01). This was done to have a first draft of the seating surface, that could resemble the two ways of using the product; the laying position and sitting position. This would only be the basis for future adjustment and detailing of the seating.
Requirements for the two positions were listed, based on the results from the prior ergonomics test (page 38) and what each position should invite for: respectively, “reading a book”/”sitting with a pc on the lap” sitting position and a relaxing, recovering laying position.

RESULT
In order to live up to the requirements for the seating surface, the curvature had to be changed a bit:



III.144



III.143

Sitting position requirements:
- the user has a straight posture.
- The bottom needs to make sure that the user will not glide.
- The back must support the neck and lower back.

Laying position requirements:
- Lift up the knees
- Support the bottom
- Make sure that the spine from the lower back and up to the neck is a straight line.
- The head needs to be leaned back in order for the user to relax the neck.

III.145


In the sitting position there were no support for the neck and head. The knee support needed to be extended to the right.


The neck support was very uncomfortable in the laying position and was not a natural extension of the spine.

CONCLUSION
After building the first prototype of the seating curvature, the next step was to build a more stable model, so a user test could be conducted in order to clarify if the user is comfortable in the two positions and fits with the user experience. Also, the enclosing needed to be tested in relation to the depth of the product and feeling claustrophobic.

- ! The seating/laying position needs to be visible in order for the user experience to be smooth and keep the professional value.
- ! The seating heights were determined to be: 45cm for laying and 58-63 cm for sitting.
- ! The depth was determined to be 70 cm.
- ! Must not give a claustrophobic feeling when fully closed

Defining requirements for aesthetics

Up until now the concepts that had been developed contained a lot of mass and the volume and scale of the furniture was quite big. An ideation on the concept, focusing only on having the seating (the S-curve from p.59-61) as a main parameter and a core functionality, had to be conducted in order to find the minimum scale of the solution space, as well as the sweet spot between mass and structure. Visualization on such is shown in illustration 146. By cutting of most of the body and mass, made the concept naturally more open and made the core exposed to the surroundings. This collided with requirement of enclosing the concept. In order for the group to maintain the focus on one thing at the time, by problem slicing, the state of mind was that the solution did not have to solve everything at ones. Instead detailing parts of the system, could help the group executing faster in the conceptualisation.

SKETCHING ROUND 1

Ill.146 DRAWINGS - STRUCTURE VS. MASS

MASS — STRUCTURE

SKETCHING FURTHER

After the first round, it was clear that it would be possible to design a lighter and more furniture-like product instead of keep working with mass.
The sketching round was a lecture in cutting away material to the essential. The group gained a new perspective on what the minimum requirement was, without losing its core functionality. However, the overall shape still needed to be further investigated. The group went on an inspiration tour in Bolia and Brdr. Sørensen in Aalborg (Appendix 24). Before starting the next round in the development, the group listed up the vision for the product's aesthetics. (Based on prior drawings):

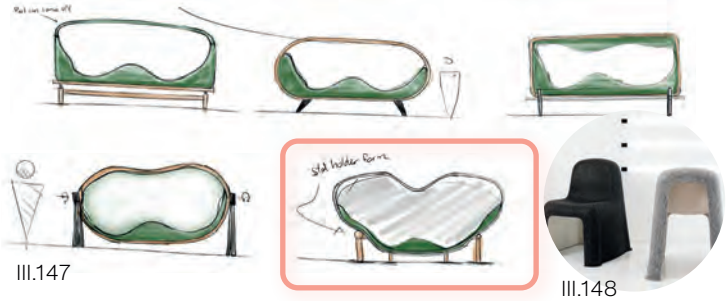
Vision for aesthetics

- A platform that lifts the seating to the right height
- Mass in the bottom - for looking stable
- Light in the top/roof
- An organic top dividing the two seating
- 90% enclosed
- Express that it is stationary
- Organic body with structural frame.

!

- Every part reflects its functions - Honesty
- Closed and anonymous outer look

SKETCHING ROUND 2



Ill.147

Ill.148

This drawing round(Ill.147) was more efficient, as the group had some specific parameters to sketch from. But it also made it harder to make innovative and more creative ideas. One idea was based on a production method that was used for the HAY Nobody chair; Thermo press polymer fibre (PET felt mat)(Ill.148). In the concept the outer-shell would be pressed on one or maybe two-four minor pieces/shells, and the seating space will be created with a secondary part; pillows or something close to that. A frame would lift the shell from the ground and embrace it, like the experience of laying inside the product. intending that the construction would be honest and each part would have their own purpose. The shape of the shell and frame needed to be investigated further.

Conclusion

The two sketching rounds opened up a new path for the group, where production, function and form melted together in one with the concept, after defining a vision for the aesthetics of the solution.

?

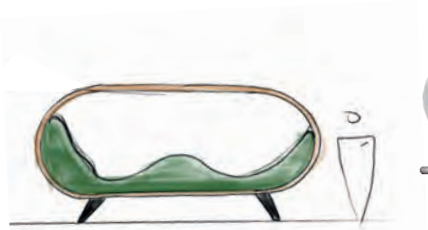
? Is there limitations for the aesthetics of the shell in relation to production?
? Can the material and shape of the shell contribute to the noise isolation of the product.
? Can the frame become a part of the value of "hugging" and embracing the private-ness and comfort of the product?

Shape of body

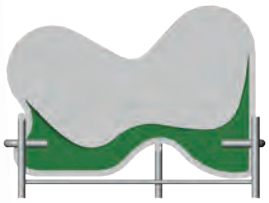
Workshop

Prior to this activity, the group found inspiration on what other types of furniture that has been manufactured with this production method (Appendix 25). Also there were some minor requirements to the body: The concept must be inviting in its shape, enclosing, and enhancing the laying position.

It was decided to go with the concept, where a shell, being the body, is enclosing the laying and sitting position lifted up by a frame (Ill.149). This choice discarded the very voluminous and big scale product. The focus was now to create an honest product where form, function and construction went hand-in-hand, where every part had its own function.



Ill.149



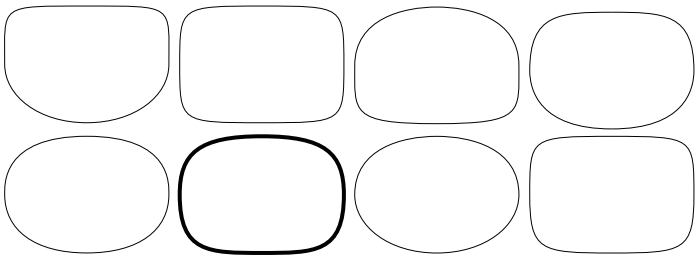
Ill.150

The above concept (Ill.150) was presented before this section. Here it was evaluated that the shape of the shell was too noisy and dominating, when the curvature of the seting position was significant in its shape as well. Separating the two different seating areas with the organic top was considered as being unnecessary in retrospect of that the product was a one-person-product. The parameter of defining the two different areas would not be integrated in the shell as in illustration 149.

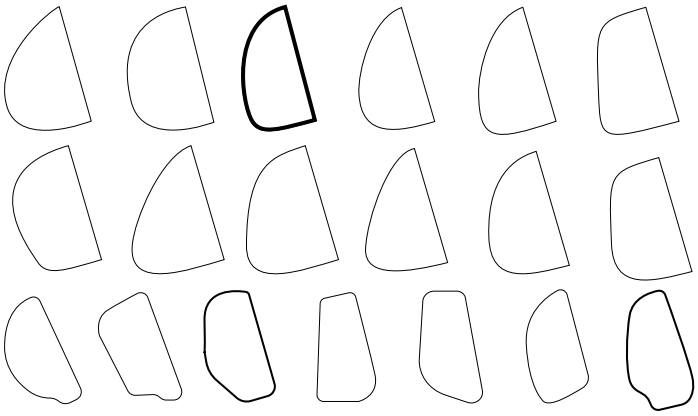
CREATING THE SHAPE OF THE SHELL

A drawing session on the shape of the shell in the new concept was conducted. The purpose was to ideate only on the shape of the shell. To answer the questions: Should the shell be geometric or organic and is there limitations for the aesthetics in relation to production?

The procedure for developing the shape was creating a lot of different shapes both from the side (Ill.152) and from the front(Ill.153) in order for the group to determine a shape as a starting point. Beforehand, the group researched on existing products for inspiration(appendix 26). From the front view drawings it was conclude that it should be as simple as possible, for not taking the user's attention away from the laying position. The side view drawings was harder to determine the shape. However, a slightly tilted shape with a lighter top than bottom was preferred to accommodate the usage. Additionally, it was important to cut everything creating extra volume, away from the concept.

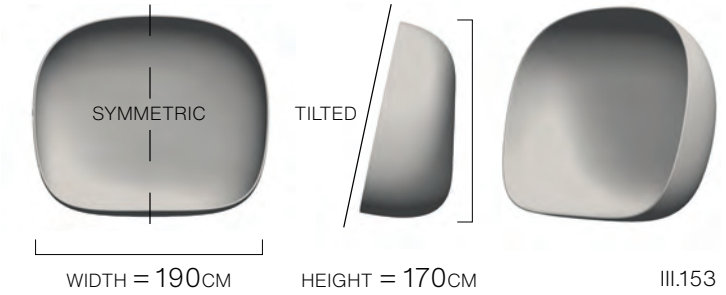


Ill.151 FRONT VIEW



Ill.152 SIDE VIEW

The chosen shapes for further conceptualization is marked in illustration 151 and 152. It was hard to come further with the shape in 2D, so the ideation moved over in 3D. The shape that was modelled was symmetric around the y-axis (from the front). A slightly difference in the curvature of the top ans bottom. The bottom intents to seem more voluminous than the top - to enhance that it is a grounded furniture. The shape is slightly tilted (seen from the side), to create an inviting opening and to minimize the volume in the top. (Ill.153).



Ill.153

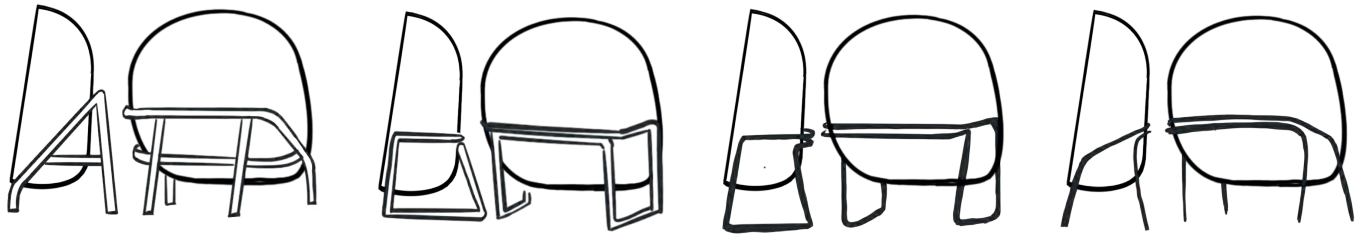
Conclusion

A suggestion for the shape of the shell was found during the ideation round. Dimensions of the shell was set to 170cm high and 190cm in width, only based on aesthetics. For further investigation a correlations between the shape of the shell and the frame holding it must be clarified. The production method of thermo moulding needed to be investigated concerning the shape and scale of the concept, to find out if it is possible to produce the shell in one part.

Ideation on frame

How does it relate to the shell

In order to progress on the aesthetics of the furniture, after determine the shape of the shell, the frame needed to be designed. The initial thoughts was to create a simple structure creating a frame that was visually 'squeezing' and 'lifting' the shell - Inspired from existing furniture(Ill.154). This was something the group found very inspiring and honest. The frame and shell had to look like it was moulded, intersecting each other, for them to fit together (appendix 27).



(1) (2) (3)

Ill.154 FRAME STRUCTURES

EVALUATION

Evaluating the sketching progress, it was clear that the frame quickly became too much, because the approach was highly influenced by creating something realistic in relation to the volume and the weight of a big furniture. Hence, the first iterations **(1)** of the frame had too much going on.

To accommodate the feature of intersecting the frame together with the shell, as well as with a view of simplicity - new concepts was created. **(2)**

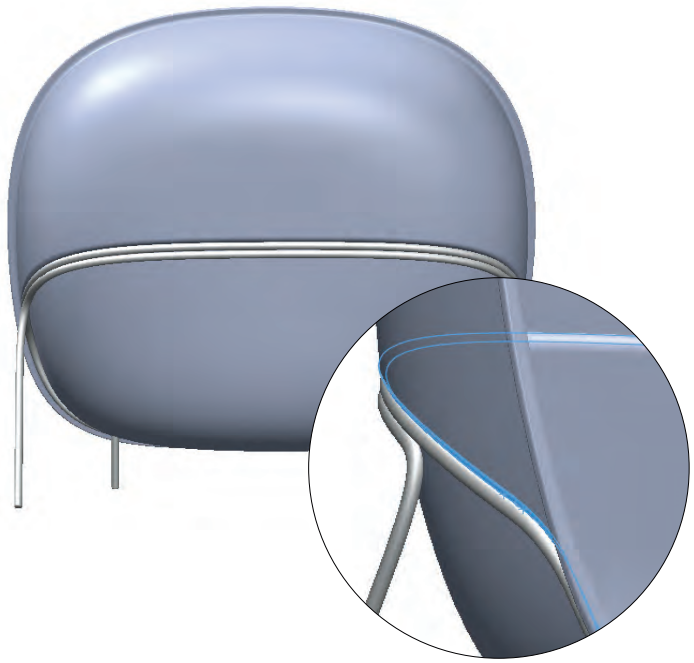
The frame for the shell was chosen to be a frame that encircled the shell and had a backframe holding this with a slightly angle to create visual stability. **(3)** Enhancing simplicity, the frame had four legs securing stability.

Conclusion

The frame for the shell had the purpose of creating stability for the product and raise it from the ground. Creating a frame intersecting with the shell was made to give stability only where it was needed without being to dominant in the overall aesthetics.

After moulding the shell and intersecting the frame to it in 3D, it was brought to groups attention that when using the production method of thermoforming imprints of every outer design would appear inside the shell as well.

? How can the shell be enclosed?
? Will the imprint of the frame in the shell interfere with the seating area?
? Can the frame withstand the weight of the shell and a human?



Ill.155 Modelled in 3D in order to visualize the intersection between the shell and the frame.

Ideation on enclosing

How to close the product

An ideation of the enclosure of the product was conducted, though a desktop research. In retrospect the enclosure of the product should have been in focus earlier in the process, as the group was aware of that the product needed to be closed somehow in order to meet the requirements. However, it seemed difficult to clarify the design parameter for enclosing a furniture without having a furniture to close. At this point, a shell and a frame had been specified. Hence, the ideation of the closing mechanism could be investigated. For proceeding, a list of possible closing-options was made followed by an evaluation on these according to their functionality and requirements of the product.

REQUIREMENTS FOR ENCLOSING

- Must be within reach from both seating positions
- Must be closable from both positions.
- Must be able to cover from light
- Must be able to function as an noise absorbing shield
- Discreet closing (not noisy)

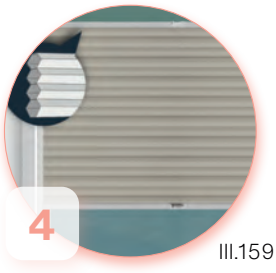
POSSIBLE CLOSING-OPTIONS

1. DOORS (Ill.156)
2. BLINDS (IN A ROLL) (Ill.157)
3. CURTAIN (HANGING) (Ill.158)
4. PLISSÉ BLINDS (SLIDING)(Ill.159)
5. SHELL (Ill.160)
6. HIDDEN SHAPE (Ill.161)
7. ZIP (Ill.162)
8. TILTING(Ill.163)

Ill.156

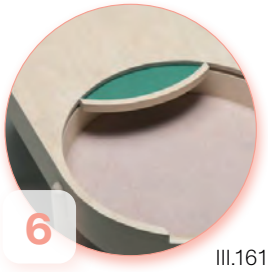
Ill.157

Ill.158



Ill.159

Ill.160



Ill.161

Ill.162

Ill.163

EVALUATION OF THE CLOSING-OPTIONS

1: Simple and straight forward. Visually a lot of mass to be moved which takes up a lot of space when open. Questioning how to close the door when being inside the product. Not a discreet closure. Creates visual disturbance.

2: Where is it when the product is open? In terms of installation, it is advantageous to utilize gravity and let the curtain come from above. Graduating closure.

3: Simple and straight forward. No concrete point of interaction. Possible unwanted movement. Graduating closure but dramatic opening (like theatre performance)

4: Adjustable and graduating closure in different directions. Less discreet (too many options?). Where is it placed when not closed?

5: A lot of volume. An overkill solution(But cool).

6: Like a sliding door but where does it come from? Where is it placed when not closed?

7: Noisy. Interfering with a quick interaction if needed, could result in stress when going out. Appealing to a sleeping bag or camping tent.

8: Association to a spaceship. Voluminous opening. Interfering with the honesty of the product.

Conclusion

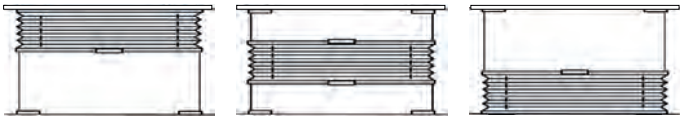
Throughout the evaluation it was clear that not every mechanism adapted to the listed requirements. A simple solution was preferred to enclose the product. Hereby, a combination of number 3 (curtains (Ill.158) and number 4 (the sliding blinds (Ill.159) was chosen to be fitting to the user scenario of the product, especially because of their adjustability. The requirements for enclosing had to be re-examined with a test, to verify the mechanism for closing in relation to the user scenario.

Smart pleated blinds

Motion blinds

For the closure of the concept it was chosen to incorporate pleated blinds to accommodate the result and evaluation on the previous page.
Pleated blinds are beneficial because they have sound-absorbing properties. An integrated double weave that creates air space in the curtain effectively absorbs the sound in a room where acoustics is important. Thus, this is an advantage according to the context of a working office with a high noise level. Also, the blinds is available in a multitude of materials, colors and densities and can be made in all sizes.

Ill.164



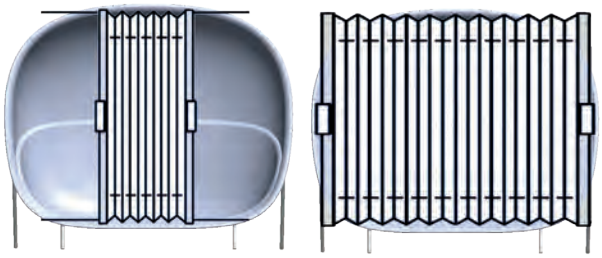
This type of blinds allowed the group to assign the closure adjustability. Top Down / Bottom Up. A flexible solution that allows the closure to be placed differently. Which was the goal for meeting the user need for personalization. Illustration 164 indicated the flexibility, however, this is illustrated with a window as an example (Botex, 2022).

CLOSURE ON YOUR TERMS

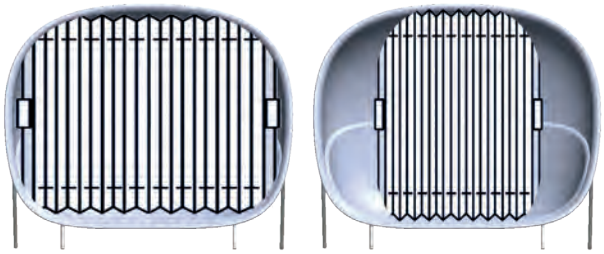
There are both manual blinds and electric blinds. Here it was concluded that electric blinds would be advantageous and meet the user scenario, where the user's reaching range did not become a limitation for the closure. Motion blinds have a flexible operating options that can give the user freedom to adjust the degree of shielding. The blinds would be installed wireless with the opportunity to recharge once or twice a year (Corcoran Window Furnishings Ltd. , 2020).

Ill.165

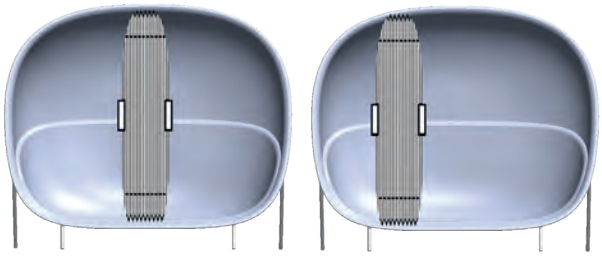
To ideate on the blinds the horizontal solution was challenged and flipped to be a vertical mechanism, in order to create full closure (Ill.166). However, a problem occurred with the squared shape of the blinds. In order for full closure, the blinds need to be cut in a shape(Ill.167), which would not be possible because of the electric mechanism. Additionally, The placement of the blinds when not closed (Ill.168) was interfering with the user scenario when entering the product as the test result on page 60-61. To avoid this, the group decided to flip the blinds back to being horizontal. The blinds would not be a problem being in the top of the concept when folded up.



Ill.166



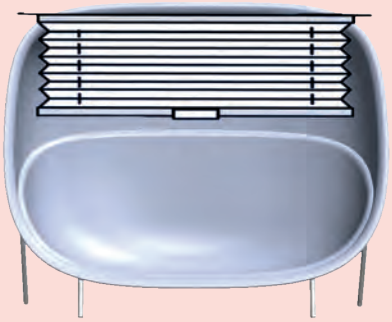
Ill.167



Ill.168

Conclusion

Motion pleated blinds was concluded to be a simple and honest solution that would help the user to close the concept on own terms deciding how much privacy that was needed (Ill.169).



Ill.169

! A remote is needed to control the blinds. This could also be the solution for adjusting the light inside the solution.

? Should the shell be symmetric around both x- and y- axis regarding installation and maximum enclosure?
? How much closure is required?

Experiments with new prototype

User experience

Since building the first prototype of the seating surface, the team built a new, stronger prototype with the adjustments from the first experiments (Page 61). The new curvature was modulated in 3D and then sliced into 2D build planes(using Slicer for Fusion 360), that could be laser-cut in cardboard. This was a cheap and easy method to obtain a precise and stable model.

Once the new model was assembled and done, user experiments could be conducted through simulation and action out (Merit & Nielsen, 2006). The purpose was to fully define the dimensions, shape of the seating and verify the enclosing type.

The activity consisted of:

1. Testing the user scenario
   - The user journey
   - The height of the roof
   - The depth and sitting height
   - Type of enclosing
2. Adjusting the laying position to the new data

All details on the tests can be read in appendix 28.

BEFORE THE EXPERIMENTS

Firstly, the group built a roof over the new prototype. The roof was attempted to look similar to the shape of the shell from the current 3D model(Ill.170).

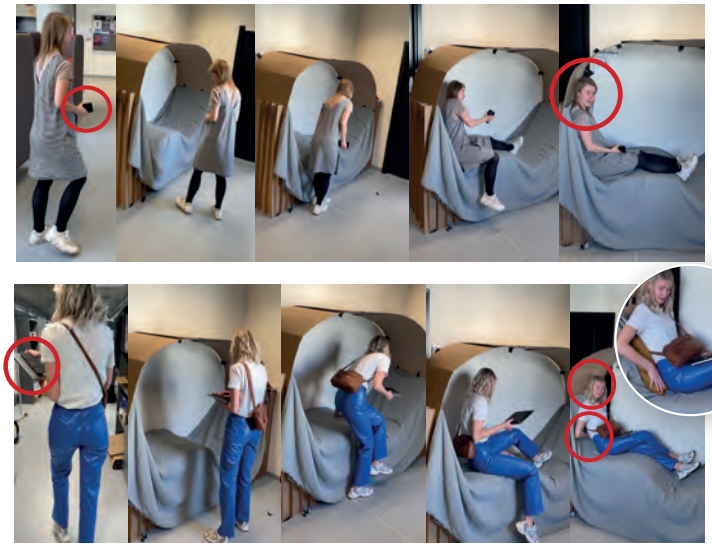
Ill.170

1 - TESTING USER SCENARIO

The test was done by asking random persons at the university, if they wanted to take a break in the group's piece of furniture. This was important, as the group did not wanted to insinuate how they should lay in the product, wanting their natural response when approaching it. From the test-persons' work station they were filmed(-shadowing) walking towards the prototype to observe how they chose to sit/lay in the product. Hereafter they answered questions about their comfort and choice of laying positioning, as a part of an active observation and participation (Merit & Nielsen, 2006). Lastly, different types of enclosing were tested by holding sheets of cardboard against the opening of the prototype.

RESULTS

- All test-person could clearly read off the two different seating (Ill.171, Ill.172)
- The height of the roof was not a problem for any of the test-persons, when entering the prototype.
- In the sitting position the head would collide with the curve of the roof; The head would bend over with no support for the neck. It was measured that 23 cm was missing for having enough space. (Ill.170)
- No test-persons took their shoes off, but when asking them why, they answered that is had something to do with the materiality; if the fabric looked delicate, they would have taken their shoes off.
- The lower back was not supported in sitting position, where a pillow was needed(Ill.171). »



Ill.171 *Two persons chose the sitting position, as it suited well with sitting with their phone, IPad or laptop.*

Ill.172 *The last test-person walked towards the product with the intention of relaxing and immediately laid down the laying position.*

Experiments with new prototype

RESULTS CONTINUED

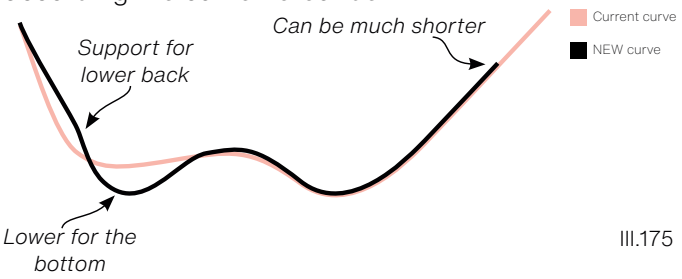
- The depth (70 cm) was suitable both for having freedom to move and fully close the model without feeling claustrophobic.
- All test-persons brought their belongings with them inside the product (Ill. 171,172,173).
- Regarding the enclosing, it was different what people preferred, as it was depending on your purpose; taking a power nap, relaxing, taking a short break or working in privacy. If you just wanted to have a break in privacy the test-persons preferred having only it half closed (Ill.174) and for power naps and recovery total closed(Ill.174).
- It could be an idea to have a separate pillow for personal adjusting, as human are different and prefer support different places.

2 - ADJUSTMENT TO NEW DATA

After testing the user scenario, it was clear that there was problems with shape of the surface:

- There was not enough space to the neck, where the head need to bend over
- There was no support for the lower back
- The sitting position needed to be lowered to create more space for the head.

Based on this the team decided to cut the seating down, according the curve hereunder:



Ill.175

After cutting the new shape, there was still a problem with the support for the lower back, so material was placed in the back to add material.

Ill.176

When adding a pillow to the back it was enough to get the lower back supported comfortably (Ill.176).

! Must have space for bringing personal belongings inside the product
! The enclosing must be adjustable in covering-level
! The enclosing must be two-sectional
! Must not give a claustrophobic feeling when fully closed

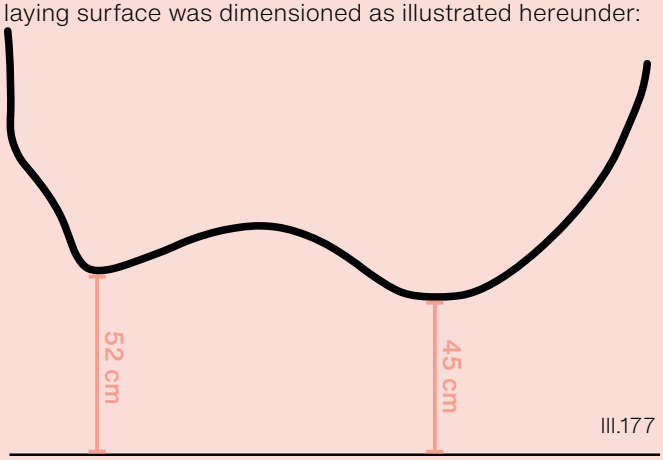
Ill.173

Ill.174

Three types of enclosing states, where tested: totally closed, half closed in the sitting-end and half closed in the laying-end. The test-person liked the option of having it half-open, as you would be able to see if people was passing by, but you can still have your own little world inside the product.

Conclusion

After the test and adjustment the final curve of the sitting/laying surface was dimensioned as illustrated hereunder:



Ill.177

Concerning the type of enclosing, it will be necessary to split it up in two parts for meeting the personal preferences, as the user test concluded. Furthermore, would this solution also embrace the function of the two seating positions (Ill. 178).

The next step is to work further with the closing mechanism and implement the new data into the 3d model.

Ill.178

It was measured that 23 cm needed to be added to the sitting position for having enough space for the head, which will have a critical impact on the shape of the outer shell.

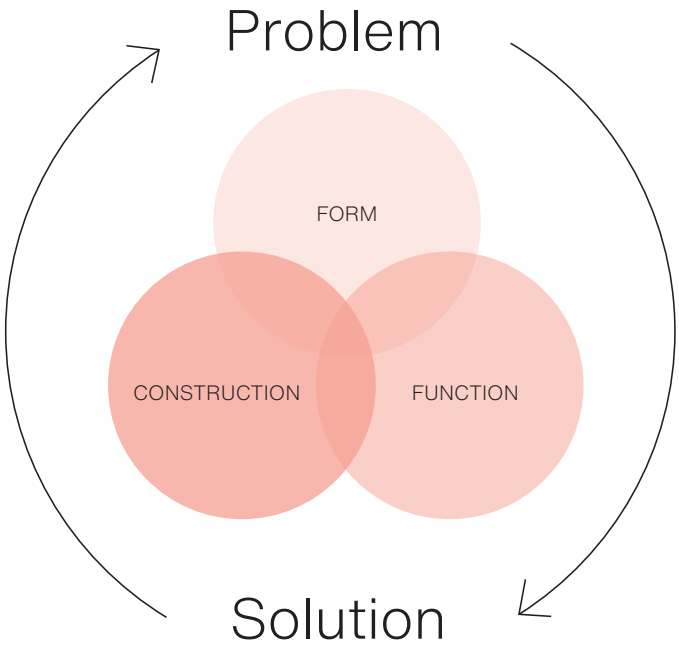
Reflection on concept

Revisiting ideation

After the test the group found a need for revisiting the working principles of the concept and in retro perspective questioning what was our dilemma. The group was trying to balance function, aesthetics and construction according to strict requirements and at the same time switching between solution spaces and problem spaces.(Ill.179)

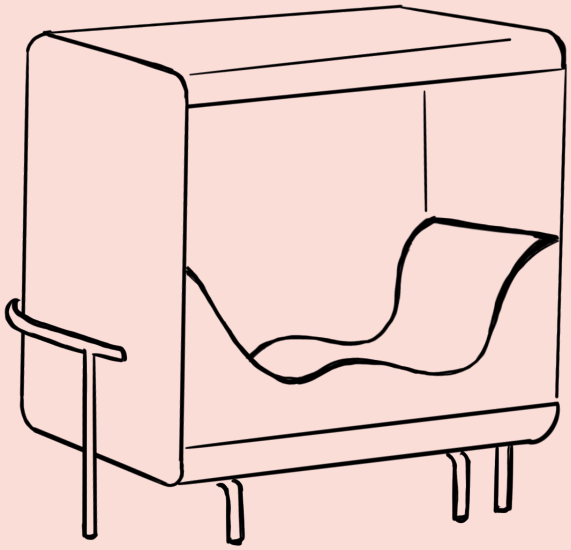
Additionally, a meeting with the supervisor brought attention to that the group had been focusing too much on the production method for creating an organic shell. Up until now the goal with the method had been to utilizing all possibilities in relation to organic shapes, which made the group narrow-minded towards making outer aesthetics fitting into the context of a working environment.

Hereby, it became necessary to ideate on the shape of the shell. However, the production method was yet still considered as beneficial for enhancing the noise isolation in the product.

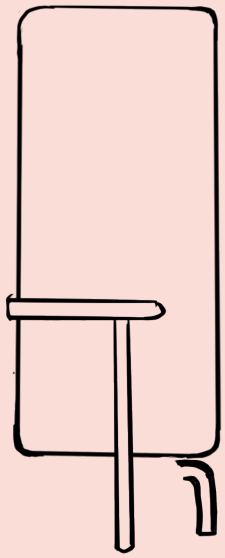


Ill.179 (Vitrivius)(Rittel and Webber, 1973)

A new sketch round had to be evolved. The group needed to remember the most important parameters to integrate in the concept were; the seating positions and the enclosure. Additionally, the context for the concept being a working environment could not be ignored.



Ill.180



Conclusion

A sketch was chosen (Ill.180) as a guideline for the changes that had to be made on the concept. For further conceptualization the aspects of the iteration had to be 3D visualized.

Design changes

Lesson in simplification

THE SHELL
The shell of the concept was changed from organic (Ill.181) to much more squared(Ill.183). The group realized that the shape of the shell had been a huge barrier for incorporating other important features in the concept. In relation to the production method of thermo moulding the shell needed to split up in two parts (Appendix 29). Aesthetically wise, the division of the shell strengthen the illusion of the two possible seating positions.

THE MATTRESS
When having the organic shaped shell the depth of the seating area(0,7 m) was not fulfilled as the shell cut off the edges of the mattress(Ill.182). Also in the discarded shell shape, a backrest along the back of the shell was also implemented, which created confusing about the direction of the seating(Ill.181). In the new simplified shell these challenges were avoided.

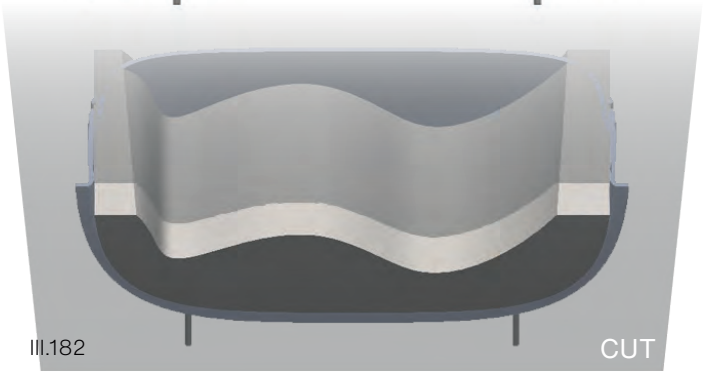
First consideration was to build the seating area (Ill.184) with plywood with a padding and foam on top in order to control that the shape of it was moulded as intended(appendix 30). However, this method would require fixing it onto the shell, alongside it would create a lot of cavity under the curvature. Which seemed too complicated. Additionally, the construction of the madras would be too heavy. A second consideration was to cut the shape out in a suitable foam type with a high density (Legeskum, 2022). Then the finish would be to upholster the shape and lay it in the bottom of the shell.

A high density foam was chosen to be the body of the mattress representing the seating area(Ill.185)(FoamOnline, 2022)(Appendix 30).

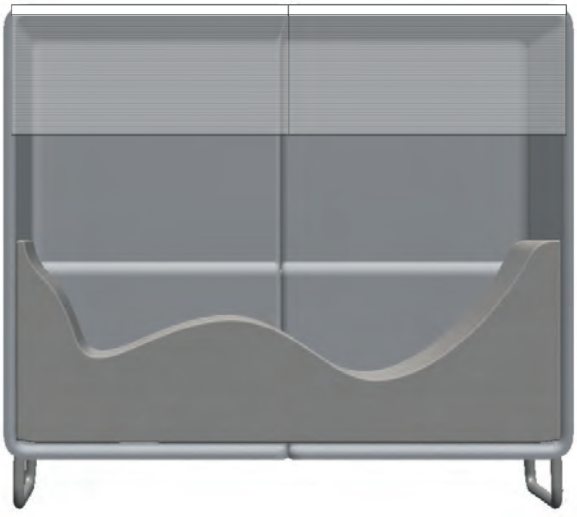
MOTION PLEATED BLINDS:
In order for the blinds to enclose the concept as much as possible the transformation of the shell to being more squared, was beneficial regarding installation of the blinds. The blinds was squared and would align with the shell when closed (Ill.183). However, the qroup accepted that a compromise with full enclosure had to be made. Hence, the closure of the concept was 90%.

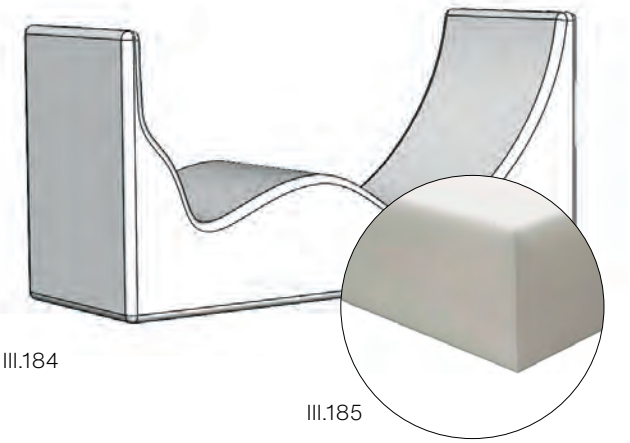
AESTHETICS
The overall aesthetics of the concept had transformed to be more squared and simple which helped the association to a office environment. By making the concept more squared it would adapt to open offices fitting up against a wall.


Ill.181



Ill.182


Ill.183


Ill.184

Ill.185

RECOVER-IN

A comfortable and shielding unit for a private moment at work

Ill.186

A SOLUTION TO RECOVER AT WORK INSTEAD OF GOING HOME, FOR PEOPLE WITH MIGRAINE

After simplyfing the shape of the concept, RECOVER-IN was the result; collecting all of the pieces from the prior concept development rounds in one concept. On the current and following page the concept is presented. This proposal was also the one presented at Milestone 3.

RECOVER-IN is a piece a furniture that is meant to be placed at workplaces away from the main offices, mainly for recovering at work instead of going home, for people with migraine but it can also be used for other purposes.

It consists of two seating zones: A sitting position and a laying position; both shaped for an ergonomic comfort. Based on that many migraineurs' migraine spring from tension-type headaches. Also during a migraine attack a person is very invalidated, so a high comfort and support is needed.
In order to close the outside working environment off there is integrated a two-set of motion blinds that can be adjusted on the user's terms. It is a very high demand for migraineurs that they can shield from light when having an attack. The blinds can close the product so the user can variate and personalize the level of exposure; Signaling if they want to be disturbed or not.

There is an integrated light in the ceiling for not sitting in complete darkness and creating an ambient atmosphere inside the product. Furthermore, there is integrated ventilation making sure that there is an airflow inside the unit, preventing it from being hot and filled with heavy air, as migraineurs seek for cold environments, so this is an important factor.
Also by having a simple and anonymous look and available for everyone, it does not make you look sick and you can keep a professional face at the same time.

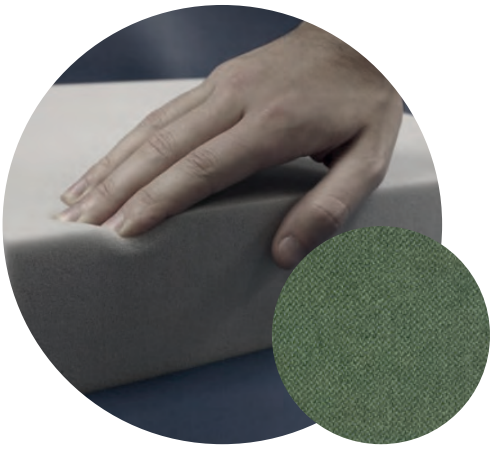
Ill.187 For tall people: Jimmi is 2.02m high.

!

A tall person would need the possibility to adjust the comfort, especially under the knees.

RECOVER-IN

The product had been made with the purpose of creating a unit that had a honest construction. Meaning, that every part of the unit had its own purpose. Additionally, the product needed to be easy to assembly and disassemble, due to its scale and the possibility of repairing and replacing individual parts.



Ill.188 Foam madras

Ill.189 Upholstery

Ill.190 Pleated blinds

Ill.191

CONSTRUCTION AND ASSEMBLY

The frame holding the unit is made of steel and is securing the product in order to create stability.

On top of the frame is the shell parts. The shell consists of two mirrored parts and is intersecting and secured by the frame(Ill.191). The shells is thermo moulded in felt(Ill.192,193) creating a soft look and is beneficial for acoustics (Engineering Study Materials, 2020). Thermoforming is the reason for the bended edges around the shells. The shells are put together with bolts.

The two shells put together embodies the product. Inside this body is the mattress which is made of foam (Ill.188)to create a soft touch. The mattress has dimensions just fitting to the shell, in order for it to be fixed in the shell. A wooden bar on the front of the mattress going through the entire unit to the back of the shell, is preventing the mattress to fall out. To create a mattress with easy cleaning a fabric with polyester was chosen to cover the foam(Ill.189).

Likewise, inside there is installed a top which is upholstered with foam and fabric to match the mattress. This top contains light and a fan to create airflow. Outside the shell there is mounted two motion pleated blinds, for each seating zone, mounted on the edge of the shells. The light and motion blinds is both controlled by an accompanying remote for personalization.

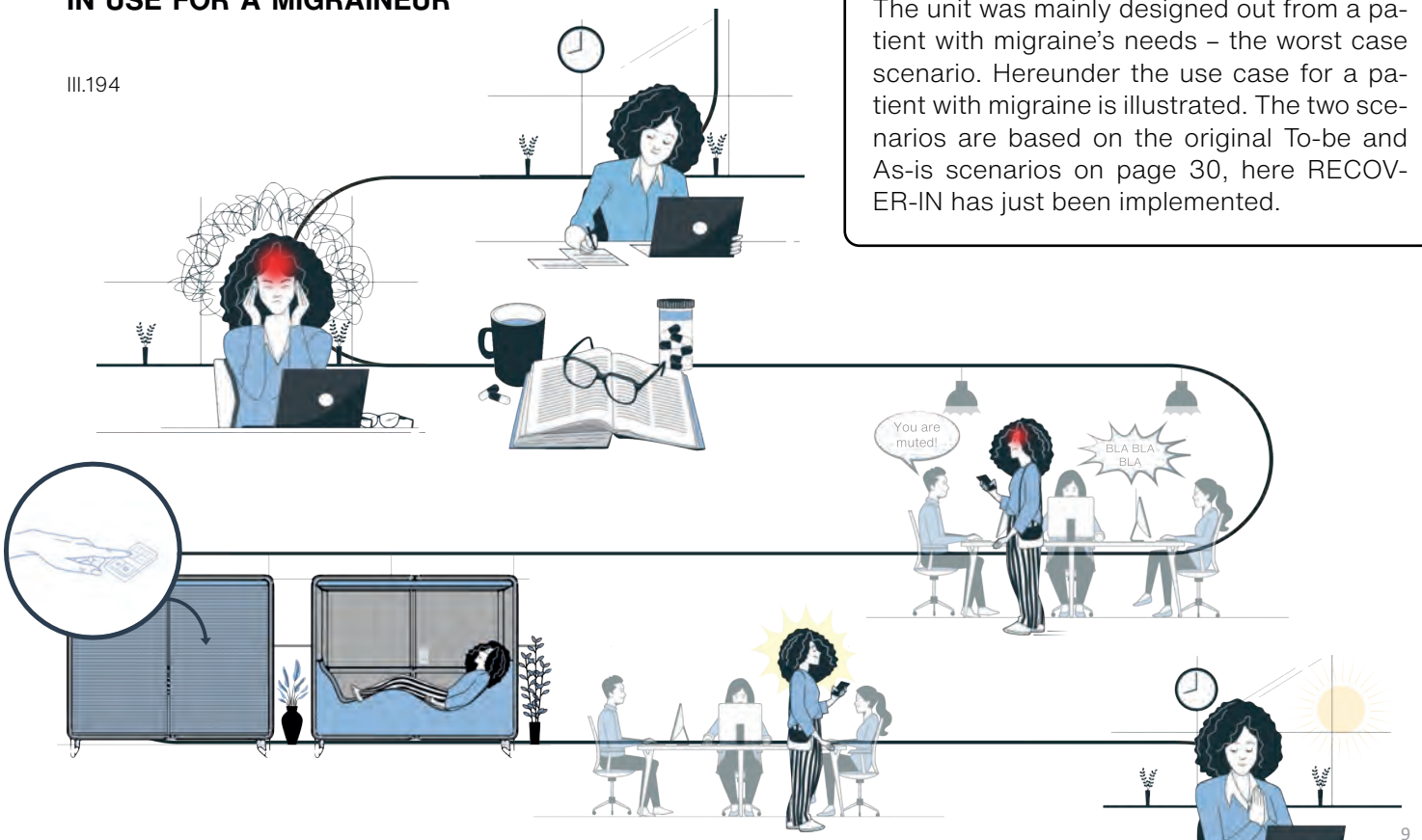
Ill.192 Felt shell

Ill.193

RECOVER-IN

IN USE FOR A MIGRAINEUR

Ill.194

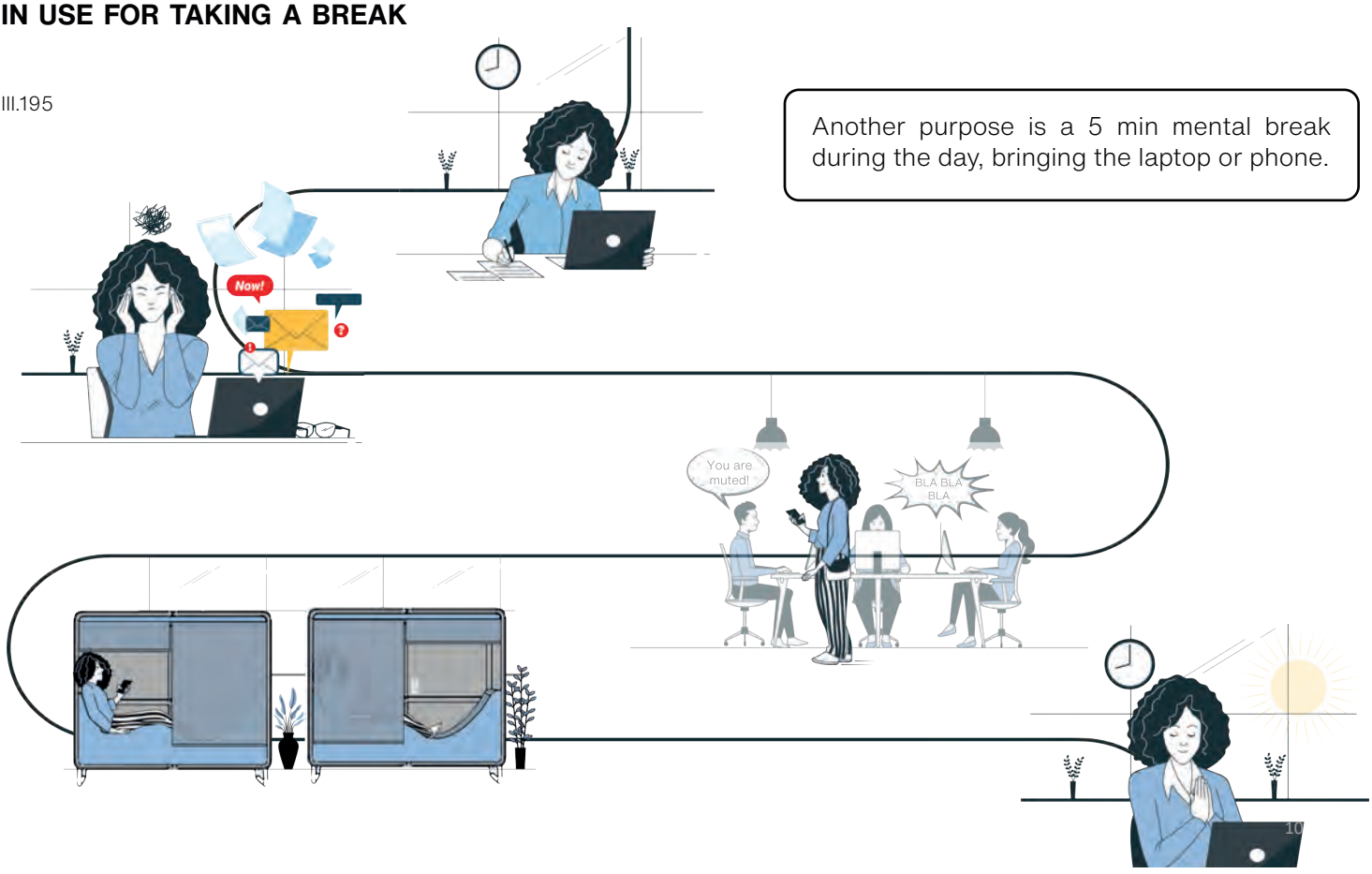


The unit was mainly designed out from a patient with migraine's needs – the worst case scenario. Hereunder the use case for a patient with migraine is illustrated. The two scenarios are based on the original To-be and As-is scenarios on page 30, here RECOVER-IN has just been implemented.

RECOVER-IN

IN USE FOR TAKING A BREAK

Ill.195



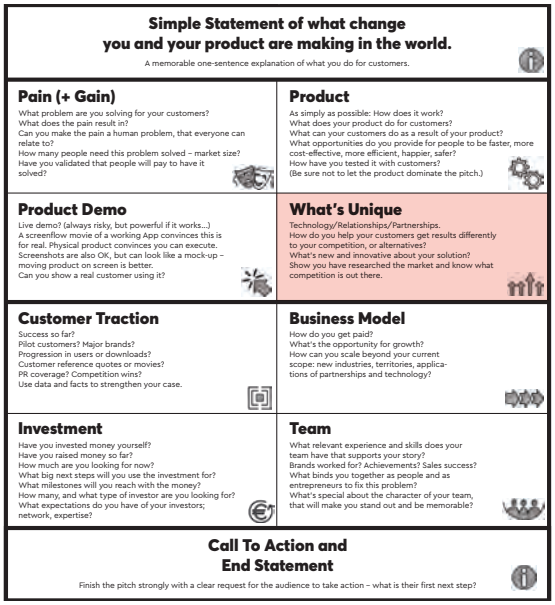
Another purpose is a 5 min mental break during the day, bringing the laptop or phone.

Product uniqueness

4-P model and Verganti's design views

When preparing for the last Milestone, it was important for the group to succeed in communicating both their problem but also their solution. From a prior course the team became acquainted with David Beckett's Pitch Canvas (Beckett, 2022)(III.196). Therefore the plan was to structure the final presentation inspired from this. Hereunder describing what is unique about the group's solution (marked in III.196), answering the questions:

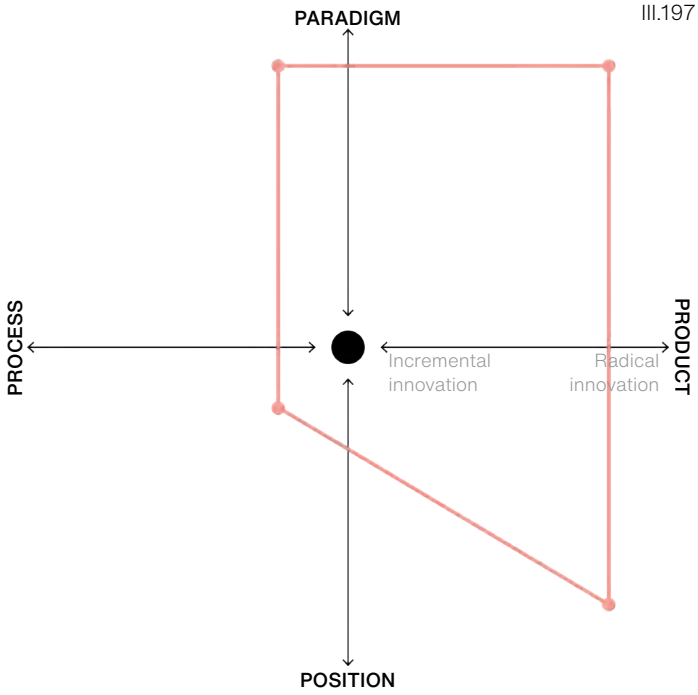
- What is innovative about the solution?
- What are our market understanding and competition?
- How do the solution help users differently?



III.196 Pitch Canvas (David Beckett)

4P MODEL

To answer these questions, the 4P model was used to map out the current solution, *Recover-in*, and pin-point its innovation and competitiveness level (The 4P model methodology is elaborated in appendix 01) (Hansen, et al., 2014)(III.197).



III.197

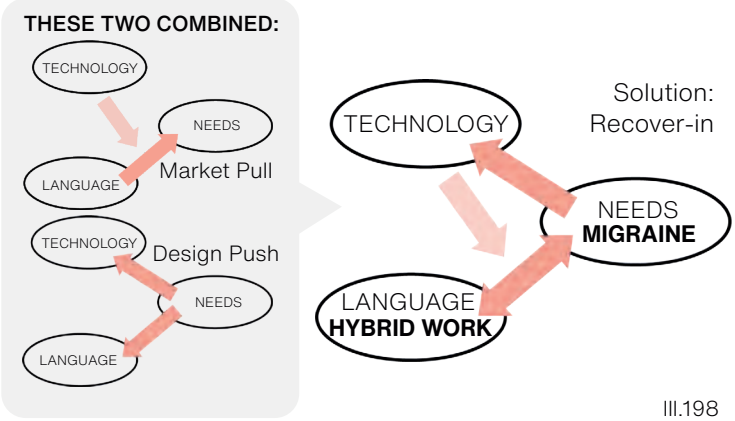
The solution, Recover-in, re-writes the rules for the 'traditional' office work behaviour and taps into the possibilities with hybrid work, creating a paradigm break. Together with innovating on the product level by concept developing out from migraineurs' extreme needs. The key-function of the product: high comfort and total privacy, do not only fit within the working segment, but can also be positioned and expanded to other public segments, as airports, nursing areas, hospitals, institutions etc. The processes behind producing the product are well-known manufacturing methods, attempting to lowering the production price. However, is the 4P model very subjective and therefore is this only reflecting the group's internal understanding of the product, outsiders might perceive the solution differently.

VERGANTI'S DESIGN PUSH & MARKET PULL

The innovation behind the solution, Recover-in, can also be understood via Roberto Verganti's design views(Verganti's design views are explained in appendix 01) (Verganti, 2003). The knowledge behind the concept derive from both user needs and socio-cultural models visioning a possible future, reflecting both the Market Pull and Design Push design view. From the Market Pull the explicit needs of patients with migraine is established. On the other hand, the working trend of tomorrow (Hybrid work) is anticipated and influenced though a Design Push. The result is an emerging of a new type of product, that both tells a story about the reality of the future integrated with the necessary conditions for a patient suffering with migraine.

> *[...]They detect the whispers of the current socio-cultural models, identify those feeble voices that are likely to get louder in the future, select from among them those whispers that best meet their own values, and help those voices to become understandable and meaningful in a new product offering.*
>
> - Roberto Verganti

As Verganti also formulate the power of a Design Push: Translated to the group's project, they have listened to the prior unheard patients suffering with migraine and their daily struggles and combined it with the value chain of Hybrid work to create Recover-in.

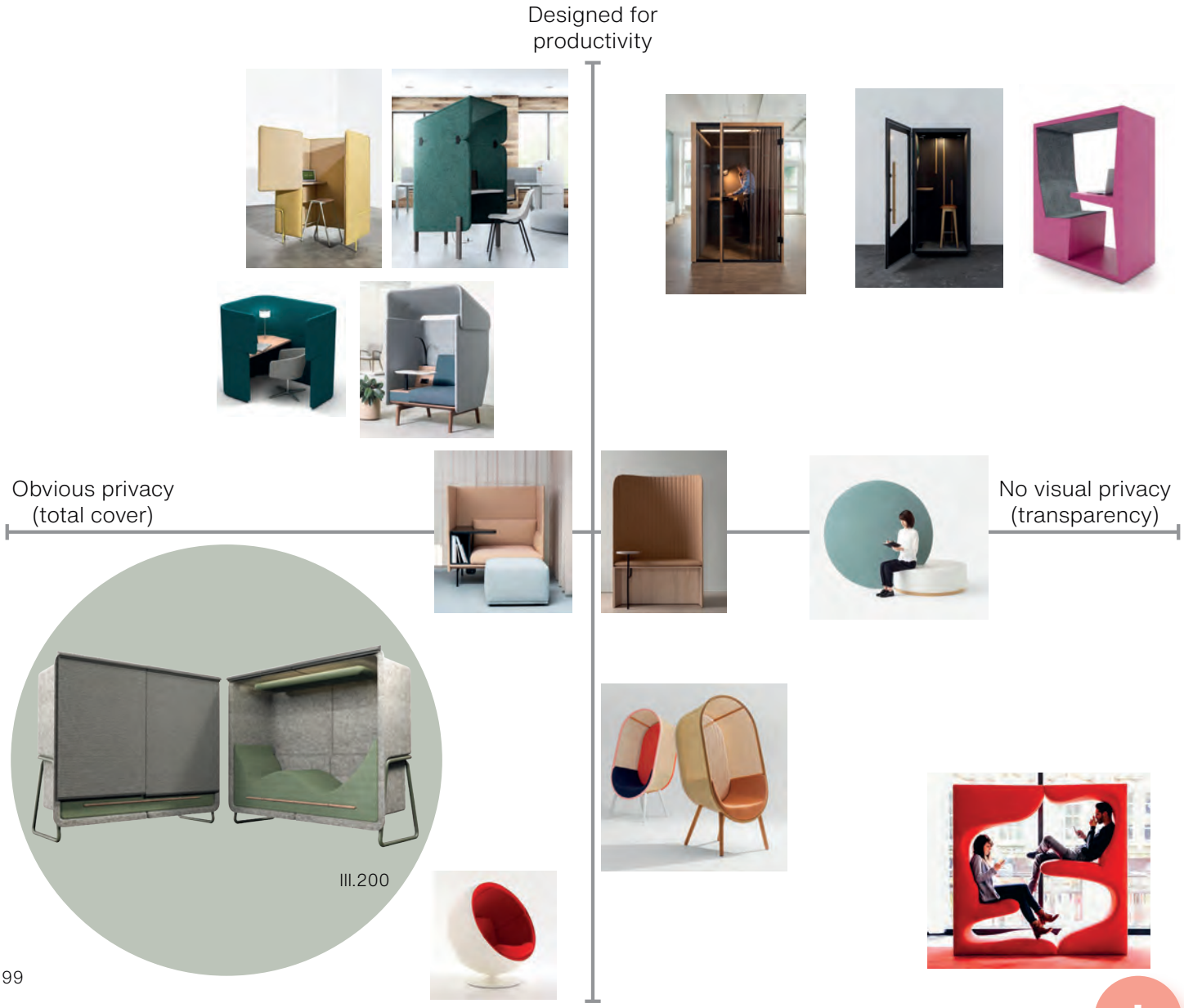


III.198

Product uniqueness

Benchmark with existing products

Lastly, the group's market understanding and how the team's solution differs from existing products, was mapped out with Perceptual Mapping (Gigauri, 2019). The products are evaluated in terms of privacy (from total privacy/cover to no visual privacy) and purpose (designed for productivity / relaxation). The uniqueness of Recover-in is that it is offering high comfort and support along with total and adjustable privacy, where you can signal to the outside world if you want to be disturbed(third quadrant). In contradiction to existing products where they are either designed for productivity with no visual privacy(first quadrant) or they have no option for closing and only designed for sitting(second quadrant).



III.199

III.200

! The product must not invite for productivity, but for comfort and relaxation.

Conclusion

The innovation of the current concept derive from its paradigm by offering full privacy and cover along with high comfort at work, that taps into a forward-looking way of re-thinking office inventory that fits within the principles of hybrid work. The project started as a Market Pull and ended with combining Market Pull and Design Push, as the concept idea of a recovering place a work, could not be sold as a migraine product, why the semantics and context of hybrid work was implemented as a product language during the process. In relation to existing products, Recover-in is unique when it comes to total cover and not designed for production but relaxation.

Milestone 3

Feedback and thourgth

REQUIREMENT FOR MILESTONE 3:
The focus in the presentation is to make a test run on the proposal in order to identify where to focus in the final part of the process(semester description).

The initial thoughts for Milestone 3 was to present the major change that the group had progressed after the change of direction. Also the goal was to succeed in communicating the problem and framing of the project, as this so far had been unsuccessful.

Up until now the group has not been successful in convincing the that the product was something that had potential.

The fly-in for the presentation seemed to be received well (The structure of the fly-in is illustrated on the following page)(the whole presentation can be seen in appendix 31).

Highlights from the feedback is elaborated hereunder:

- It was mentioned that the group needed to be very clear in their formulation of the requirements of the product.
- The context could be adapted to the other contexts like airports, shopping centres, stores etc.
- The airflow needed to be clarified. A concern to noise was brought to the groups attention, and whether it should bed active or passive cooling. And would the user risk getting a cold?
- The concept had possibility for being simplified even more.

Most importantly, it was questioned if the group should just kill their darling "Migraine", as the gap in market(p. 74-75) was very strong in itself, even without the migraine framing.

THE NEXT STEP

- Reflect on killing migraine.
- Detailing features on the product regarding interactions with light and blinds
- Feet forward on product occupation from longer distance
- Create business strategies
- Calculation of strength on frame and mattress
- Production methods and final choice of materials.
- Production price

Fly-in for presentation

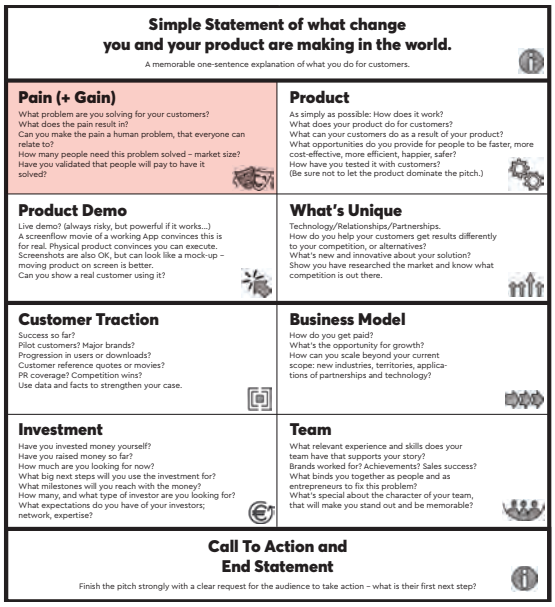
As the uniqueness on page 74-75, the fly-in for the presentation at Milestone 3 was also based on the Pitch Canvas (Beckett, 2022). It was important for the group the explain the transformation and process from 'migraine' to 'Hybrid Work' - and why these where related to the core pain of the project. By working with this, the group learned to communicate better to outsiders.
Hereunder is the fly-in presented with a visual presentation:

Ill.201

The core problem of migraine:
You cannot relate to migraine except if you have had it yourself. A disease that can be triggered from anything.

Market size - the result of the pain:

- Migraineurs have a lot of sick days
- 1.2 billion DKK lost in production every year
- They cannot stand to stay at work - They need to go home
- The surroundings will make it worse and last longer
  harsh light, high noises and different smells



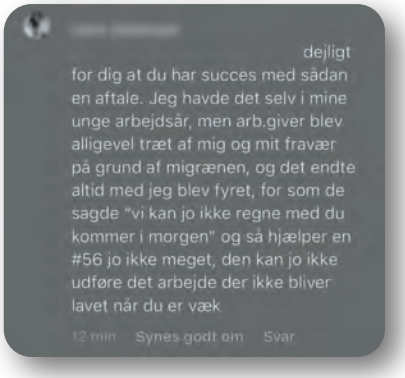
Ill.203

The unawareness at the work places:
The workplaces do not know anything about the dilemmas of having migraine. If the patient tries to provide them with insights, the following Facebook posts are some of the reactions(All comments can be read in appendix 32):

Well, how can we then make the workplaces aware?

WE DON'T

Research within this area has so far been unsuccessful, as Kirsten Nabe-Nielsen informs about on page 25.



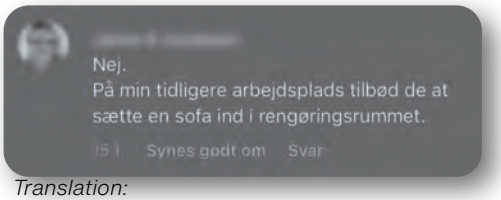
Translation:
"Nice for you that you have had success getting such a deal. I had it myself in my young working years, but my employer got nonetheless tired of me and my absence due to my migraine and it always ended with that I got fired. As they said: 'We cannot count on if you are going to show up tomorrow." And then a paragraph 56 do not help much. It cannot do the work that is not done when you are absent.

Disguising and making the solution the "new normal":
Instead, the solution taps into current work trends, where everybody can use the product. After Corona many companies have opened up for employees can personalize their workday and structure on an individual level as a part of the upcoming hybrid work style – where it is also okay to take a break.
Referring to the visited companies(Page 35-36):

LES DEUX

SIEMENS Gamesa
RENEWABLE ENERGY

KMD
An NEC Company



Translation:
"No. At my previous workplace they offered to place a couch inside the cleaning closet."

Translation:
"No. I was asked to take an aspirin and move on."

Ill.202 **All Facebook posts can be read in appendix 32.**

The solution = Recover-in

VI.

DETAILING.

Chapter summary

This chapter presents the detailing process of the product proposal, hereunder: manufacturing, product architecture, calculation of strength and business strategy. However, it starts by killing the darling; migraine, that has been the main focus for the group up until now. A final Design Brief is found in the end of the chapter collecting all the elements that has directed the design process.

Killing the darling : Migraine

One of the suggestions at the last Milestone was to kill the group's darling, migraine. It was clear that the group could create a stronger concept, by toning down the extreme requirements from the migraineurs. It was reflected upon that migraineurs could bring personal stuff and utilize their existing coping strategies (p. 18-19) within the solution, to obtain their wished conditions, for example total darkness. In terms of the new framing it was evaluated that cutting migraine would only make the strategy of hybrid work stronger and clearer. As the group's supervisor formulated it:" *During Corona people had to transform their home into a work environment, now post-corona the group has proposed the opposite transformation"*.
Before the detailing phase, the design brief will be updated and re-framed according to leaving migraine behind.

III.204

Design Brief update

~~PROBLEM STATEMENT~~
~~How can a workplace take part in reducing sick days by offering a time-out/energizing place for migraineurs?~~

PROBLEM STATEMENT
How can a workplace tap into the hybrid work trend by offering a time-out place for privacy and immersion?

~~VALUE MISSION~~
~~The product must give a feeling of well-being while providing surplus energy for the migraineur while creating an equal environment with co-workers~~

The product must give a feeling of **disconnection** while providing **immersion** for the employee, creating a place for **relaxation** at work.
VALUE MISSION

III.205
IMMERSION...
Like reading a good book

III.206
DISCONNECTION...
Like cutting all electronic devices

III.207
RELAXATION...
Like laying in a hammock during summer

~~INTERACTION VISION~~
~~The product must fit into a professional environment while being private and flexible in usage for recovering and taking a break.~~

The product must fit into a **professional** environment while being **private** and **flexible** in usage for taking a break and cover from surroundings.
INTERACTION VISION

Design Brief update

Graduating and re-framing requirements

LIGHT *(P. 38-39)*:
Must illuminate the inside of the product with adjustable light from 0 - 345 lumen
The light source must not be visible for the user
The light must have a warm color (2000-2200 K)

NOISE AND SURROUNDINGS:
Must absorb noises from surroundings (Max. 35-40 dB inside the product)*(p. 38-39)*
Must aware the user in case of a possible evacuation *(p. 37)*

COMFORT:
Must be able to both lay down and sit up *(p. 47 + 59-61)*
The sitting height must be 0,52 m *(p. 68)*
The laying height must be 0,45 m *(p. 60-61)*
The inside depth of the product must be 0,7m *(p. 61 + 67-68)*
Must have ventilation for air flow inside the product *(p. 24 + 43)*

PRIVACY & ADJUSTABILITY:
Must indicate when the product is occupied *(p. 49)*
The enclosing must be adjustable in covering-level *(p. 67-68)*
The enclosing must be two-sectional *(p. 68)*
Must not give a claustrophobic feeling when fully closed *(p. 61)*
A remote is needed to control the blinds and light *(p. 66)*

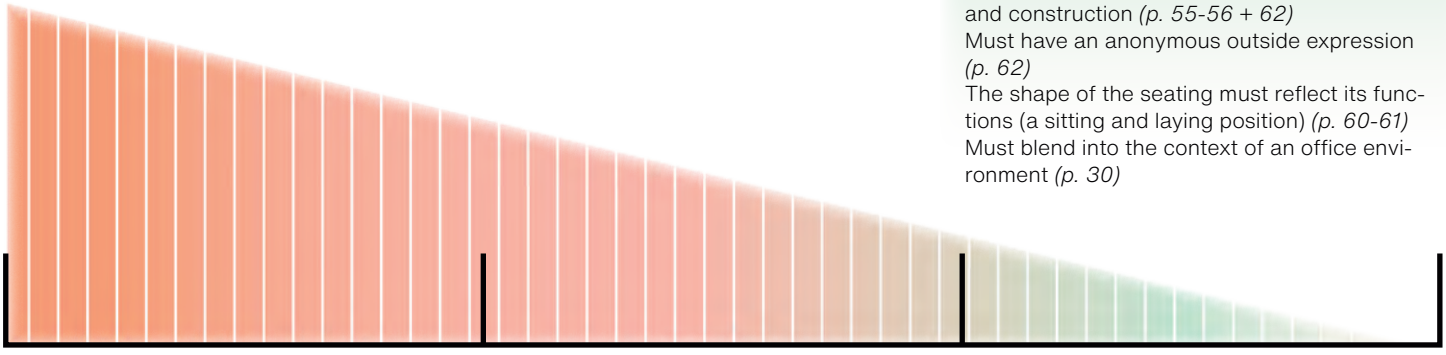
The prior division of requirements is eliminated, instead the requirements specification is weighted in relation to the method of Steen Agger (Agger, 1984), by graduating and prioritised the requirements into three overall categories. Under each prioritisation, the requirements are divided into themes. In the "()" the origin of the requirement is defined. The group will still bring some of the requirements from the migraine research but just down-scale them. For example, instead of requiring total darkness inside the product it is down-scaled to 70-85%.

DIMENSIONS:
Must maximum cover a ground area of 2,8 x 2,8 m *(p. 37)*

INSIDE EXPERIENCE:
The seating must be adjustable for personalization *(p. 40 + 67-68)*
Must be a one person product *(p. 12 + 56)*
Must block out 70-85 % of the light from surroundings *(p. 23-24)*

PRODUCT IN FUNCTION:
Must enhance the trend of Hybrid Work *(35-36 + 55-56)*
Must be cleanable *(p. 25)*
Must be integrated in an office environment *(p. 21-22 + 35-36)*
Must not invite for productivity *(p. 74-75)*
Must have space for bringing personal belongings inside the product *(p. 67-68)*
Must be installed away from the work stations (p. 29-30)

AESTHETICS:
Must have an honest and function-defined form and construction *(p. 55-56 + 62)*
Must have an anonymous outside expression *(p. 62)*
The shape of the seating must reflect its functions (a sitting and laying position) *(p. 60-61)*
Must blend into the context of an office environment *(p. 30)*



FIXED REQUIREMENTS **MINIMUM REQUIREMENTS** **WISHES**

III.208

For the detailing phase, migraine will be eliminated and the new scope of the project will only be focusing on Hybrid work.

Product simplification

Detailing

One thing that was mentioned at the last Milestone, was that the concept could be simplified(p. 76). Furthermore, the team utilized design strategies from Circular Economy to target the detailing of the product:

- Design for product integrity (Hollander et al., 2017)
  → Design for repair
  →Design for upgrading
- Circular design principles (Alivojvodic et al., 2020)
  → Product recovery - enable materials or components to be easily brought back into a value chain
  → Product use - Design for durability, modularity, repair/ upgrade-ability, and efficiency while in use.

The two strategies are elaborated in appendix 01.

Iteration and detailing of the product was conducted to finalize the product and its features. The following will explain the chances that was made after Milestone 3 (details can be read in appendix 33).

THE SHELL

The main purpose of the changes was to simplify the expression of the product. The first wish of change was to get rid of the imprints inside the shell caused by the production method of thermoforming (Engineering Study Materials, 2020) to create less aesthetic 'noise'. Also, the imprint had no purpose and was interfering with the mattress.(Ill.209).

THE FRAME

The intersection between the shell and the frame was changed. The intersection was changed to only occur on the sides of the shells (Ill.210). Hereby, the imprint would be hidden behind the mattress (Ill.209). Additionally, this also benefited the fixating of the mattress inside the shell. The structure of the frame was change and simplified. Letting the frame intersect with the shells underneath secured the shells, ensuring that the assembling of the two shells and frame could not be done wrong (Ill.212). Also, this prevented the shells from sliding off the frame. Lastly, the frame was changed to have four legs instead of only two and the legs were more aligned with the product from all sides signalling stability. The previous legs was associated with a chair from the side and the angles of the frame signalized movement and not stability (Ill.212).

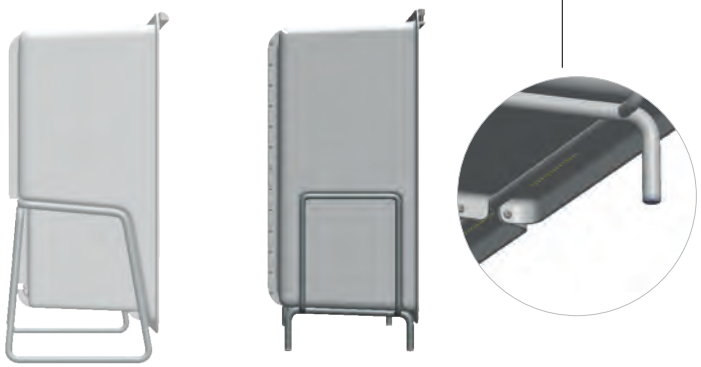
THE MATTRESS

To strengthen the two-sided product, enhancing the sitting and laying zone, the mattress was split in two (Ill.213). Hereby, the mattress was aligning with the two shells and the set of blinds.
In addition to the mattresses, two pillows were designed to accommodate a level of adjustment and to invite for personalization of ergonomic comfort; A pillow in each zone to reach (Ill.213).

THE FEATURES INCORPORATED

For Milestone 3 the group presented that the product had integrated airflow. A change in air outlets in the top was made due to a calculation of the air-flow, where it was estimated to be overkill (Ill.214)(appendix 33).
Wiring for light and airflow fans was intended to be hidden between the interface of the two shells.
An extra feature was added to the product, for showing that it is occupied: A pressure sensor underneath the each mattress, connected to LEDs (Ill.211), had to light down on the floor whenever a person is using the product and putting pressure onto the mattresses.

Ill.209

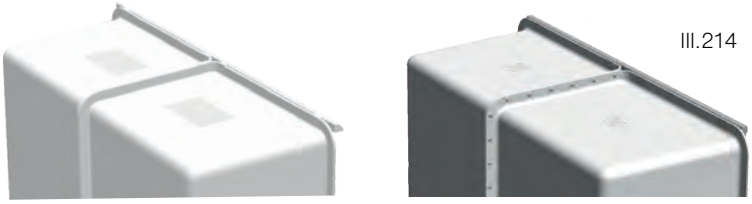


Ill.210

Ill.211

Ill.212

Ill.213



Ill.214

Product architecture and leverage

PRODUCT ARCHITECTURE

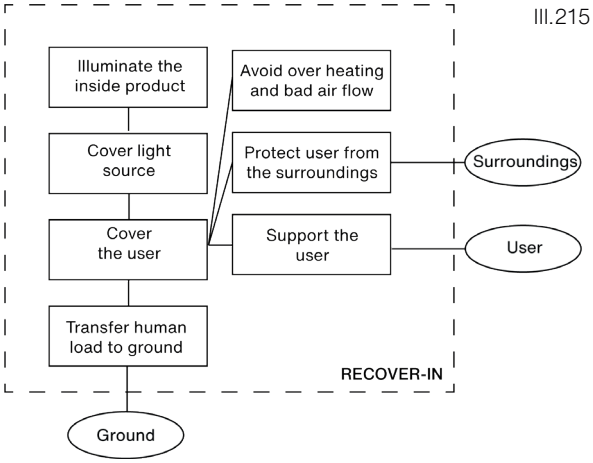
It was considered that making the product modular would be beneficial for both repairing it but also considering the solution's market segmentation. The solution brought for Milestone 3, was analysed according to Karl Ulrich's methodology for analyzing product architectures by (Ulrich, 1995):

1. Arrangement of functional elements
2. Mapping from functional elements to physical components
3. Specification of the interfaces among interacting physical components

ARRANGEMENT OF FUNCTIONAL ELEMENTS

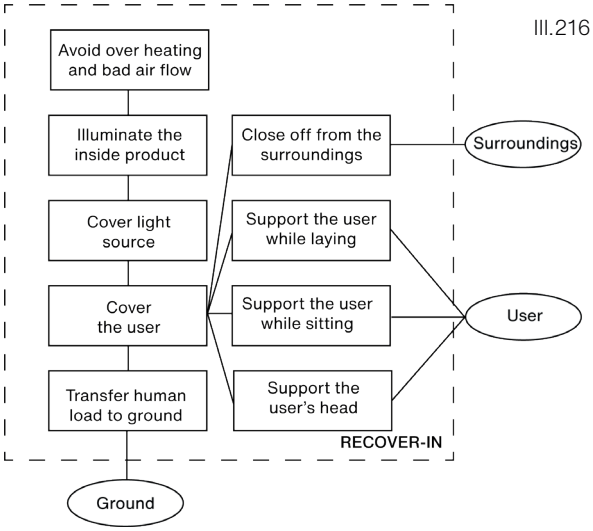
Function structures can be done on different levels of abstraction. In this case the detail level will go down to have a collection of functional elements, shown on Ill.215 for the concept from Milestone 3 and Ill.216 for the newest solution. Some elements that is not clear in this model is aesthetics of the product and how it harmonize with in its context: the working environment.
Comparing the function elements of the two versions, they are much alike, however do they diverge in how the 'user support is detailed and subdivided. Also the avoiding over-heating function is moved.

RECOVER-IN FROM MILESTONE 3



Ill.215

NEWEST CONSTRUCTION OF RECOVER-IN

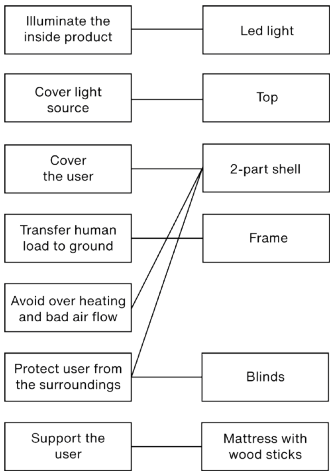


Ill.216

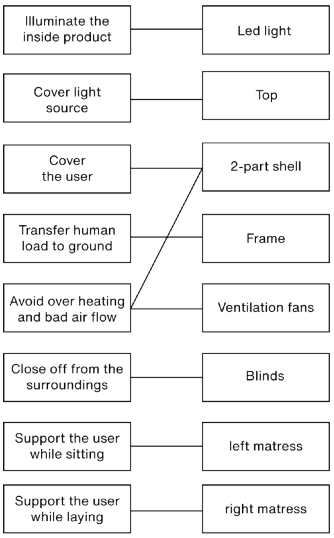
MAPPING FROM FUNCTIONAL ELEMENTS TO PHYSICAL COMPONENTS

For mapping and translating the functional elements into physical components, a component is in this example defined as a subassembly or a separable physical part (Ill.217).

RECOVER-IN FROM MILESTONE 3



NEWEST CONSTRUCTION OF RECOVER-IN



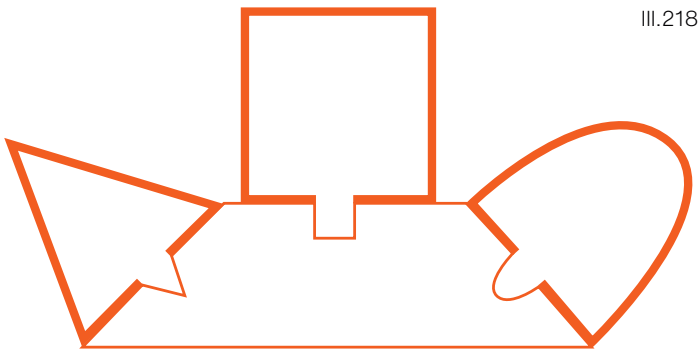
Ill.217

SPECIFICATION OF THE INTERFACES

The interaction between the components; the interfaces, will be specified during the whole chapter, according to assembly and materials.

EVALUATION

Taking a look at the product architecture typology, the concept has many modular components within it, yet the 2-part felt shell has some function sharing and integrated characteristics, where it function as a base for mounting and holding many of the product's components. Overall the architecture can be seen as a slot, where the different parts cannot be interchanged. Here the product varity is constrained to the choice of parts within an already defined product structure(Ill.218).



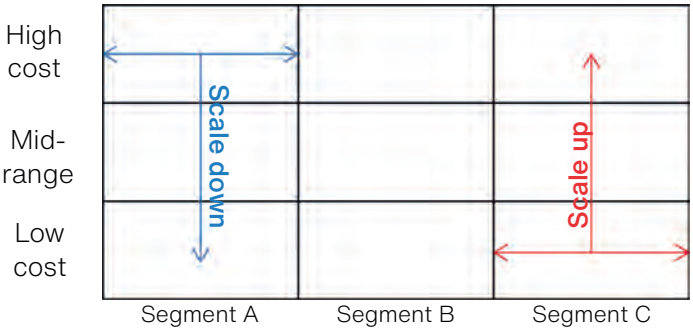
Ill.218

SLOT-MODULAR ARCHITECTURE

MARKET SEGMENTATION

Along with having a modular product based on a slot-architecture, it as possible to take advantage of its platform, by being able to create variants, renew the product with time and address more market opportunities.
By taking basis in the method of Meyer and Lehnnerd, a strategy and market segmentation for the product platform can be suggested (Meyer & Lehnnard, 1997)(All types of strategies can be found in appendix 01).

For the solution, Recover-in, a vertical scaling would be suitable for addressing a range in price and performance(Ill.219). The benefit of this approach is that the same platform can be utilized, where it is possible to save money on developing a whole new platform for each performance and price level. In this case the platform will be the frame and the two-part shell.



Ill.219 *Vertical scaling of key platform subsystems*

In this project the product will excelled in the high-end of the market where all functionalities are present. For reaching lower price point, certain features will simply be removed from the product or swapped with a cheaper component. In this case removable features could be:

- Blinds
- Light
- Ventilation
- Seating surface
- Detachable pillows

Additionally, the blinds could be downgraded to a single unit and the light could be downscaled to being non-adjustable light.

Creating different variants of the concept that will target different price points, will make sense in this project regarding how companies depreciate their inventory. When buying inventory for your company in Denmark, you are able to depreciate the product over a couple of years. Furthermore, if the product is under 30.000 DKK you can do a accelerated depreciation, where you do not have to do it over a couple of years. This is an advantage when considering inflation. Because if you depreciate the product over several years, the product will lose around 2% of its value each year.

Therefore it would be beneficial to have a variant of the product that hit the price point of the limit of accelerated depreciation (30.000 DKK).

This is the same strategy that MuteBox has used with their slot based product architecture, where they have several versions of the same “box”, where they have an exclusive all-in-one box but also a more stripped version (p. 37).

Creating variants will make sure that the product can be positioned better and reach out to a broader market, compared to existing products within office inventory that span over a big variation in price point(Ill.220).

Conclusion

After mapping the old and new construction of the solution, Recover-in, it is clear that it has an overall modular product architecture, but the felt shell has its own integrated platform where components can be added and removed from. It is reflected upon that it is acceptable that the shell has an integrated architecture compared to its performance to absorb noise and at the same time cover with a low amount of components. Additionally its aesthetics value is not a parameter in the applied method.
For taking advantage of the modular product architecture, there can be created variants of the product by vertical leveraging. Based on the high-end type of the product, features can be removed or downgraded (e.g. type of blinds, light and ventilation) to fit to different price points.

Ill.220

Materials

Production and manufacturing

The materials of the product had to be specified along with finding suitable productions methods and manufacturing processes of each part in the product proposal. The following will describe this:

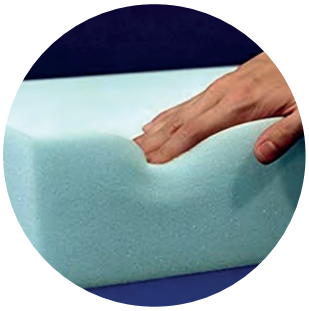
MATTRESSES
The two mattresses is made of a combination of a greater part of high density foam (Ill.223) (A Polyether foam HR50270 (Claudius Foam, 2022a)) and at the top a 5-10 cm medium density foam(Ill.224) (A cold foam HS41090 (Claudius Foam, 2022b) to create a soft touch. The pillows (Ill.221) and the top (Ill.227) is also covered in medium density foam to create coherence and soft look to these parts as well. The production method related to all parts with foam is a CNC Foam Cutting Machine (ESUN INTERNATIONAL CO., LTD., 2020). This machine can cut with high precision and meet the cutting requirements for the curvature of the mattresses.

For upholstering the mattresses (Ill.222) the pillows (Ill.221) and the top (Ill.227), a 98% post-consumer recycled polyester (2% polyester) was chosen (Gabriel, 2022). A green color was chosen for the fabric (Ill.225).

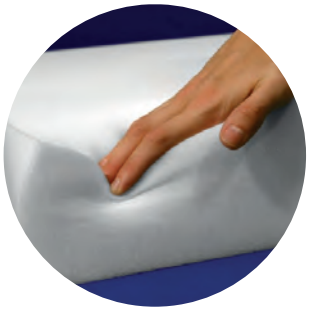
THE TOP
The top (Ill.227) inside the shell is made by a piece of medium-density fibreboard working as a platform for fans (Ill.226) and LEDs. The medium-density fibreboard is then covered in foam and fabric. A calculation of how much air flow needed inside the product was conducted based on the airflow of a office environment (appendix 33). Two fans were added for better circulations of air inside. Noctua fan (Ill.226) was a suitable candidate for a low noise fan with the required performance (Noctua, 2022).

Ill.221 Pillow

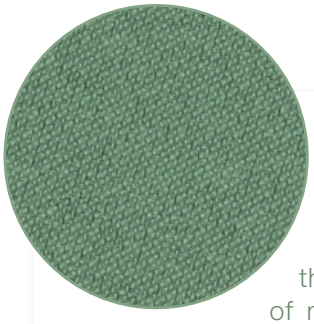
Ill.222 Mattress



Ill.223 High density foam



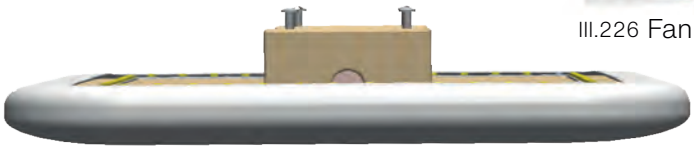
Ill.224 Medium density foam

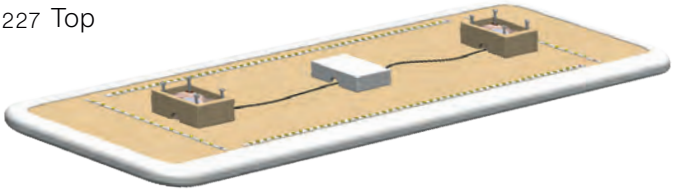


Research on color theory and what it does to the human body was made to specify a color spectrum that could be applied at the upholstery. Green is a symbol of nature and “new beginnings”. Refresh and restore. The green color helps relax the muscles, nerves and thoughts. Physiologically green affects the nervous system, causing us to breathe slow and deeply, helping the heart to relax and slowing the production of stress hormones (appendix 36).

Ill.225

Ill.226 Fan

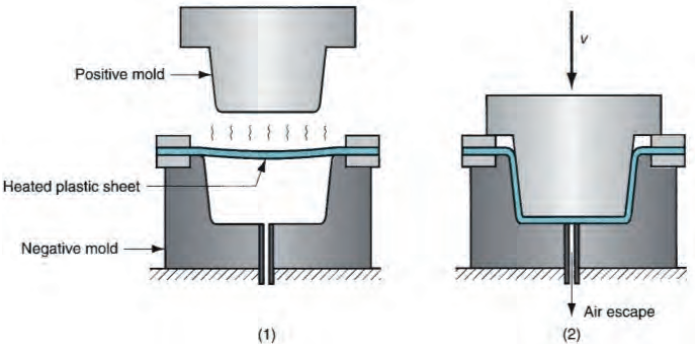




Ill.227 Top

SHELLS

The shells(Ill.230) is made out of PET felt (Ill.228) (Féline, 2022) and formed by a Mechanical Thermoforming Process involving shaping a preheated felt sheet with a direct mechanical force. A core plug, a positive mould, forces the soft sheet to fill the space between the plug and the negative mould. Draft angles on the shells were added in order to get the shells out of the mould (Appendix 34). The production method provides precise dimensional tolerance and surface detailing which is beneficial for creating the two shells. Also, for them to fit perfect together with bolts (Ill.231). The felt has been chosen to enhance the noise absorption both inside and outside the product (appendix 35).



Ill.229 Mechanical Thermoforming Process (Praj Engineers, 2021)

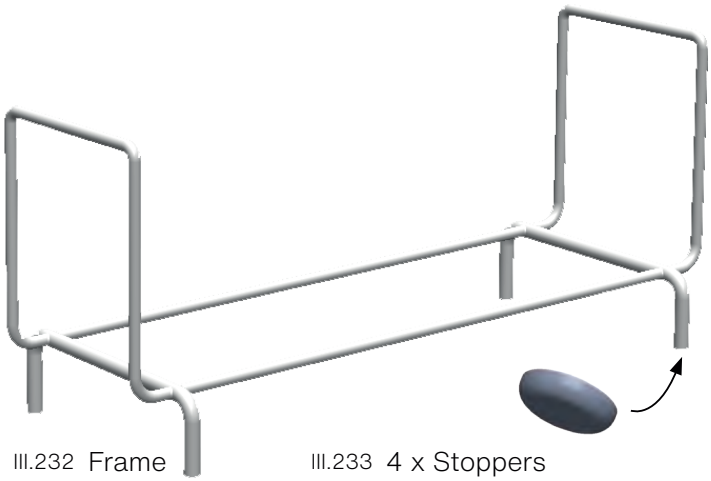
Ill.230 Shell part

Ill.228 Felt

Ill.231 Bolt

FRAME

The frame (Ill.232) is made of a standard steel profile where the top part, that is securing the shell, has a diameter of Ø30cm and the legs has Ø40mm. The entire frame is bended in the defined directions and coated with powder coating to avoid corrosion and provide it with a black color. In the end of every leg there is a plastic stopper(Ill.233) to avoid damage onto the floors.



Ill.232 Frame

Ill.233 4 x Stoppers

BLINDS

The pleated motion blinds (Ill.234) in the product will be provided from an external supplier, Luxaflex, with its function of shielding from light, cover from the surroundings and create good acoustics conditions with its two sided design (Ill.235) (Luxaflex, 2022a). However, the mount for them has to be made of sheet metal with a simple bending in order for the blinds to interface with the shells. There will be two mounts for each blind.

Ill.234 Mount for blinds

Ill.235 Pleated Blinds

Durability

Calculations

In order for the group to determine the durability of the product, calculations were made. The system was considered as a point load affecting a beam. Based on when a person sits in the product, this is referred to as a solid body that affects in a position x, in this scenario meaning the sitting area.(Ill.236)

The following was used to calculate the spring constant for the steel frame (Gere & Goodno, 2013, p. 1049) (Ill.237):

$$\delta = -\frac{pbx}{6LEI}(L^2 - b^2 - x^2)$$

Then isolate P for calculating the constant k (similar to Hooke's law):

$$F = \boxed{-k} * \delta \qquad p = \boxed{-\frac{6LIE}{bx(L^2 - b^2 - x^2)}} * \delta$$

The person sitting in the product is sitting on a mattress. This has to be taken into account in the calculation as well. To calculate the spring constant k in the mattress a compression test where made. (Ill.238)
Then internal stress, strain and E modulus is calculated to find the k:

$$k_{mattress} = \frac{\mathrm{E} * \mathrm{A}}{\mathrm{L}}$$

Where E is the E modulus, A is the area of a the butt, and L is the Height of the madras.

The system is then simplified by using the reciprocal value of the to k values:

$$\frac{1}{k_{eff}} = \frac{1}{k_{mattress}} + \frac{1}{k_{frame}}$$

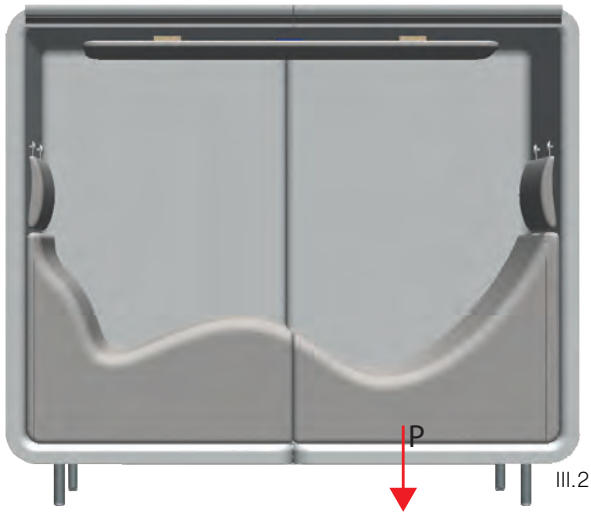
A scenario is set up with a man sitting down from a height of 0,3 m with a weight of 100 kg. From this scenario the quadric equations is solved, for delta:

$$\frac{k_{eff}}{2m * g}\delta^2 - \delta - h = 0$$

The deformation and k values is inserted into Hooke's law and the force is calculated. This force is used to calculate the internal stress in the beam at point of the load (Ill.239):

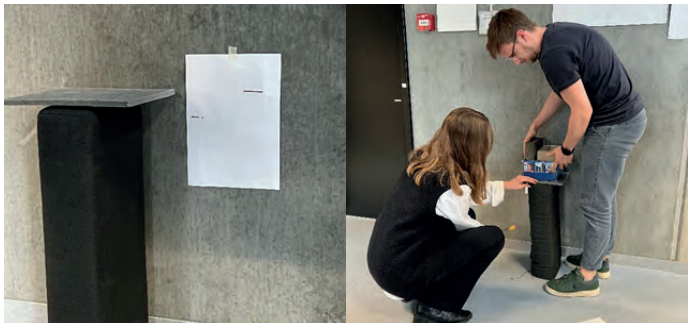
$$\sigma = \frac{M_x}{I}$$

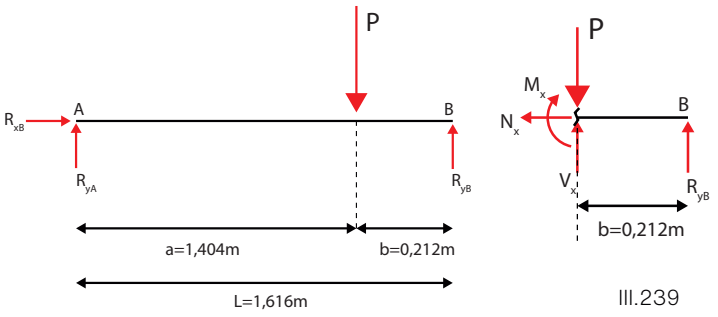
This results in a stresses of 2 MPa, wich should be ok because steel yeid is at 280 MPa.



Ill.236

Ill.237


Ill.238



Ill.239

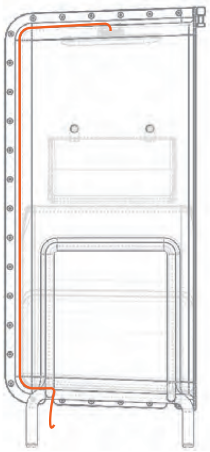
Conclusion

The system have a force of impact on 5249 N which will contribute to a deflection in the materials (the mattress and frame) of 10 cm. However, there is source of errors in the calculation of the system. The fact that the foam has different densities has not been accounted for. It is only the medium density foam that is included. The system was determined to withstand the impact of force. For more detailed calculations see Appendix 37.

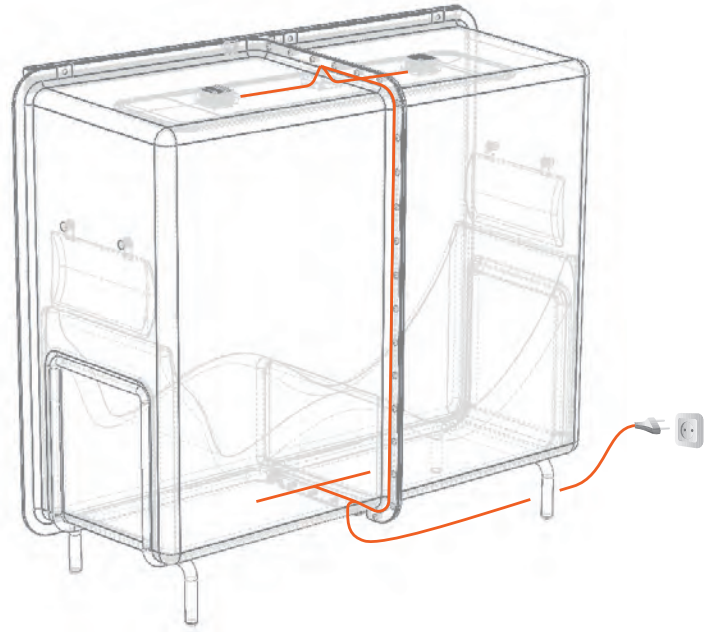
Wiring

Programming

The product is featuring LED light, ventilation fans, and pressure-sensors an in order for these to function wiring and electricity is required. The wiring in the product will follow the body of the shells tucked in-between to two shells and its bolts. (Ill.240).



Ill.240

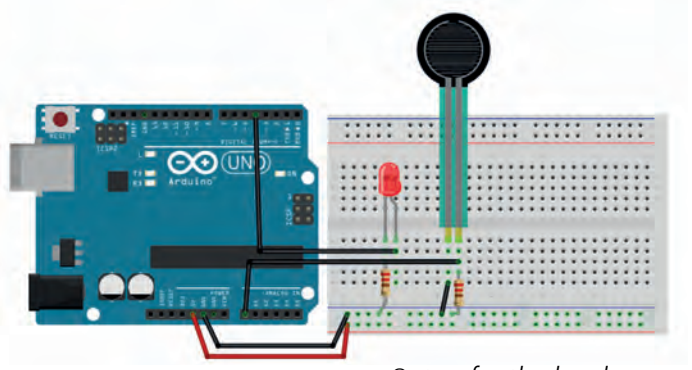


SHOWING THAT THE PRODUCT IS OCCUPIED

In order for the integrated system to function it will require force sensors connected to the LEDs in the bottom of the product(Ill.241) that will light up when the sensors are activated. The purpose for the system and programming is to inform if there is sitting or laying a person inside the product. Showing that it is occupied from the distance. The system consist of:

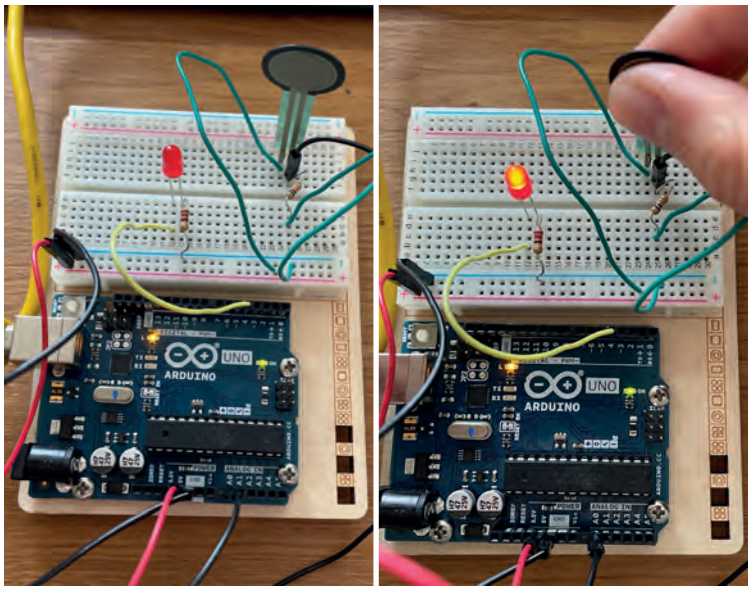
- A Force Sensing Resistor (FSR)
- A LED bulb
- Wires
- A resistor

The FSR functions as a toggle switch to turn the LED on and off (a flowchart is also illustrated the programming principle in illustration 242). Hereby, the LED, with a resistor, is added to the circuit, which is shown in the diagram below (Ill.243). The programming code can be found in appendix 38.



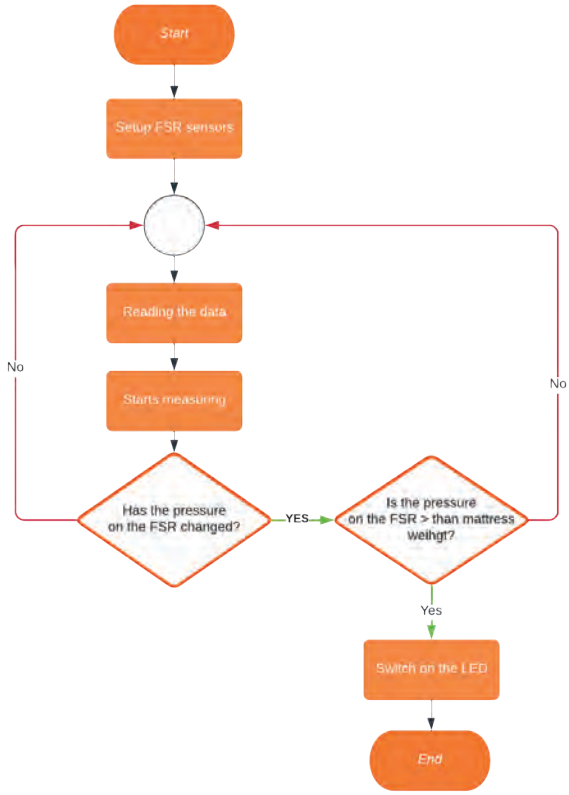
Ill.241 *Setup for the hardware*

Ill.243



Without force

With force



Ill.242 Flowchart repesenting one of the systems

Remote

For blinds and light

In order for the user to interact with the product's integrated light and motion blinds, it was necessary to ideate on a remote control. The defined operation options for the remote was: adjusting the light up and down, plus folding the motion blinds up and down.

The chosen motion blinds (p. 85) from Luxaflex (Luxaflex, 2022) has a remote "PowerView® Automation" controlling the blinds (Ill.244). The remote has many options, as it can be connected to several blinds within the home. Additionally, the design is standard for adapting to different blinds types (blinds lower, raise, tilt, and turn) within Luxaflex's product portfolio. The group wanted to scale the amount of buttons down so the user only has the necessary buttons for controlling blinds and light.

For inspiration the group looked at the wireless remote control from IKEA (Ill.245). Hereby, the design of the remote for the product was made with two buttons on the top with a larger sun indicating turning up the light, and a smaller sun indicating lowering the light. For the closing and opening of the two blinds, an up and down button for each blind were placed on the remote (Ill.246).

Ill.244
Luxaflex remote design for blinds (Luxaflex, 2022b).

Ill.246

Ill.245 IKEA remote designs (IKEA, 2022b)(IKEA, 2022c)

Conclusion

The remote for the product is necessary for the product to enhance its purpose: To fully enclose, where the adjustability and personalization of the product is very much depending on the function of the remote.

? What happens if the remote gets lost?
? Can the product function without the remote, what will the obstacles be?

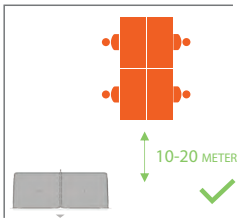
! Minimal operation
! The remote needs to have a "home" inside the product

Placement

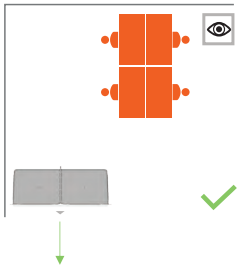
To give the user of Recover-in the best possible experience of the product it would be beneficial for the group to create a manual for installing the product for optimal placement of Recover-in at a workplace. Based on the feedback from Milestone 3 where it was noticed that a visualisation of the context was missing. Additionally, drawing inspiration from the installation of MuteBox(appendix 16). Six installing advices for optimal placement is listed hereunder:

Advice for optimal placement of Recover-in

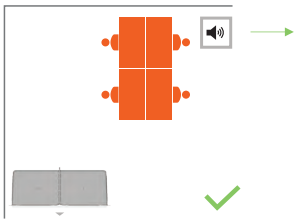
1
Place Recover-in at least 10-20 meters from the nearest workstation



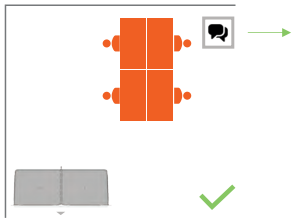
2
Orientation of the front of Recover-in is recommended to not be visual from the colleague's workstation.



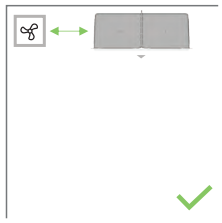
3
If possible, place Recover-in so the direction of speaking colleagues points away from it.



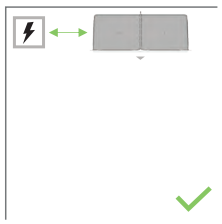
4
Do not place Recover-in directly beside coffee machines or other noisy elements.



5
Recover-in can advantageously be placed close to an ventilation device in the room, as it optimizes the air flow in the product.



6
Recover-in needs to be placed nearby a power-supply.



EXAMPLE OF PLACEMNT IN A OFFICE PLAN

Ill.247

! Needs to be placed nearby a power-supply.

Business model

In this section the overall business strategy, operational value chain and cost estimation are examined. An overall assumption is that a start-up company will be in charge of realising and selling the product, where it will be explored what the possibilities are within this configuration. The purpose is to suggest a business plan that demonstrate how to launch a product into a competitive market. In Appendix 39 a Business model canvas has been created to clarify the unknown unknowns regarding the business strategies, before the final path was chosen.

B2B MARKET

While estimation the production cost, the team was in contact with a Key Account manager, Johnny Aarup, from furniture fabric company, Gabriel. With an insight knowledge about the office inventory market, he suggested the group to utilize B2B market channels and already well-established brands, as it is very hard to break though on this market without a revenue stream or well-known brand.

100 DAYS RETURN RIGHTS / RENTAL SERVICE

When interviewing Kirsten Nabe-Nielsen (p. 25), she mentioned the dilemma of introducing a new type of product to companies. Therefore, she also suggested:

> I am thinking about, how you [the team] can get companies to dare to try this or invest in it? Maybe it was an idea to offer that you get a trial for the product. Because the basis is skeptical, you need to have an option of being able to strengthen the understanding of the need for the product on the workplace.

- Kirsten Nabe-Nielsen (appendix 3e)

By offering a, for example, 100 days trial. it will be possible for the company to test out if it actually is a product that would be used by their employees. Also, the company has less risk when buying the product. This is also the strategy, MuteBox is utilizing (Appendix 16). Also a rental service could be a strategy to extent the life-time of each product from a sustainable point of view.

EVALUATION

Right now the drawn up strategy is based on external suppliers localized in Scandinavia (Denmark and Sweden). Regarding cost it would be cheaper to outsource to other countries in Europe and still have the suppliers close, concerning quality check and transport. However is it a big value for the customer if the product is made in Denmark, which could have an impact in its saleable factor. This will be a dilemma between the cost and value of the product.

Operational value chain

ELECTRONICS

Electronics for the product as: LED light, sensors, ventilation modules, wires etc. will be ordered in bulks at different retailers that have the required parts. It will be benefical to find a supplier that can deliver all the parts to have a stable supply chain.

FOAM

claudius

The foam will be supplied from the Danish company: Claudius, that is specialized in furniture foam. The company was chosen, because they were able to provide with an estimate price on the two mattresses in the solution. The foam will be shipped to an upholsterer and covered with fabric.

FABRIC Gabriel®

The fabric manufacturer, Gabriel, will provide the fabric for the solution. They are specialized in providing fabric for the furniture industry. Sustainable is an integrated value in their brand, something the team values high when considering supplier. The fabric is sent to the upholsterer.

UPHOLSTERY

At the upholsterer the two mattresses and pillows are upholstered. It is evaluated that it would be possible to find a foam manufacturer that also could be in charge of the upholstery for saving a step in the supply chain.

METAL FRAME

NM SMED & MONTAGE

The frame will be produced at 'NM Smed & Montage', as they can bend and weld the frame. The company has contact with a painter, that can coat the frame with a powder coating. From here the frame is sent to the start-up company for assembly.

FELT SHELLS

NORDIFA Engineered Textiles

The shells are manufactured at the Swedish company, Nordifa, who also produces HAY's Nobody chair. They also provide the raw material for thermo moulding the shells. After the felt is moulded they will water jet cut excess material and holes in the shell.

RETAILERS

Martela
best workplaces.

møbel gruppen

INVENTARLAND

KontorMøbler.dk
Indretning på den nemme måde

dpj Workspace

The start-up company of Recover-in, will be in charge of the final assemby, programming, product development and support of the product. Later on, when expanding the business, it would be beneficial to outsource the assembly and storage/packaging.

START-UP

ASSEMBLY

When starting the company the early product versions will be tested and assembled internally, while the product is sold in low numbers.

OWN WEBSHOP

WWW.RECOVER-IN.DK

BLINDS Luxaflex

The blinds are manufactured and provided by Luxaflex. They will be sent to the start-up as a finished component ready to mount on the final product.

III.248

Cost estimation

Cost volume profit

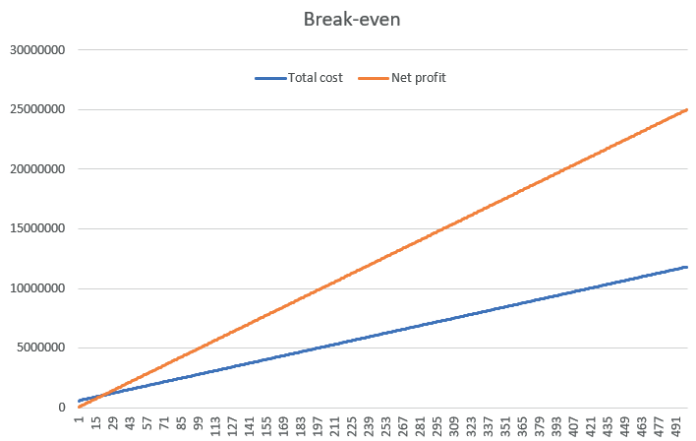
An economic analysis (Atkinson et al, 2012) a quantitative approach, was used in the circumstances of an estimation of potential cost of each the product. There are several cash outflows (costs) in the life cycle of the product in terms of money spend on the product, as well as the process of development; costs of production includes equipment purchases and tooling, wage and VAT (appendix 40). It should be noted that the electronic elements (sensors, print board, wires) are not included. An estimation of the cost volume profit (CVP) of the project's expected cash flows was used as a measure how many units need to be sold before turning a profit. In order for the CVP to be made, it was necessary to conduct a Bill Of Material (BOM) which can be found in the technical drawings folder on page 1. After having listed all parts of the product and clarified production methods an estimation of cost could be made(ill.249).

The break-even price was calculated, using the following assumptions:

- All cost are complete variable or fixed.
- Produced output quantity equals sales quantity
- Revenue pr. unit does not change as a function of sales quantity
- Fixed cost remain the same for alle levels of production.

From there the risk can be involved in the decision making of how many units do we need to sell before we cover the cost. With sales price sat at 50.000 DKK with 500 units.

Units	Revenue	Variable cost	Fixed Cost	Total cost	Net profit
1	50.000	22485,6	566828	589313,6	-539.314
2	100.000	44971,2		611799,2	-511.799
...					
21	1.050.000	472197,6		1039026	10.974



COST ESTIMATION AND CALCULATION III.249

Units produced	500		
Sales price	50000		
Variable cost	Quantity	Price	Total
Mattresses			
Both mattresses	1	2000	2000
Fabric (m)	5	75	375
PET felt shells			
Felt (sqm)	8	70	560
Bolts	25	5	125
Wage	0,16	500	80
Blinds			
The Blinds	2	6402	12804
Mounting sheet metal	4	21	84
Pilows			
Foam (Residual foam)	2	0	0
Fabric	1	75	75
Fasteners	4	5	20
Hangers	4	7	28
Top plate			
Plywood top plate	1	100	100
Fans	81	2	162
Foam (Residual foam)	1	0	0
Fabric	1	75	75
LEDs (5 m)	1	75	75
Frame			
Steel profils	1	3000	3000
Powder coating	1	1175	1175
Assembly	1	200	200
Opholstry (hours)	5	400	2000
Total variable cost			18738
Total V Cost +VAT	1,2*		22485,6
Fixed cost			
Tooling for shells	2	283414	566828
Total fixed cost			566828
Profit pr unit			26380,744
Total profit			13190372
Contribution margin per unit			52,76 %

Conclusion

In order for the product to break-even, 21 units of the product needs to be sold to cover the costs of manufacturing (break-even). Gathering of prices for the product was qualitative by reaching out to supplier with phone calls and emails There is a large opportunity in getting better prices, at other suppliers by reaching out to more.

What are future possibilities?

As the design of Recover-in is based on a trend, it is relevant to ask what the future possibilities will be for such a type of product. Also, the impact on how we will decorate and build work places in the future. The reflection is based upon the model of Richard Normann “Reframing business” (Normann, 2001). In Ill.250 the past, present and future system is mapped out.

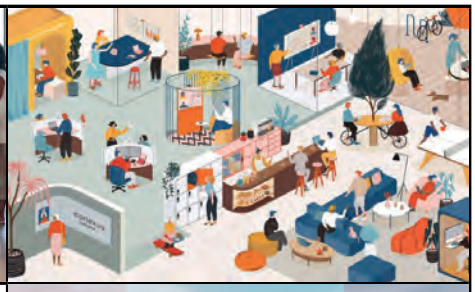
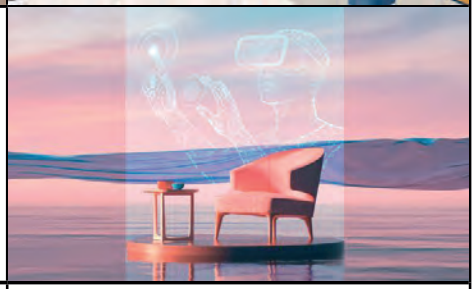
‘Yesterday’ is split up in two, as the near past is related to being sent home and forced to work from home during the pandemic and the past is the ‘old normal’ where people worked traditionally at their work place before Corona. In the past, there was no need for having a specific place for taking a break in privacy. This was first discovered after working from home, where the employees had a new need for seeking away from the home-built work station and relax as much as possible in their preferred way, for example laying on the couch reading a book. So, the near past the system is the couch.

Today the system is defined as the team’s solution in the context of the on-going implementation process of Hybrid Work in companies. Here the super-system, the work places, are trying to re-decorate their existing offices to fit with the new needs of the employees. Comparing the sub-system of Today with the Near past, electronics have been integrated to create and replicate the personal, relaxing experience as being at home, translated to a professional super-system.

Trying to predict and reflect upon the future of this type of system, it will very much be depended on the future technology and how we will re-think the super-system. Hereunder, the layout of work places in an architectural matter. It is considered it will be much more zone-defined (as mention on page 55-56), where the individual employee does not have one permanent station, but can structure their own work flow.

Within the sub-system, the materials of the product will be affected by how we in the future will recycle and process raw materials to meet sustainable goals, for example, creating foam of plastic granulate, food scraps or other bio degradable materials.

Regarding the future’s technological sub-system, the product could create the ultimate personal experience by utilizing virtual reality and sensors. The sensors could measure your health and create conditions regarding comfort, light and climate that fits you the best, by recognizing the individual using the product. The virtual reality can be used to “travel” you wherever you want; the forest in Red Wood, The middle of the desert or to the Moon.

	YESTERDAY		TODAY	FUTURE
	PAST	*NEAR PAST*		
SUPER-SYSTEM				
SYSTEM				
SUB-SYSTEM	-	Materials: Fabric, wood, foam & metal Undefined, static comfort No electronics	Materials: Recycled felt, fabric, foam and metal Defined two-part comfort Pressure sensor, LED light, ventilation, electric blinds	Materials: Bio/granulate foam?, smart fabric?, granulate, wood/reused plastic frame, compressed reused textiles felt? 100% individual comfort adjustment VR experience, Body/health measurement sensors, person identification, color spectrum light, “smart closing”?, personal ventilation adjustments

Ill.250

Final Design Brief

For collecting all the elements that has directed the design process, a final design brief was created. With the intention of clarifying the final framing of the project, a systematization with all requirements have been listed together with the origin of the information behind each specification.

FRAMING

The framing of this project is to create a piece of furniture for office spaces, where it is possible to take a comfortable break covered from surroundings.

III.251

PROBLEM STATEMENT

How can a workplace tap into the hybrid work trend by offering a time-out place for privacy and immersion?

III.252

VALUE MISSION

The product must give a feeling of **disconnection** while providing **immersion** for the employee, creating a place for **relaxation** at work.

INTERACTION VISION

The product must fit into a **professional** environment while being **private** and **flexible** in usage for taking a break and cover from surroundings.

III.253

III.254

Final Design Brief

		NO.	REQUIREMENT	PAGE NO.	REFERENCE	QUALITATIVE/ QUANTITATIVE	UNIT
FIXED REQUIREMENTS	Light	01	Must illuminate the inside of the product with adjustable light from 0 - 345 lumen	38-39	Light test	Quantitative	lumen
		02	The light source must not be visible for the user	38-39	Light test	Qualitative	generic
		03	The light must have a warm color (2000-2200 K)	38-39	Light test	Quantitative	Kelvin
	Noise and surroundings	04	Must absorb noises from surroundings (Max. 35-40 dB inside the product)	38-39	Noise test	Quantitative	dB
		05	Must aware the user in case of a possible evacuation	37	Fire restrictions	Qualitative	generic
	Comfort	06	Must be able to both lay and sit up	47 + 59-61	Multiple use and comfort	Qualitative	generic
		07	The sitting height must be 0,52 m	68	Prototyping and user test	Quantitative	meter
		08	The laying height must be 0,45 m	60-61	Prototyping and user test	Quantitative	meter
		09	The inner depth must be 0,7 m	61 + 67-68	Prototyping and user test	Quantitative	meter
		10	Must have ventilation for air flow inside the product	24+43	Survey and prototyping	Qualitative	generic
	Privacy & Adjustability	11	Must indicate when the product is occupied	49	Mapping out prior concept	Qualitative	generic
		12	The enclosing must be adjustable in covering-level	67-68	User test	Qualitative	generic
		13	The enclosing must be two-sectional	68	Prototyping and user test	Qualitative	generic
		14	Must not give a claustrophobic feeling when fully closed	61	Prototyping	Qualitative	generic
		15	A remote is needed to control the blinds and light	66+88	Research	Qualitative	generic
MINIMUM REQUIREMENTS		16	Must maximum cover a ground space of 2,8 x 2,8 m	37	Mutebox interview	Quantitative	meter
	Inside experience	17	The seating must be adjustable for personalization	40 + 67-68	User tests	Qualitative	generic
		18	Must be a one person product	12 + 56	User needs	Qualitative	generic
		19	Must block out 70-85 % of the light from surroundings	23-24 + 80	User need → re-framing	Quantitative	Percent
	Product in function	20	Must enhance the trend of Hybrid Work	35-36+ 55-56	Observations, interviews and research	Qualitative	generic
		21	Must be cleanable	25	Expert interview	Qualitative	generic
		22	Must be integrated in an office environment	21-22+ 35-36	Context and visiting companies	Qualitative	generic
		23	Must not invite for productivity	74-75	Product uniqueness	Qualitative	generic
		24	Must have space for bringing personal belongings inside the product	67-68	User test	Qualitative	generic
		25	Must be installed 10-20 meter away from the work stations	29-30 + 89	User journey and placement	Quantitative	meter
WISHES	Aesthetics	26	Must have an honest and function-defined form and construction	55-56 + 62	Conceptualization and research	Qualitative	generic
		27	Must have an anonymous outside expression	62	Conceptualization	Qualitative	generic
		28	The shape of the seating must reflect its functions (a sitting and laying position)	60-61	prototyping	Qualitative	generic
		29	Must blend into the context of an office environment	30	Scenario	Qualitative	generic

VII.

EPILOGUE.

Chapter summary

The last chapter concludes on the project followed up with a reflection that elaborates upon the process and its progression, decision-making, and the product itself. The group is also zooming out to reflect upon what they learned from dealing with a very wicked problem and use the key learnings in future projects. Finally, a reference- and illustration list is gathered.

Conclusion

CHAPTER 1
Migraine is a neurological disease that occurs as severe and frequent headaches. It is the thirds greatest disease in Denmark and around 640.000 suffer from it, costing the society 1,2 billion every year, while the treatment process is largely unsuccessful. The perception of migraine is diverse in every field and influence the patient in many ways other than just pain. To solve this, migraineurs use a lot of coping strategies, and self treatment. There is a lot of solutions for treating headaches during an attack, but these product are mostly for home use, therefore the framing of this project was to pursue migraine at work, with the intention of designing a safe-space at work to recover during a migraine attack.

CHAPTER 2
Brainstorm on value vison was created to create a sense of what is important for the user. Then three concept themes was created to open up the solution space, and then one theme was chosen to proceed with. From this, a user scenario and design brief was created to be able to make three viable concept ideas, and then presented at Milestone 1.

CHAPTER 3
More knowledge was gathered from stakeholders to understand working culture, but also to learn how the context would look like. Light and noise test showed that migraineurs don't like total darkness, and the maximum noise level could be defined as the noise of light rain. Ergonomic testing showed that a modification of zero gravity laying position had to be modified to be acceptable. Prototyping, conceptualizing, and testing again created the boundaries for a design brief, and a concept for Milestone 2 was created. The feedback for the concept was not good, and the project pivoted.

CHAPTER 4
The solution was mapped out and evaluated in relation to the user case, which showed that it did not solve the problem space nor fulfilled the requirements. Therefore a reframing of the project was constructed to try understand the problem space better. Cognitive mappings of the customer and user journey were done for creating an internal overview of the group's insights at that time, resulting in re-defining the value mission and interactions visions.

CHAPTER 5
A new direction in the solution space was examined from earlier research, which led to new tests, concept and many iterations until a solution emerged. What shaped the new direction was a user test, an aesthetics exploration, product architecture, manufacturing and closing mechanism. A new model in communicating the solution was used and was very beneficial in communicating the project, for a better feedback.

CHAPTER 6
An iteration on the problem space resulted in removing the focus from migraine to only focus on the hybrid working environment. The product was detailed using different design strategies, such as design for repair, upgrade, product recovery etc. to have a result that is leaning towards Circular Economy. These strategies correspond well with product architecture for vertical scaling, therefore is the result a modular piece of furniture where it is possible to take a comfortable break in privacy, covered from surroundings of the office space.

Product reflection

A Project is never finished, its just abandoned, therefore there is still plenty of areas for optimization and opportunities. The product proposal therefore has some shortcomings and room for better ideas.

Shell
Right now the shell is made of two mirrored shells produced using two different tools. It would be much cheaper only using one, and also reduce the start investment cost. This will allow the number of units produced to be smaller, and therefore also reducing risk in investment. To be able to do this, the shell needs to be symmetric in both the y- and x-axis.

Remote
The risk of loosing the remote is high and a alternative coud be creating a stationary solution. Its interaction is lacking and needs further development, because the remote holds the product's key interaction concerning privacy and personalization.

Blinds
The blinds on the product is the largest expense in the product. There is many other blinds that does the same, for a much cheaper price, therefore this would be the best area to reduce cost of production. Another approach is to cut Luxaflex in on the product, and create a partnership with them, giving them free promotion, keeping the logo in the product, and they could provide the blinds at a discount or for free.

Probing the market
Probing the market with the product, in earlier phases would have given the product a better case compared to pricing. Furthermore, it could have provided sense of how much a costumer would be willing to pay. This would also be a good case for getting investors on board. An example could be, that you already have ten costumers willing to pay, we just need funding to create it.

Reflection

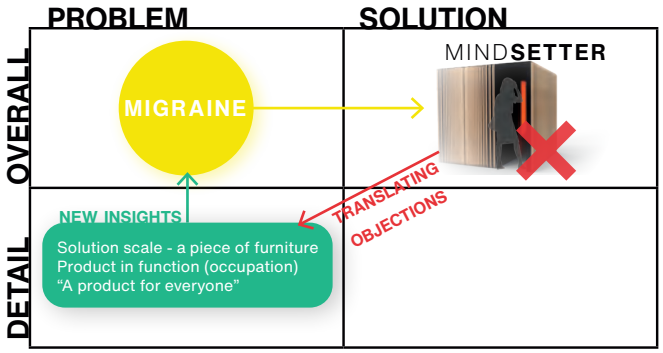
On process and approach

WORKING WITH AN EXTREMELY WICKED PROBLEM

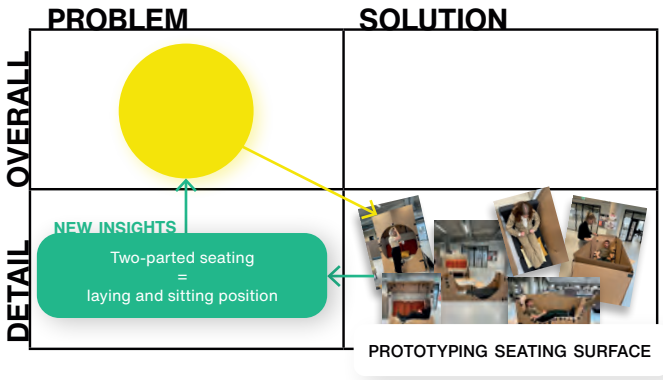
When the team started the project, they could not visualise and imagine what the final solution would be, they just had a piece of paper with the topic “Migraine” written on it and then they locked themselves in at the university. But not long time after the team was storming out of the building to seek information. This is also how Rittel formulate the properties of a ‘Wicked problem” (Rittel, 1972). The foundation of the project was based on a wicked problem, an ill-formulated problem where the amount of information and the far-reaching user and expert crowd were confusing with conflicting values. Therefore, the group also knew that they have put themselves in the middle of the forest, where it was a possibility that they would not find a way out - a frustrating challenge and journey that would have resemblance to torture. The result of working with an extreme wicked problem, as the group did, was that they had several turning points during the process, because the navigation through the forest can lead to the wrong path.

Shifting between problem and solution, was something the team had to tackle all the time as they had many contradicting but also highly prioritized demands. An example was the development of the concept “mindSETTER” in chapter 3. Here the group created an overall solution and tried to incorporate all sorts of details in the conceptualization rounds. Here the group got very bad feedback at the status-seminar (Milestone 2 p. 47) and firstly “blamed” the supervisors for not “understand the concept correctly” but also hit the bottom mentally and asked themselves: ”*Do we need to start all over two months into the project? Can we not use any of our research?*”. But as Rittel states regarding wicked problems: “*the solver of a wicked problem have no right to be wrong. He is responsible for what he is doing.*”(Rittel, 1972, p. 392). So instead of blaming everyone else and planting the white flag inside the forest, the group zoomed out and analysed what the objections were on the “bad concept”, to achieve knowledge about the details of the problem, that provided new information to the overall problem and framing of the project (Ill.255).

From here the group could execute much faster by solving details of the solution instead of trying to solve everything at once. For example, after Milestone 2 the group detailed and prototyped on the seating surface and user experience without having an overall concept. This provided detailed information about the problem and solution, where the group could progress from that in an iterative process (Ill.256).
The same was the case when killing the darling, migraine, where the requirements and some of dilemmas from the original framing could be translated into the new framing of Hybrid Work.



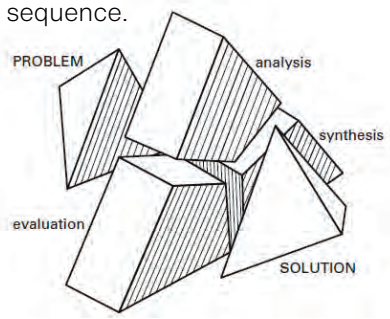
Starting with a too big problem to grasp and then trying to come up with an overall solution that is objected. Instead of giving up, the objections is utilized to gain new information about the details of the problem (Haase & Nhu Laursen, 2020). Ill.255



Speeding up the execution by solving details and obtaining insights about details of the problem. (Haase & Nhu Laursen, 2020). Ill.256

PROCESS APPROACH

The process of this project has been far from linear, a lot of iterations have been made along the way as a part of new understandings about the wicked problem. An idea of how the process was can be found in (Lawson, 2005) where problem, analysis, synthesis, evaluation, and solutions is different blocks, where the processes is in no direct order and can move freely in-between all of these blocks at any given time. This resembles the teams process in navigating in a wicked problem; constantly moving in-between, back and fourth these blocks. The block that caused the team most issues was the synthesis block, especially in the process of making the concept of MindSETTER. What then got the team back on track was to map out the data behind the concept (synthesize), and then evaluate (p. 49) the concept from the synthesis.
By moving back and fourth between solution and problem many times: analysis, evaluation, and synthesis is forced upon you. For example when evaluating MindSETTER (solution) more questions was generated about the problem. This leaded to analysis with tests, evaluation of these, and in the end synthesis of the data. All combined to a solution. This process is repeated many times, and not always in this sequence.



Ill.257

A HITCH-HIKERS GUIDE TO WICKED PROBLEMS

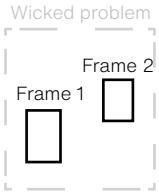
Zooming out and reflecting on the process, the group has some strategies that they would use again and some danger signals that they should be more aware of when dealing with a wicked problem and working with inclusive design (Morales, 2021).

AGILITY

The process ended up framing a paradigm shift, which can be categorized as a complex problem containing a lot of unknown unknowns (Snowden & Boone, 2007). For it to work, a design must be very agile in decision making, and open for opportunity, when new data emerge. This is not easy. For example, when the team received the knowledge of that workplaces do not care about migraine, a new way of creating the solutions was presented, this led to the research in the customer segment, and a gap presented itself with the new way of working, post corona. Here, the group could have been more agile, and act on the data, focusing more on hybrid work, than migraine. Additionally, a determination on the pattern that emerged would have been beneficial (Snowden & Boone, 2007). After having experience with navigating within a complex problem, the group would in future project when facing a complex problem be more aware of letting pattern to emerge and synthesising insights, instead of keeping collecting more data and let it accumulate. Here it would be beneficial to utilize approaches that encourage reflection and interactions; as Clustering (Kolko, 2011), cognitive mapping (Martin & Hanington, 2012) and mind-maps(Tollestrup, 2004), that helps clarifying and systemizing patterns and most importantly reducing complexity.

FRAMING

When working with wicked problems, framing is a way to handle the ill-formulated, open ended and ambiguous problem. The frame creates a proposal for how the solution could be, in order to obtain the desired value. By constructing this frame it creates understanding of the problem, and a direction or vision for the solution.



Ill.258

This showed to be applicable when changing direction from a room, to designing a furniture. Here the framing of the product was changed from one frame to another (Haase and Laursen, 2018). When tackling extreme wicked problems in other cases, it will be beneficial to implement the product DNA framing early in the project, in contradiction to the group's project that first implemented it after they already got lost in the forest.

By introducing it earlier in the process it will help reasoning the solution and navigating in the fuzzy front end; slicing the complex problem into minor manageable product framings (e.g. market-, expression-, and interaction frame). Most importantly, when phrasing the product framing internally in the team, it can be utilized to explain the product DNA to outsiders, which could have helped the group communicating the solution and problem space better at Milestone 1 and 2(Haase and Laursen, 2018).

DANGER SIGNALS IN THE DOMAIN OF WICKED PROBLEMS

There are some danger zones when dealing with a wicked and complex problem. Such as temptation to fall back into the habitual command-and-control mode. This is where the solutions become locked, and there is no room for patterns to emerge. This is often caused by impatiens or difficulty in handling failure (Snowden and Boone, 2007).
This happened during the conceptualization phase when the shell was "done" the fitting of the enclosing mechanism had to fit the shell. But for this to happen the shell that was just finished, needed to be changed ones again. This process could be done more efficiently with the proper knowledge about the pit falls. For others to learn from the group's mistake, iterations could have been avoided by being better at evaluating and reflecting, and not executing all the time in urge for solving all at once. Methods that are effective for this is among others: the selection chart from "Engineering Design" evaluating one or more solution variants up against each requirement, Stakeholder Walkthrough(presenting early prototypes to stakeholders and end-users) (Martin & Hanington, 2012, p. 168) and as the team's project was very depending on emotion and 'including design' a desirability Test could have been done: Having participants to describe presented mock-ups and drawings with 3-5 adjectives (written on index-cards). This would have avoided that the group just chose what they thought was the 'best' solution, to which concept awaken the optimal and desired emotional response, when using/seeing the product (Martin & Hanington, 2012, p. 64).

UTILIZING THE PRINCIPLES OF INCLUSIVE DESIGN

From a retrospective view, it became clear for the group, that they actually designed from principled of Inclusive Design: considering the full range of human diversity, empowering product designers to create products whose experiences serve as many people as possible" (Morales, 2021).
The inclusive design principles consist of (Morales, 2021):

1. Seek points of exclusion to generate new ideas and come up with new concepts for inclusive solutions.
2. Identify challenges related to the context – When is the user unable to use a product effectively?
3. Avoid personal bias – include user in the research and prototype phase.
4. Offer various ways to engage key principle for inclusive design, giving users different options that fits them best in their unique circumstances.

Even though, the principles of Inclusive Design is mostly targeted for UX designers, Industrial designers can utilize the principles when dealing with a user-centered wicked problem forward.
The principles can be translated to actions in the team's project as:

1. The group started be identifying that the patients with migraine are experiencing stigma, also at their work where they are afraid of having too many sick days and that their employer might not understand them. Therefore the group saw a gap for including the migraineur at work to make them feel more comfortable and create a safe space for them.
2. When identifying challenges in the user's context, it became clear that the solution needed to be placed away from the working area and the product should be available to everybody.
3. Users were included in the prototyping phase to test light and noise conditions and prototyping the seating area.
4. A key functionality in the product proposal was to make space for personalization and adjustability, regarding the blinds, seating zones and lighting.

Therefore, the group sometimes, succeeded incorporating principled from Inclusive Design, in the future it would be smart to consider this in the start of the project to direct the research and concept development process even more.

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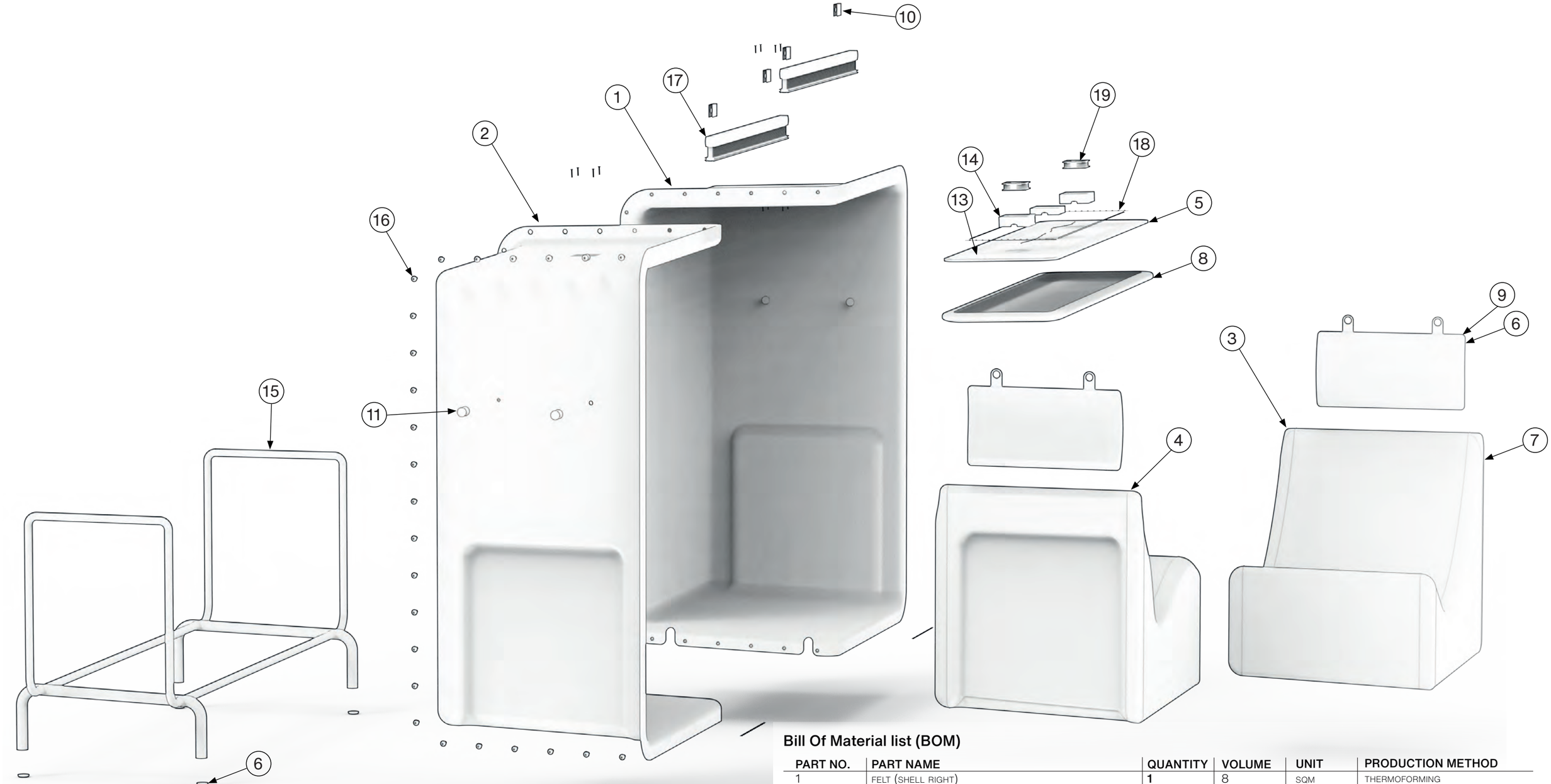
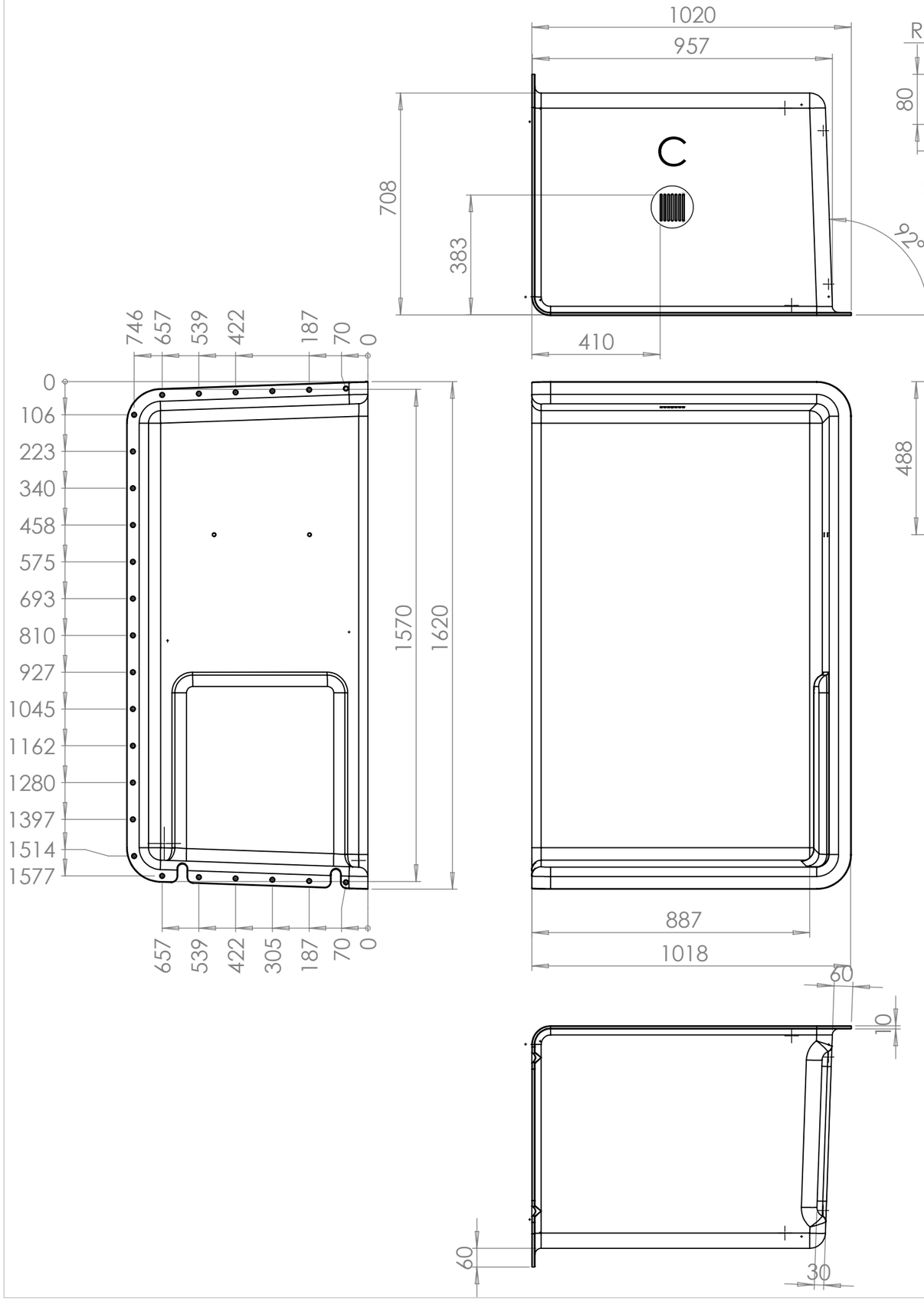
Illustrations list

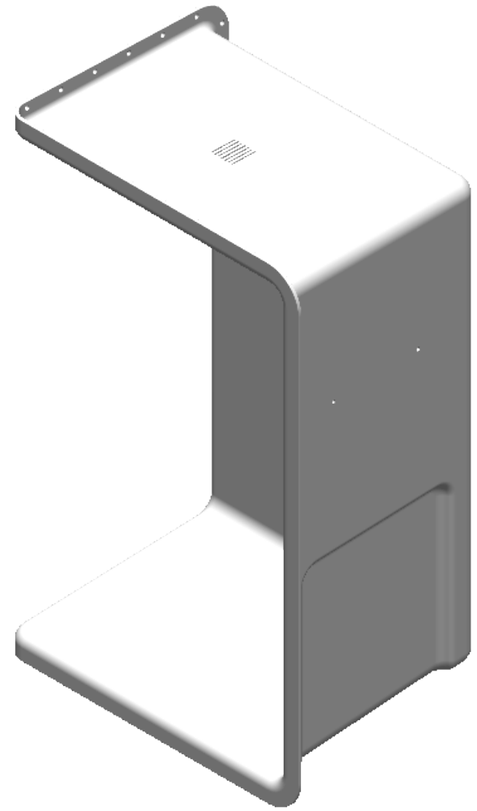
AALBORG
UNIVERSITY



Bill Of Material list (BOM)

PART NO.	PART NAME	QUANTITY	VOLUME	UNIT	PRODUCTION METHOD
1	FELT (SHELL RIGHT)	**1**	8	SQM	THERMOFORMING
2	FELT(SHELL LEFT)	**1**	8	SQM	THERMOFORMING
3	COLD AND POLYURETHANE FOAM (FOR LAYING MATTRESSES)	**1**	0.27	CUBIC METER	CNC FOAM CUTTING MACHINE
4	COLD AND POLYURETHANE FOAM (FOR SITTING MATTRESSES)	**1**	0.23	CUBIC METER	CNC FOAM CUTTING MACHINE
5	COLD FOAM (FOR TOP PLATE)	**1**	-	CUBIC METER	CNC FOAM CUTTING MACHINE
6	POLYURETHANE FOAM (FOR PILLOWS)	**2**	0.01	METER	CNC FOAM CUTTING MACHINE
7	FABRIC (FOR MATTRESSES)	**1**	5.77	SQM	UPHOLSTERY
8	FABRIC (FOR TOP)	**1**	1.60	SQM	UPHOLSTERY
9	FABRIC (FOR PILLOWS)	**1**	0.6	SQM	UPHOLSTERY
10	MOUNTING (FOR BLINDS)	**2**	-	-	SHEET METAL BENDING
11	FASTENERS FOR PILLOWS	**2**	-	-	-
12	HANGERS	**2**	-	-	-
13	MDF PLATE	**1**	0.017	SQM	CNC MILLING MACHINE
14	MDF BOX	**2**			CNC MILLING MACHINE
15	STEEL FRAME	**1**			BENDING AND POWDER COATING
16	BOLTS	**25**			
17	BLINDS	**2**			
18	LEDS	**1**	5	METER	
19	FANS	**2**			
20	PLUGS	**4**			





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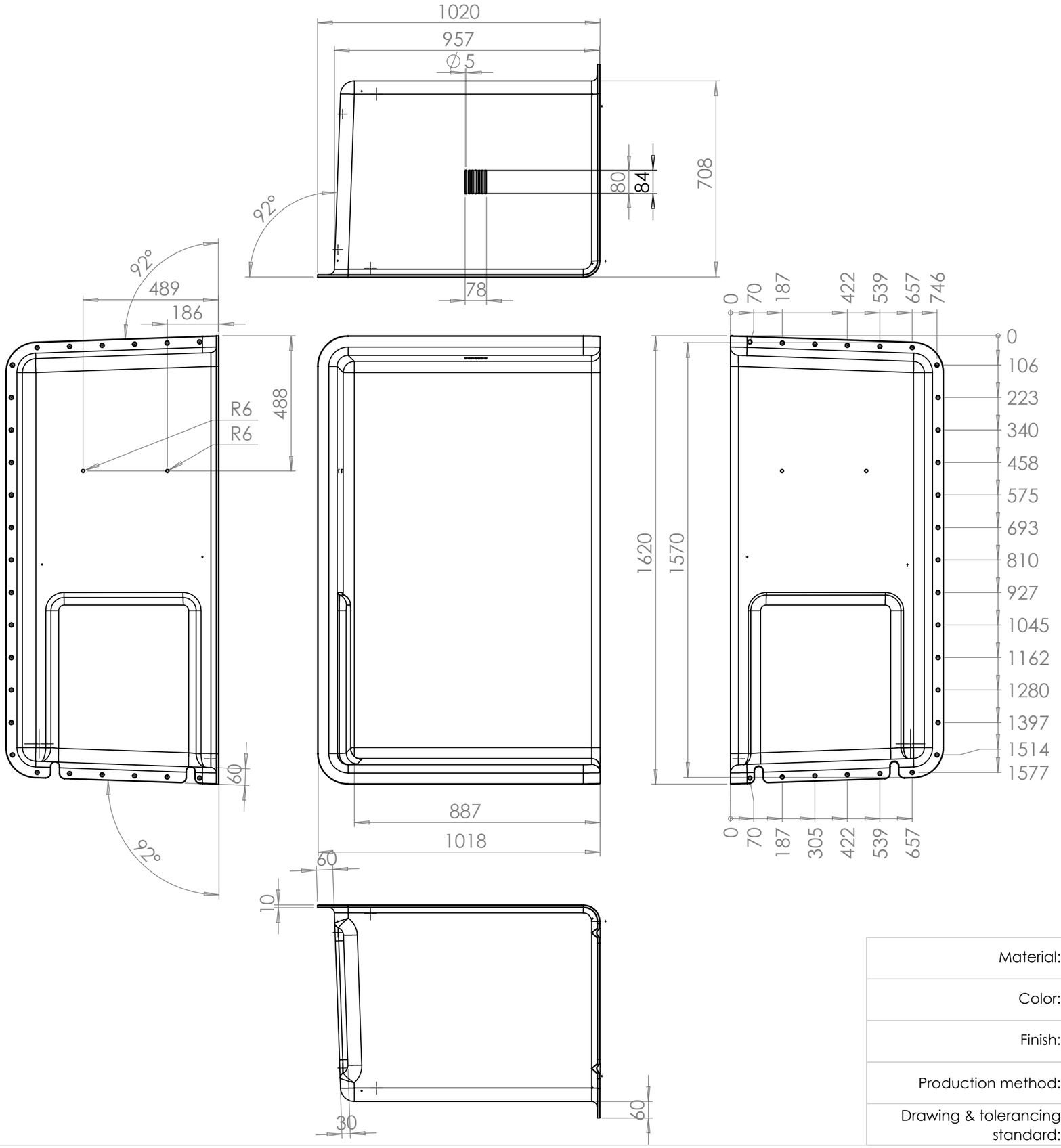

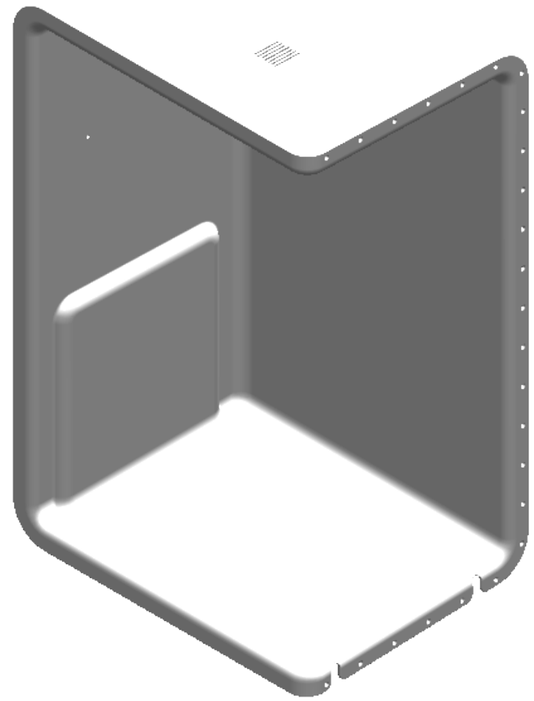

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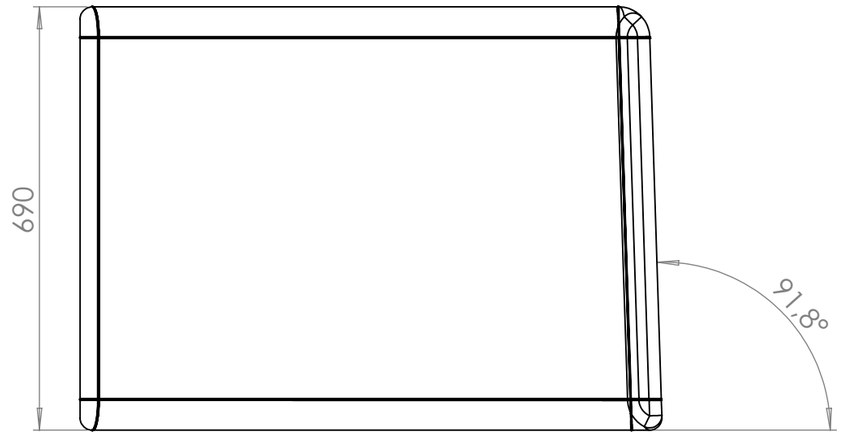

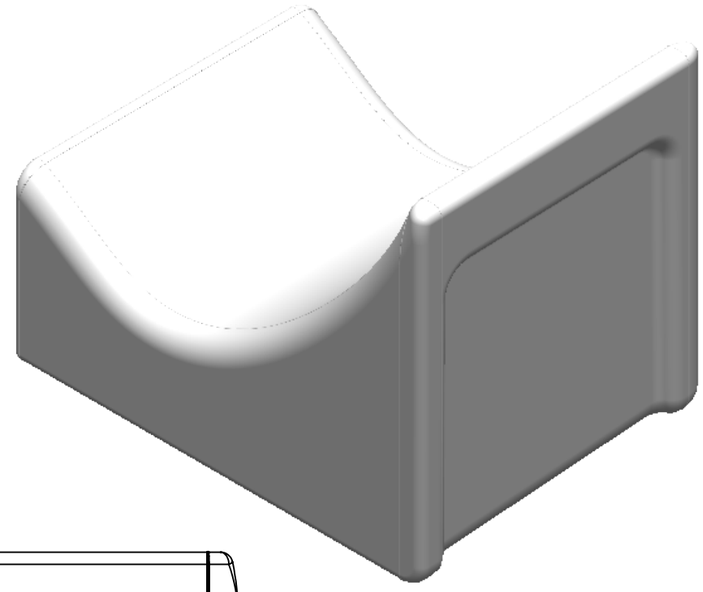

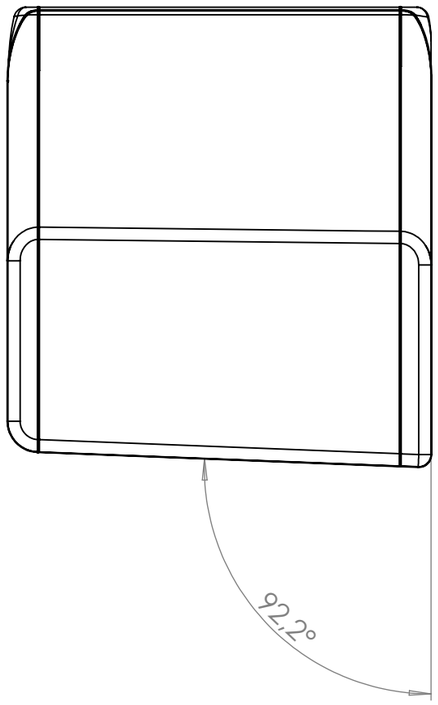

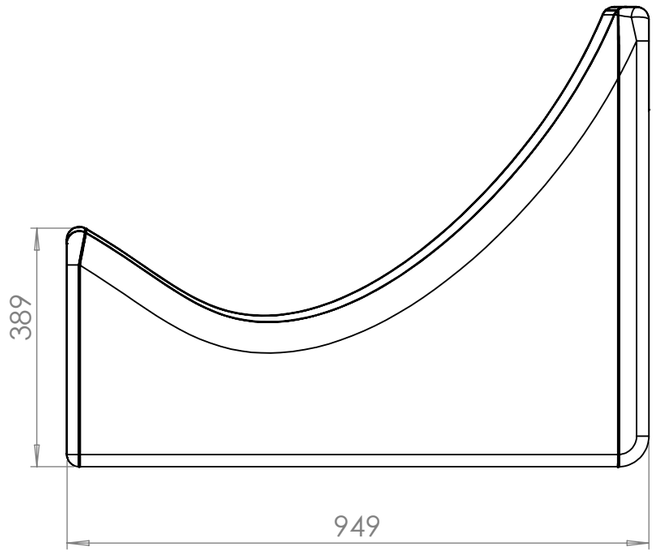

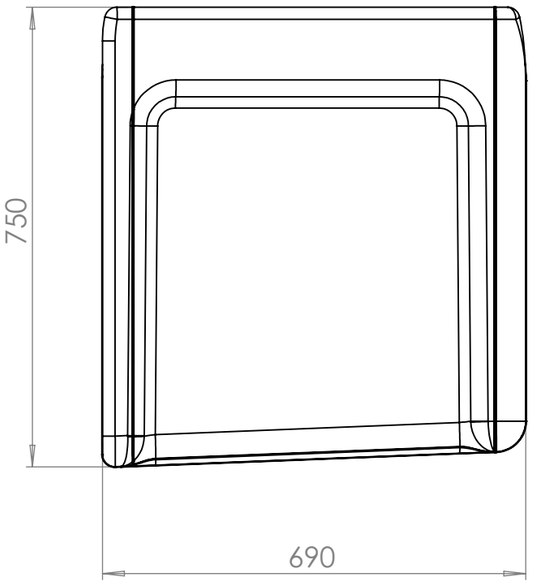

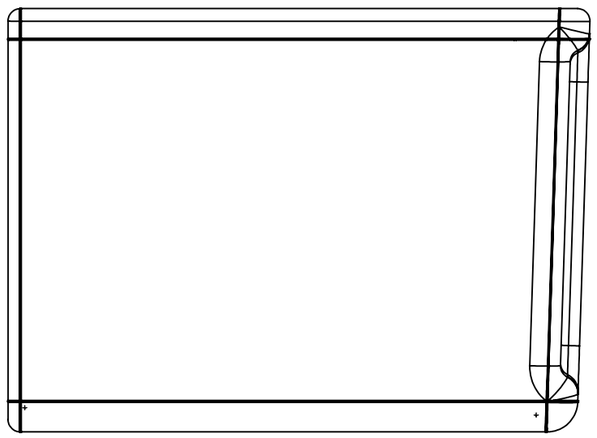

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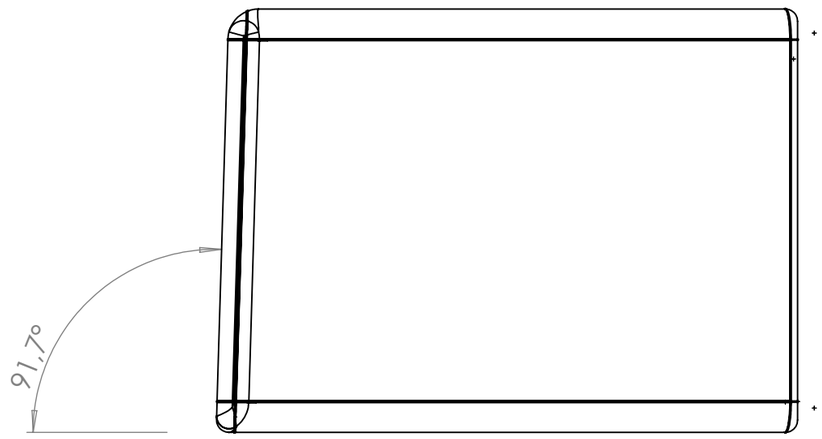

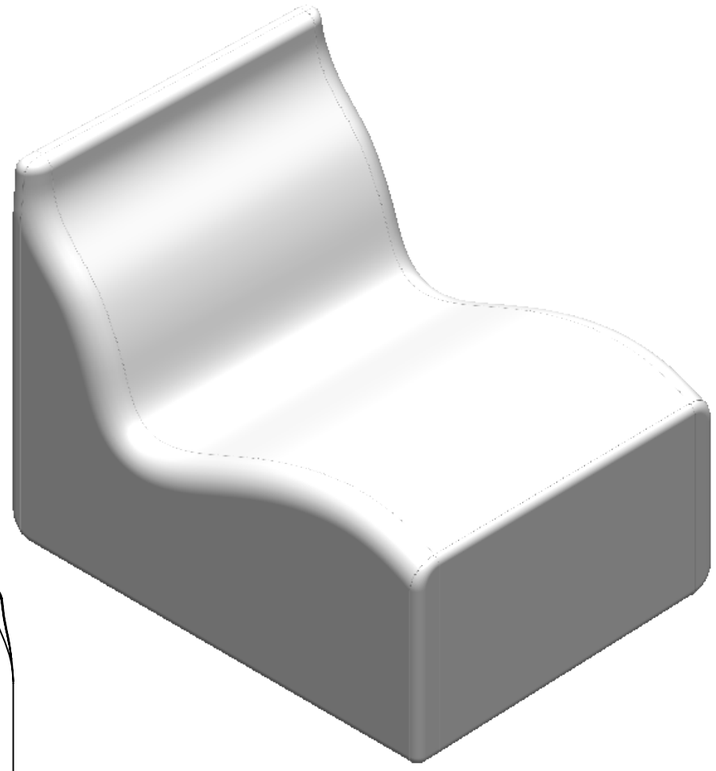

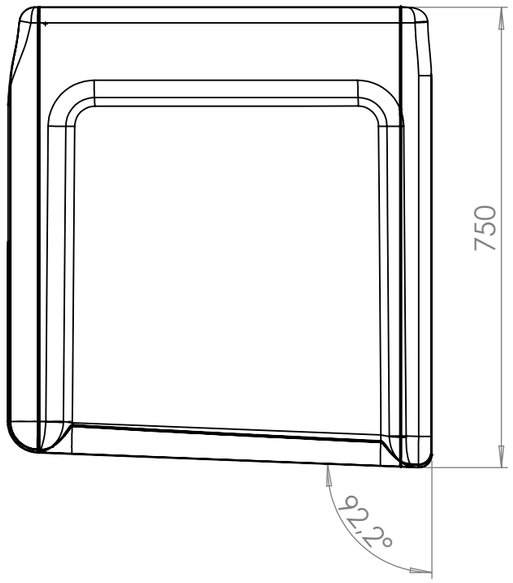

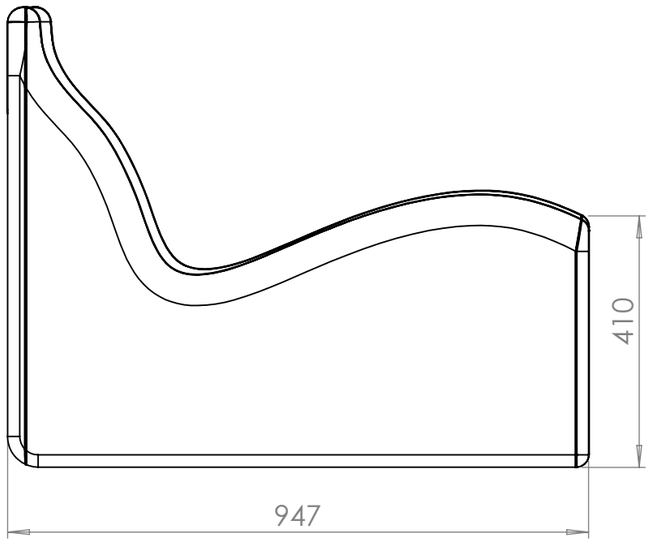

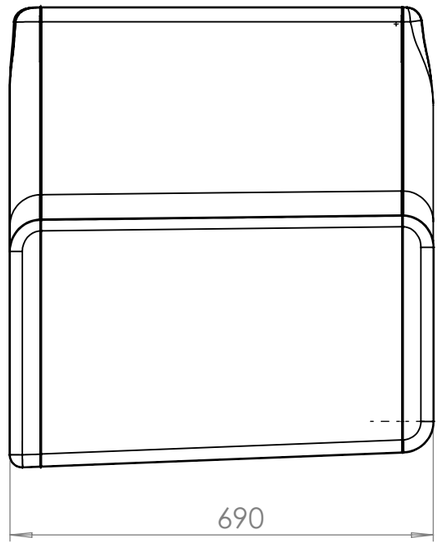

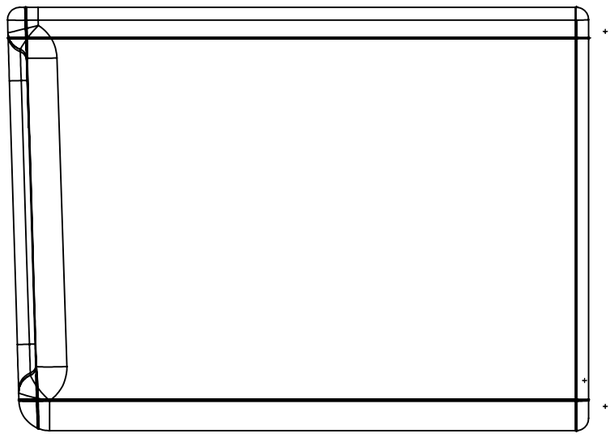

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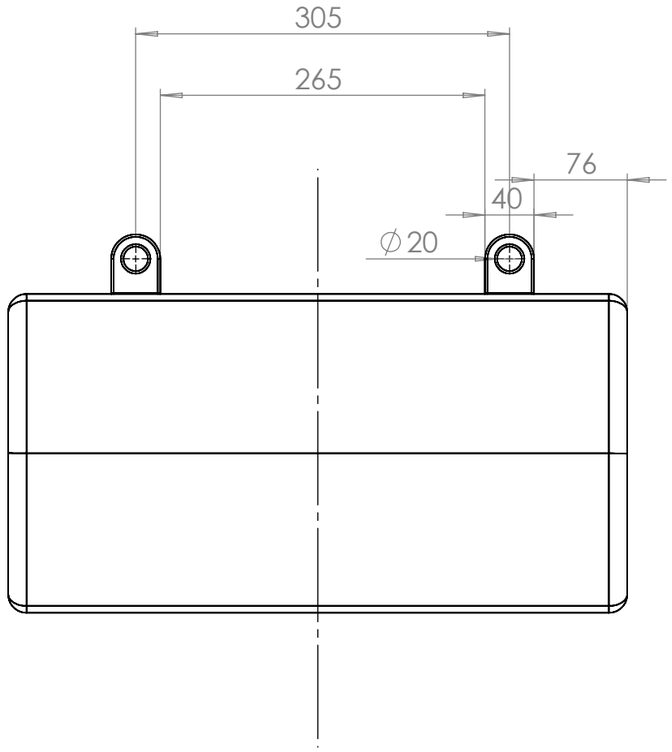
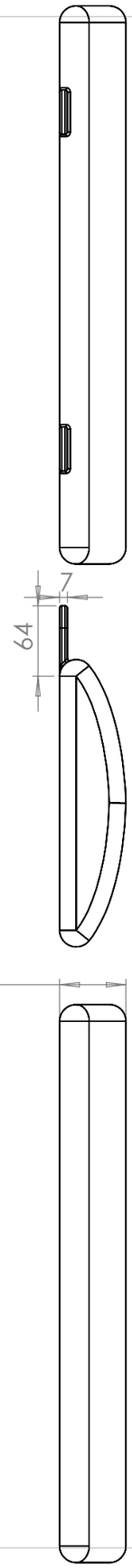
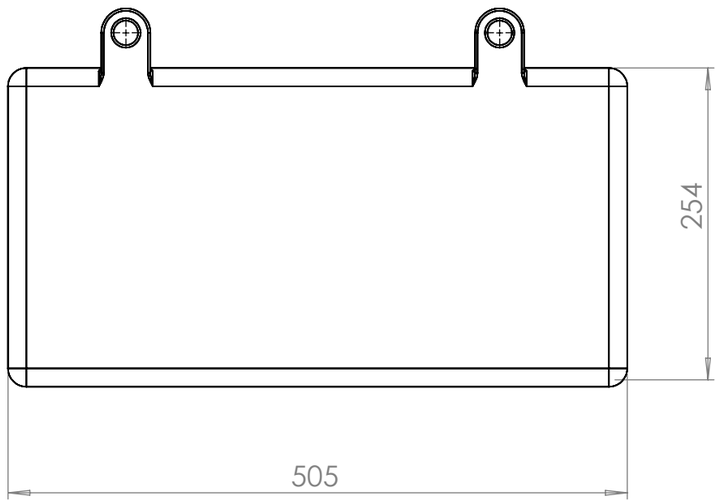
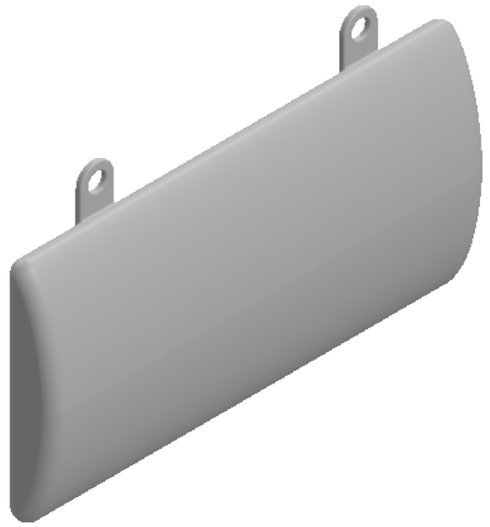
Color:	White	Document type: Technical Drawing	sheet format: A3
Finish:	As-Machined	Title: Recover-in Sitting Mattress	DWG number: 4
Production method:	CNC foam cutter		
Drawing & tolerancing standard:	ISO 2768 - medium	PART 4	Rev: / date of issue: 23-05-2022 / Sheet: 4/9

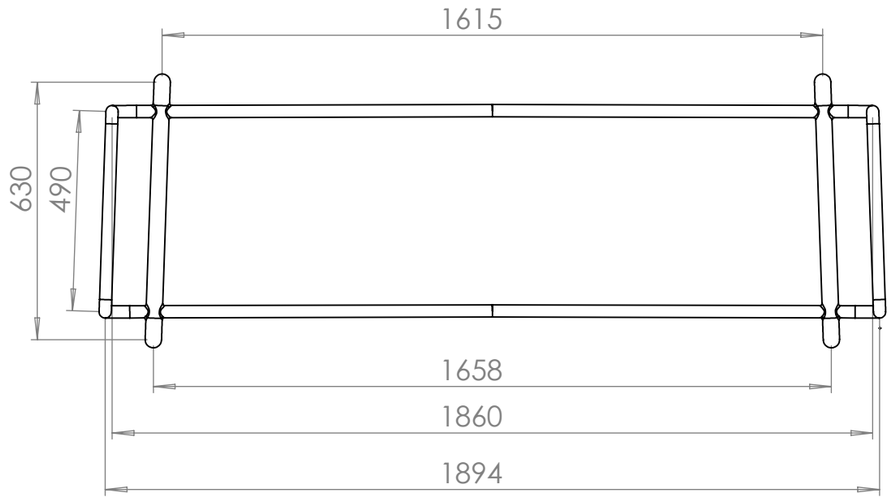


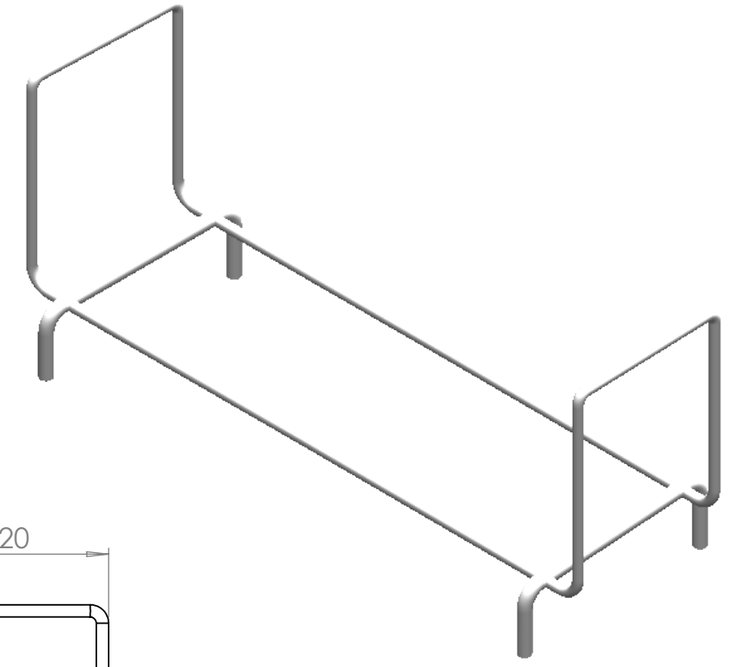


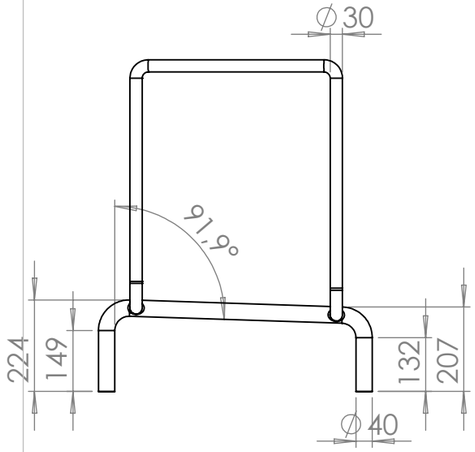


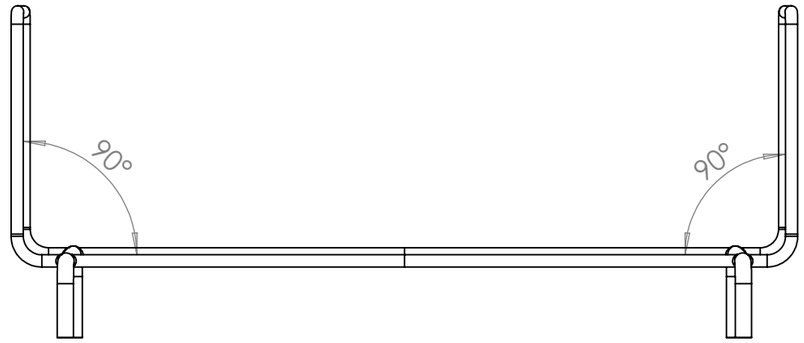


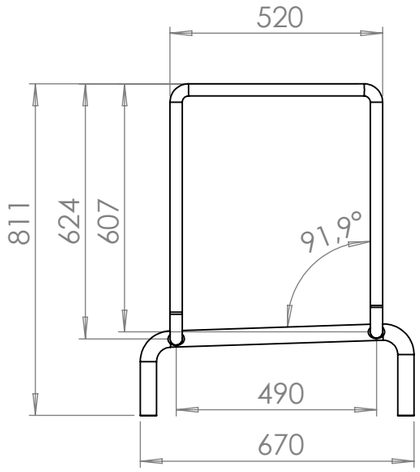
Material:	Polyurethane foam	Created by: MA4-ID2	Sheet scale: 1:5
Color:	White	Document type: Technical Drawing	sheet format: A3
Finish:	As-Machined	Title: Recover-in Pillow PART 6	DWG number: 5
Production method:	CNC foam cutter		
Drawing & tolerancing standard:	ISO 2768 - medium		Rev: / date of issue: 23-05-2022 / Sheet: 5/9

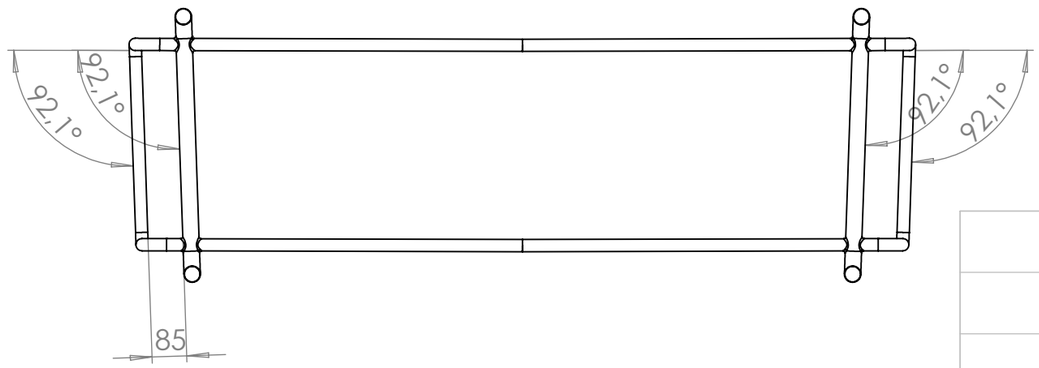




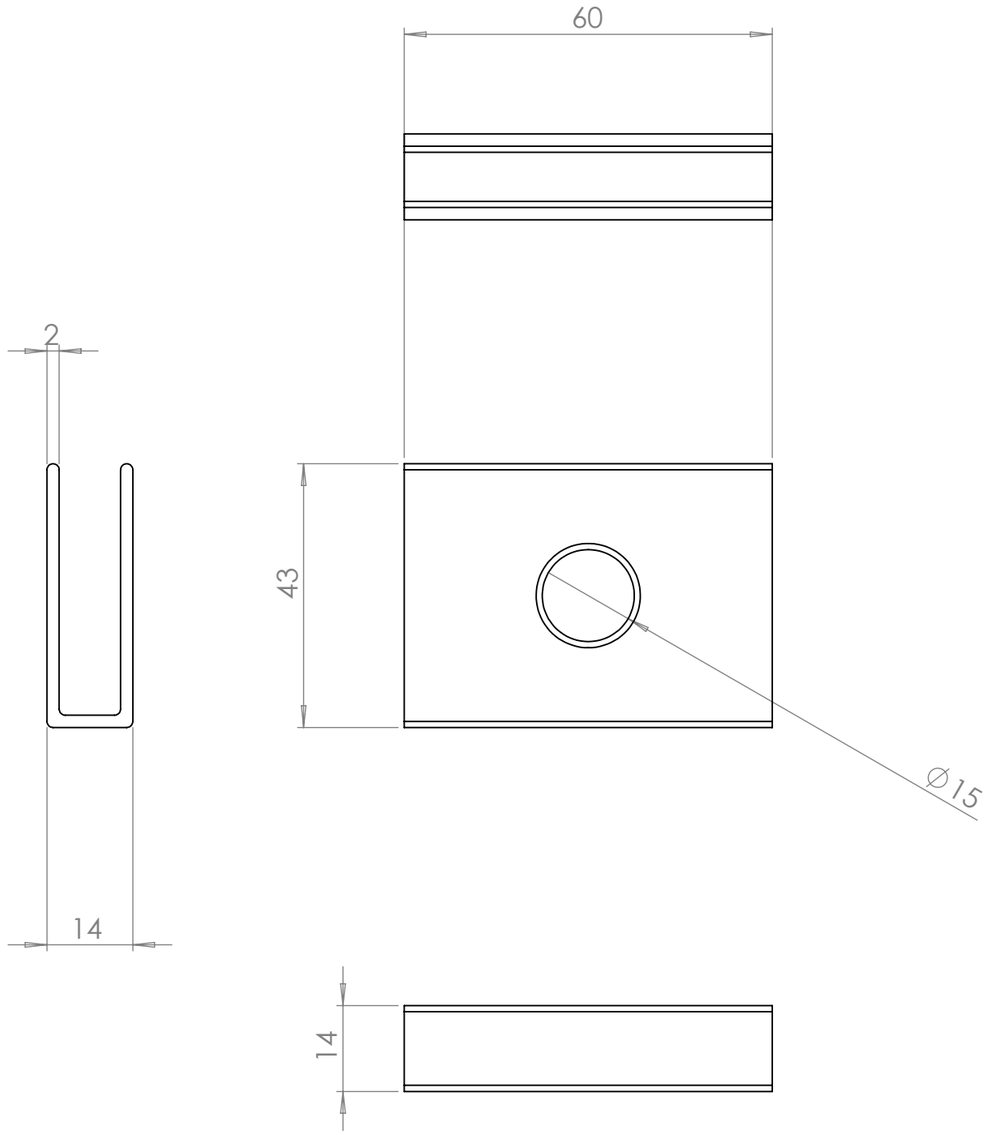




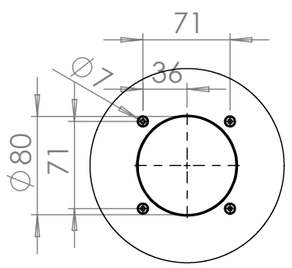




Material:	Steel	Created by: MA4-ID2	Sheet scale: 1:15
Color:	Black	Document type: Technical Drawing	sheet format: A3
Finish:	Powder coating	Title: Recover-in Frame PART 14	DWG number: 6
Production method:	Bending		Rev: / date of issue: 23-05-2022 / Sheet: 6/9
Drawing & tolerancing standard:	ISO 2768 - medium		

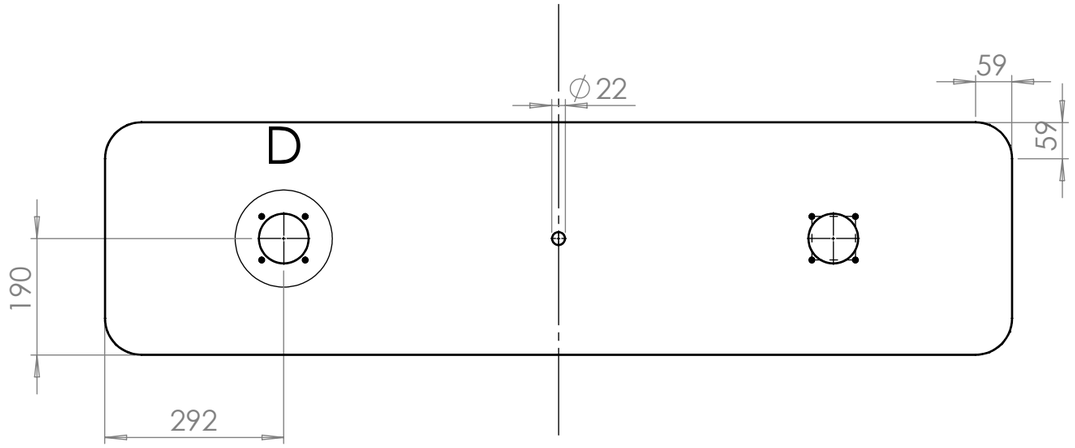


Material:	Sheet metal	Created by: MA4-ID2	Sheet scale: 1:1
Color:	Grey	Document type: Technical Drawing	sheet format: A3
Finish:	Powder coating	Title: Recover-in Mounting for blinds	DWG number: 7
Production method:	Bending machine		
Drawing & tolerancing standard:	ISO 2768 - medium	PART 10	Rev: / date of issue: 23-05-2022 / Sheet: 7/9

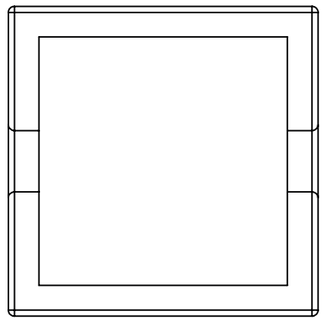


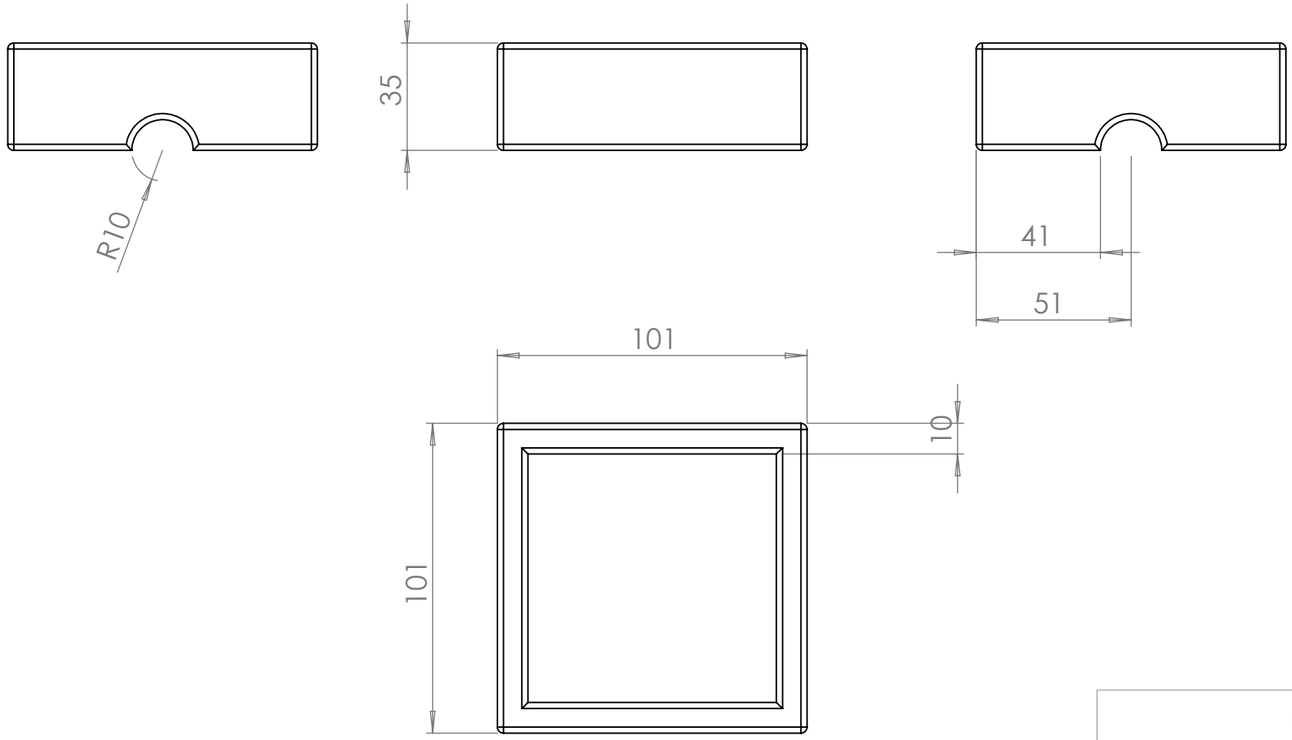
DETAIL D

SCALE 1 : 5



Material:	MDF	Created by: MA4-ID2	Sheet scale: 1:10
Color:	MDF	Document type: Technical Drawing	sheet format: A3
Finish:	As-Machined	Title: Recover-in MDF plate	DWG number: 8
Production method:	CNC milling		
Drawing & tolerancing standard:	ISO 2768 - medium	PART 13	Rev: / date of issue: 23-05-2022 / Sheet: 8/9





Material:	MDF	Created by: MA4-ID2	Sheet scale: 1:2
Color:	MDF	Document type: Technical Drawing	sheet format: A3
Finish:	As-Machined	Title: Recover-in MDF box	DWG number: 9
Production method:	N/A		
Drawing & tolerancing standard:	ISO 2768 - medium	PART 14	Rev: / date of issue: 23-05-2022 / Sheet: 9/9