SPROUT

Product report

Aalborg University - 2024
MSc04 ID4
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Titel page

Project title
SPROUT

University
Aalborg University

Report type
Product report

Project period
01/02/24-30/05/24

Team
MSc04 ID4

Superviser
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Number of pages
25

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Table of content

Abstract

The amount of twins born globally has increased in recent years due to fertility treatments and women becoming pregnant at a higher age. However most twins are born prematurely which requires a fast establishment of a healthy breastfeeding pattern in order for them to gain weight and be discharged.The best and most timesaving and stress free way of doing so is by tandem breastfeeding, however this way of breastfeeding requires assistance.

A product proposal has therefore been designed to allow the mother to tandem breastfeed without the need of assistance at the hospital as well as at the home. This will improve both the mother´s and nurse´s workload, optimizing their time and bring a sense of serenity into a chaotic situation. Through research and interviews with both nurses and twin mothers, the needs and requirements of these user groups have been understood. This information has been used to generate sketches, concepts, mock ups and CAD-models which have been tested on the user groups to evaluate and provide feedback on the functions, interactions and perception of the concept. The product proposal has resulted in a semi-furniture that consists of a backrest with an adjustable back piece attached to two side pieces intended to hold the babies by securing them with an incorporated swaddle. A wedge on each side piece makes it possible to adjust these according to the size of the mothers upper body. Each part is upholstered and can be separated when cleaning the product by removing the cover and throwing it in the washing machine.

A good start in life

When having twins, the amount of time mothers spend breastfeeding is doubled, since breastfeeding two babies at once is too overwhelming and stressful of an experience. This is exhausting for the mother, however tandem breastfeeding requires her to be relaxed and at ease for the lactation to start, which with the current solutions available is not possible without assistance. **Sprout is the semi-stationary nursing solution for twin mothers who wish to perform tandem breastfeeding without assistance,** *getting more time on her hands and a sense of serenity in a chaotic period of time.*

Fitting different individuals and contexts

By using Sprout the mother is able to prepare for breastfeeding on her own by placing and securing the babies directly on the side pieces before sitting down, instead of requiring help from either her partner or a nurse when hospitalized. Once seated, the mother is able to have both her hands free to take care of one baby, knowing the other baby is safe and secure in the swaddle attached to her nursing bra, allowing the baby free movement when breastfeeding.

Sprout is adjustable in several different ways to fit different body types, two growing babies and an altering environment. Functions such as attaching the backrest into one of three positions and adjusting the backpiece ensures the nursing solution to fit different individuals and contexts.

Set up when first recieving Sprout

1

Upon receiving the nursing solution the mother unpacks it from the box.

2

The mother takes out each part, and washes the cover for the wedges.

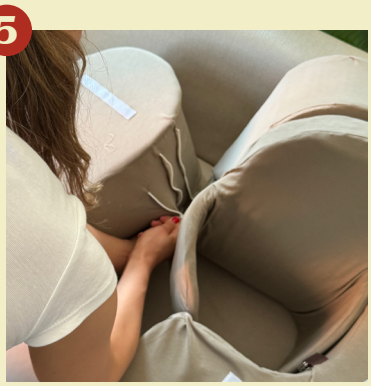
3

Once dry, she put the covers back on.

4

Next, she places them on the respectively side pieces.

5



She then zips the backrest onto each side piece, adjusting it to her size.

6

Now she adjusts the backpiece to match the depth of the couch.

*Sprout is easy to set up and only requires **a few simple steps** to ensure a comfortable and supportive tandem breastfeeding experience.*


MONACO

Features

Sprout has several different features to comply with being adjustable, comfortable and secure.

1

Adjustable backpiece

The backpiece can be positioned according to the context and fits into couches and beds of different depths by extending the backpiece by sliding it down on the backrest.

2

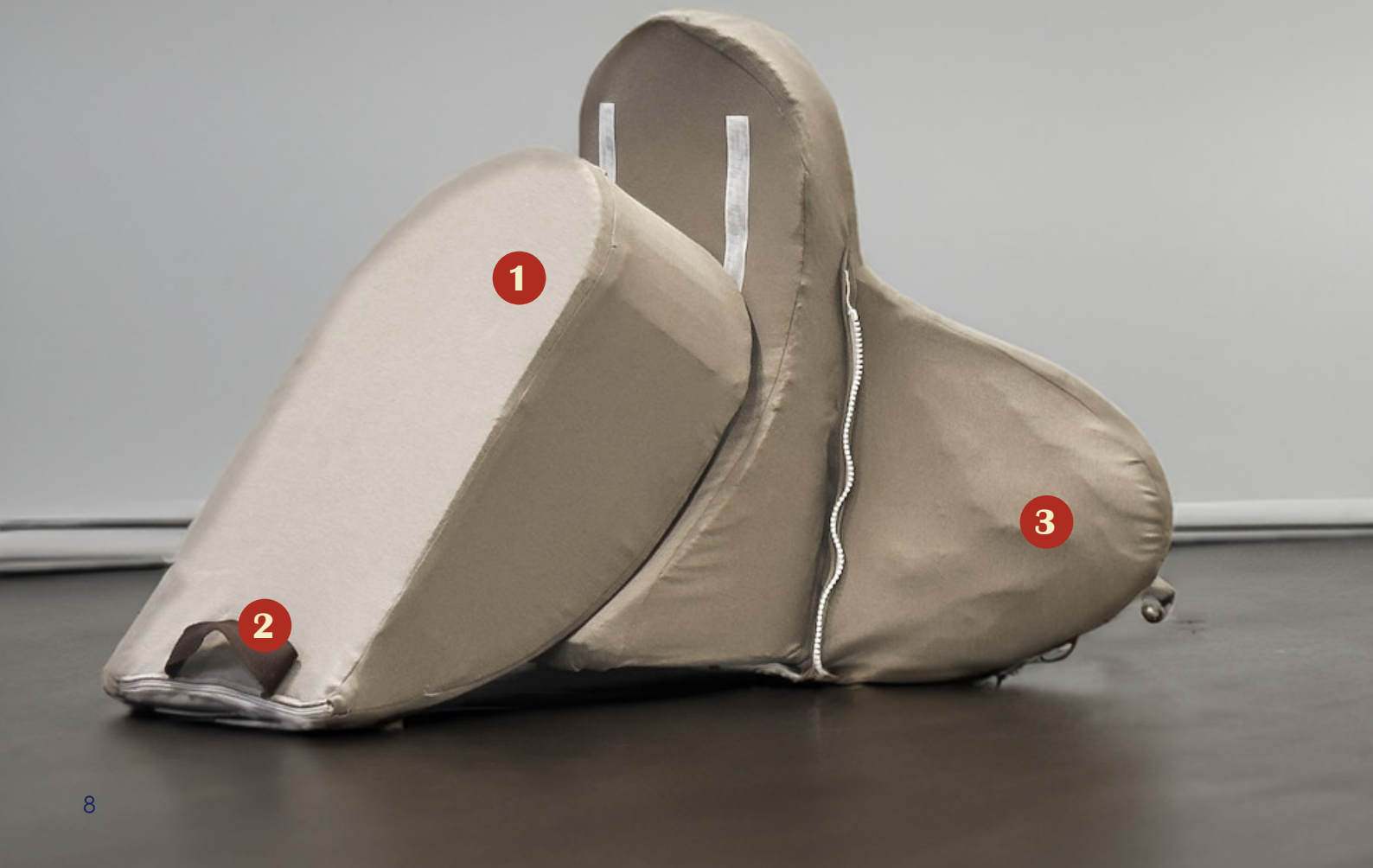
Handle

The handle on the backpiece indicates in which direction to pull in order to extend it.

3

Wings

The wings of the backrest provide extra comfort for the mother when sitting in the nursing solution.



4 Wedges

The slightly angled wedges prevent the babies from having reflux and elevate them towards the mothers chest. It comes in two different heights, complying with different body types of mothers.

5 Ring lock

The ring lock is a safe and easy way of securing the baby in the swaddle and a manageable solution when releasing the baby from the swaddle during breastfeeding.

6 Clips

The clips attached to the tip of the swaddle fits the clip on a nursing bra, making it possible to use when wearing any kind of nursing bra.

7 Swaddles

The swaddles are of elastic cotton fabric, ensuring the babies movement when fastened.

8 Buckle Belt

The slightly angled wedges prevent the babies from having reflux and elevate them towards the mothers chest. It comes in two different heights, complying with different body types of mothers.

9 Attachable zippers

The zippers sewn into the upholstery of the backrest can be placed into one of three zippers on the side piece, depending on the size of the mother.

User scenarios in both contexts

Hospital

1

The mother, partner or nurse fetches Sprout and places it on the hospital bed.

2

The backpiece is adjusted to fit the bed.

3

The mother retrieves the babies and secures them in the swaddle one by one.

4

The mother sits down and secures Sprout around her waist with the buckle.

5

The swaddle is released and attached to the breastfeeding bra on each side.

6

She can now begin tandem breastfeeding.

7

The babies are fed and the mother fastens them to the side piece using the swaddle.

8

The mother can now get up and free one baby at a time to place them in their crib.

9

Sprout is taken off the bed and put on stand by until it is time for breastfeeding again.

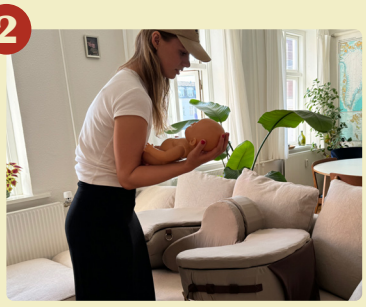
Sprout is designed to function seamlessly both in the hospital ward and at home. Twins are very often born prematurely and require hospitalization for a longer period of time, **making the hospital the home of the family for the duration of their stay.** By using Sprout to breastfeed while hospitalized, it ensures a domestic comfort in an otherwise sterile environment. At the hospital Sprout utilizes the existing furniture on the hospital ward by being placed on the hospital bed before every use and otherwise stationed next to it. When using Sprout at home, **the nursing solution will be an extension of the sofa**, residing there for the duration of its use. The covers can be bought in a color matching the sofa, making it blend into the environment.

Home

1

Sprout is permanently placed on the couch, ready for use.

2



The mother retrieves the first baby.

3

She places the baby on one side of Sprout and secures the baby with the built-in swaddle. Step 2 and 3 are repeated for the second baby.

4

The mother sits down and secures Sprout around her waist with the buckle.

5

The swaddle is released and attached to the breastfeeding bra on each side.

6

She can now begin tandem breastfeeding.

7

The babies are fed and the mother fastens them to the side piece using the swaddle.

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The mother can now get up and free one baby at a time to place them in their crib.

9

Sprout is taken off the bed and put on stand by until it is time for breastfeeding again.

“I like how this nursing solution, unlike any other on the market, allow me to have my hands free, letting me care for both babies simultaneously“

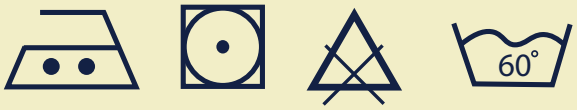
- Ida Nielsen, Twin mother


MONACO
MONTE CARLO

Cleaning scenario

The covers on Sprout are all detachable and can be taken off when it is necessary to be washed. The wedges are intended to be washed more frequently as they are in direct contact with the babies and are therefore as easy to put on and off as a pillow case.

The side pieces, backrest and backpiece are on the other hand made of linen fabric, intended to be wiped off more often than being washed. However, when needed, **every cover can be zipped off and washed.**



1

The pieces are detached from each other and the linen covers unzipped to take them off.

2

All covers are washed at 60 degrees.

3

Once dry, the covers are put back on.

4

The nursing solution is ready for breastfeeding, with clean covers.

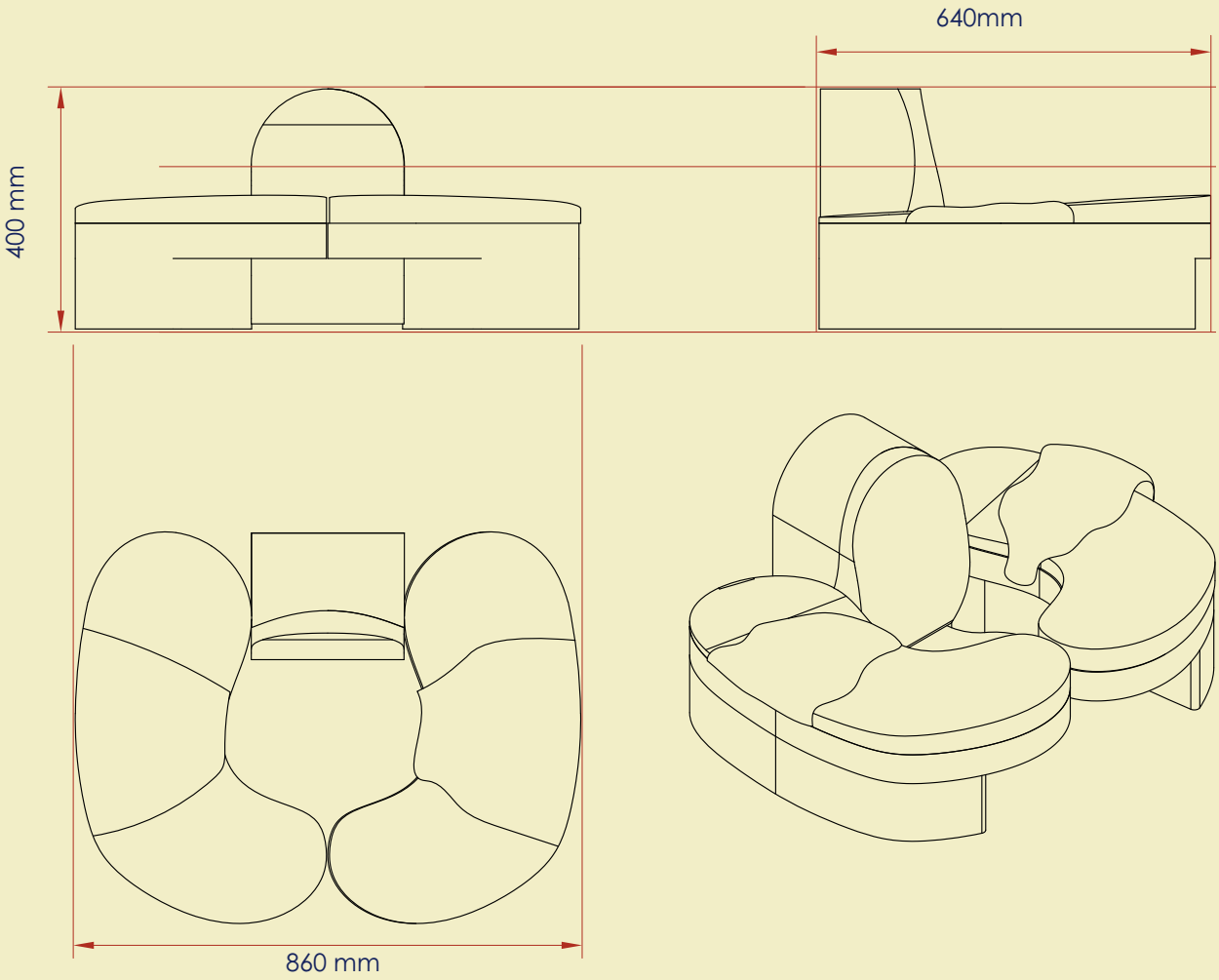
Specifications

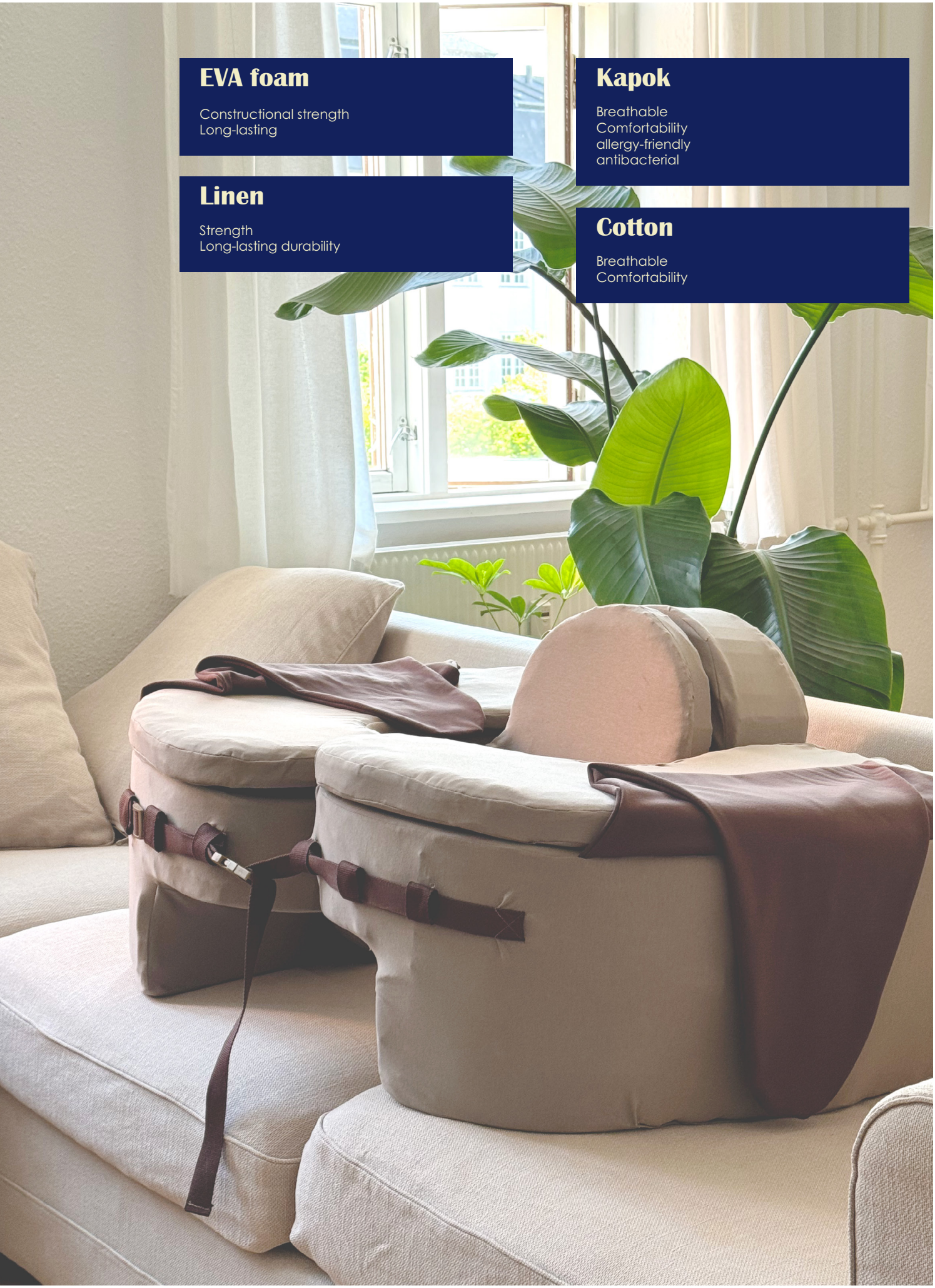
Total product weigt:

15 kg

Dimensions

H: 400 mm x W: 860 mm x L:640 mm





EVA foam

Constructional strength
Long-lasting

Linen

Strength
Long-lasting durability

Kapok

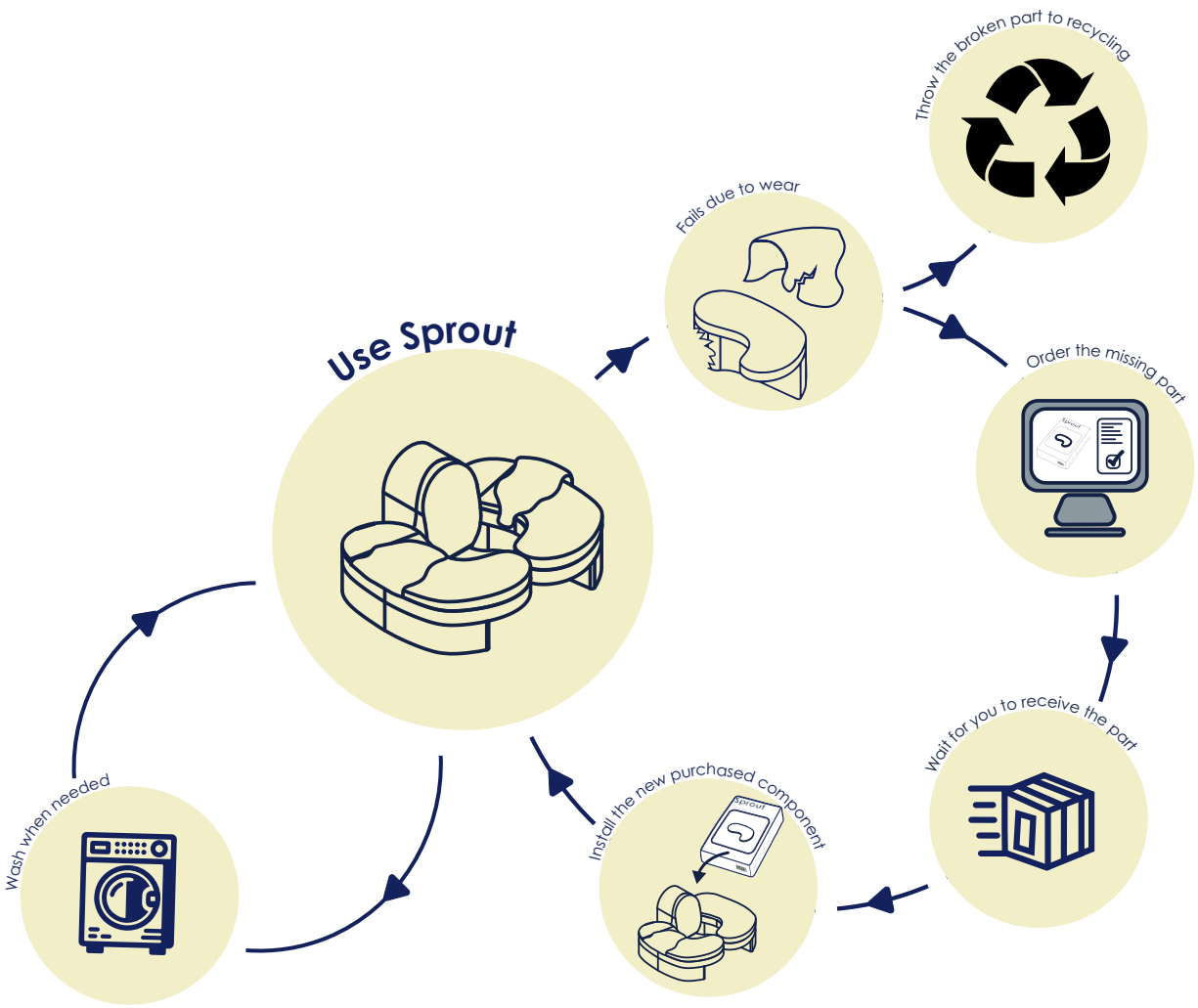
Breathable
Comfortability
allergy-friendly
antibacterial

Cotton

Breathable
Comfortability

Renewal of the product

Sprout is designed in a modular structure to ensure longevity. Therefore, Sprout can be disassembled by the customer independently, without the need for third-party assistance, thereby increasing the likelihood of successfully replacing any defective parts. For instance, if the left wedge is accidentally damaged, a new wedge can be purchased and installed. This modular design ensures that the product can be easily maintained and preserved, allowing Sprout to last for many years.



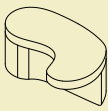
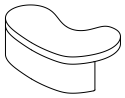
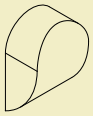
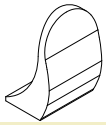
Initial purchases

Sprout provides everything you need to get tandem breastfeeding off to a great start. When buying Sprout you buy into a product durable enough to be sold on after use. When buying a used Sprout, adjustments enabling all sizes of women are accounted for.

Everything needed might be a new cover, which can be bought separately and comes in a variety of different colors and patterns to personalize the nursing solution. Should a part be damaged it is possible to buy a new one for replacement, as all spare parts are sold individually. Sprout does not require external maintenance as the customer can perform any possible replacements themselves. Below is a list of available spare parts, including their names, dimensions and prices.

2.999 DKK

Additional purchases

Left side piece	L 64 cm, W 43 cm, H 18 cm		800 DKK	
Reght side piece	L 64 cm, W 43 cm, H 18 cm		800 DKK	
Back piece	L 16 cm, W 26 cm, H 38 cm		500 DKK	
Back rest	L 22 cm, W 26 cm, H 40 cm		650 DKK	
Left wedge	L 64 cm, W 43 cm, H 6 cm		300 DKK	
Right wedge	L 64 cm, W 43 cm, H 6 cm		300 DKK	
Cover for Left side piece	L 64 cm, W 43 cm, H 18 cm		500 DKK	
Cover for Right side piece	L 64 cm, W 43 cm, H 18 cm		500 DKK	
Cover for Back piece	L 16 cm, W 26 cm, H 38 cm		300 DKK	
Cover for Back rest	L 22 cm, W 26 cm, H 40 cm		450 DKK	
Cover for Left wedge	L 64 cm, W 43 cm, H 6 cm		500 DKK	
Cover for Right wedge	L 64 cm, W 43 cm, H 6 cm		500 DKK	

AALBORG
UNIVERSITY

SPROUT

PROCESS REPORT

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Aalborg University - 2024
Industrial design
MSc04 ID4

Titel page

Project title
SPROUT

University
Aalborg University

Report type
Process report

Project period
01/02/24-30/05/24

Team
MSc04 ID4

Superviser
Christian Tollestrup

Technical superviser
Lars Rosgaard Jensen

Number of pages
86

Appendix
213

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Abstract

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A product proposal has therefore been designed to allow the mother to tandem breastfeed without the need of assistance at the hospital as well as at the home. This will improve both the mother´s and nurse´s workload, optimizing their time and bring a sense of serenity into a chaotic situation. Through research and interviews with both nurses and twin mothers, the needs and requirements of these user groups have been understood. This information has been used to generate sketches, concepts, mock ups and CAD-models which have been tested on the user groups to evaluate and provide feedback on the functions, interactions and perception of the concept. The product proposal has resulted in a semi-furniture that consists of a backrest with an adjustable back piece attached to two side pieces intended to hold the babies by securing them with an incorporated swaddle.

Reading guide

The process report is a part of the master´s thesis written in the spring of 2024 by three 10th semester industrial design engineering students at Aalborg University. It is one of four parts of the master´s thesis along with a product report, appendix and a seewing guide. The process report is an overview and reflection of the design process of developing a product proposal as a solution on how to make it possible for twin mothers to tandem breastfeed without assistance.

The iterative design process is described through five chapters describing the background knowledge, research, concept development, specifications of the final product proposal and business case. References to the appendix are described throughout the report to elaborate the tests, research and calculations mentioned.

! Requirement

Feedback

Note

Throughout the process repport requirements are presented after each section and summarized in a design brief closing the chapter. They are listed in a prioritized order, indicating the order in which the requirements have been adressed. Re-evalutated requirements are illustrated with a red arrow →. Feedback is presented in boxes thoughout the report and **text written in bold and pointed out with speech bubbles indicate insights** that have led to the identification of requirements for the product proposal. In addition a series of words have been described to clarify the meaning.

Insight

References are made using the Harvard method and a complete list of references can be found at the end of the report.

Word:	Meaning:
Singleton	A baby born as an individual without a twin
Tandem breastfeeding	When breastfeeding two babies at once
Premature	Babies born before 37 weeks of pregnancy are completed.
Fullterm	Babies born between 39 weeks to 40 weeks and 6 days
Postnatal	Refers to the period immediately after childbirth.

Prephase and acknowledgement

A great appreciation is directed towards nurse and lactation consultant, Pernille Hurup Lyn from Aalborg University Hospital, for bringing our awareness to the initial problem for the thesis and for being at disposal for multiple interviews, feedback and user-tests. An additional appreciation is addressed towards the other nurses and mothers who were interviewed during the development of the thesis and helped out testing and giving feedback on numerous concepts. This provided great insight to understand the problem from several different angles.

Lastly a great thanks is directed at the supervisors for the master´s thesis, Christian Tollestrup and Lars Rosgaard Jensen for guidende and assistance throughout the project.

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Introduction

In recent years there has been an increase in the global number of twin births, due to fertility treatments and women becoming pregnant at a higher age. (videnskab.dk,2024; sdu, n.d.) 45 % of the twins born in 2021 required hospitalization at a neonatal ward as twins are often born prematurely. (www.regionshospitalet-randers.dk, n.d.; sundhedsdatastyrelsen.dk,n.d.)

A crucial part of reaching a discharge of the babies, which can take up to months because of the premature babies´ often fragile health, is to establish a healthy breastfeeding pattern, in order for the babies to gain the required amount of weight. This in turn requires the mother´s lactation to run smoothly, which is affected by her mental state of mind. When feeling stressed the hormone adrenaline is released which disturbs the milk ejection reflex oxytoxine, a hormone that feels calming, pleasant and relaxing on the mother. (sundhedsplejersken.dk, 2012) Feeding a hungry and screaming baby can be a stressful experience for a mother, whereas trying to calm down two babies at once is both stressful and overwhelming for most.

At the neonatal wards the nurses encourage the twin mothers to tandem breastfeed by feeding both babies at once to ease some of the load of the mother who will double her time breastfeeding if the babies are fed one at a time, which is exhausting as the mother will then spend most of their day breastfeeding. However, according to nurses and mothers, there are no good nursing solutions for tandem breastfeeding and most mothers give up once discharged if not sooner because they need assistance to prepare for tandem breastfeeding.

When attempting to tandem breastfeed at the neonatal ward, the nurses spend a lot of time assisting the mother by stacking her up with pillows and blankets to support her back and arms, to ensure the correct position of the mother while breastfeeding, giving her a better experience with it and optimize her lactation by sitting comfortably and relaxed. Time that could be spent elsewhere in a busy hospital, if the mothers were not in need of assistance.

The scope of this masters´ thesis is to design a product that allows the mother to tandem breastfeed without assistance and in the optimal position, thereby improving her experience with tandem breastfeeding and at best, accelerate the time of discharge from the neonatal ward.

Nurses

Pernille Hurup Lyn
Lactation consultant, Aalborg Hospital

Anne Lucht
Lactation consultant, National Hospital

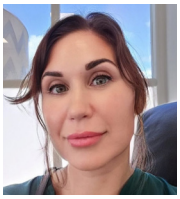
Anne Lund
Retired nurse

Hanne Thrane Mikkelsen
Neontal nurse, Randers Hospital

Lotte Bjørnskov
Neontal nurse, Viborg Hospital

Merete Pedersen
Neontal nurse, Roskilde Hospital

Twin mothers



Holly Beth

Dorthea Nylander

Sine Daugaard

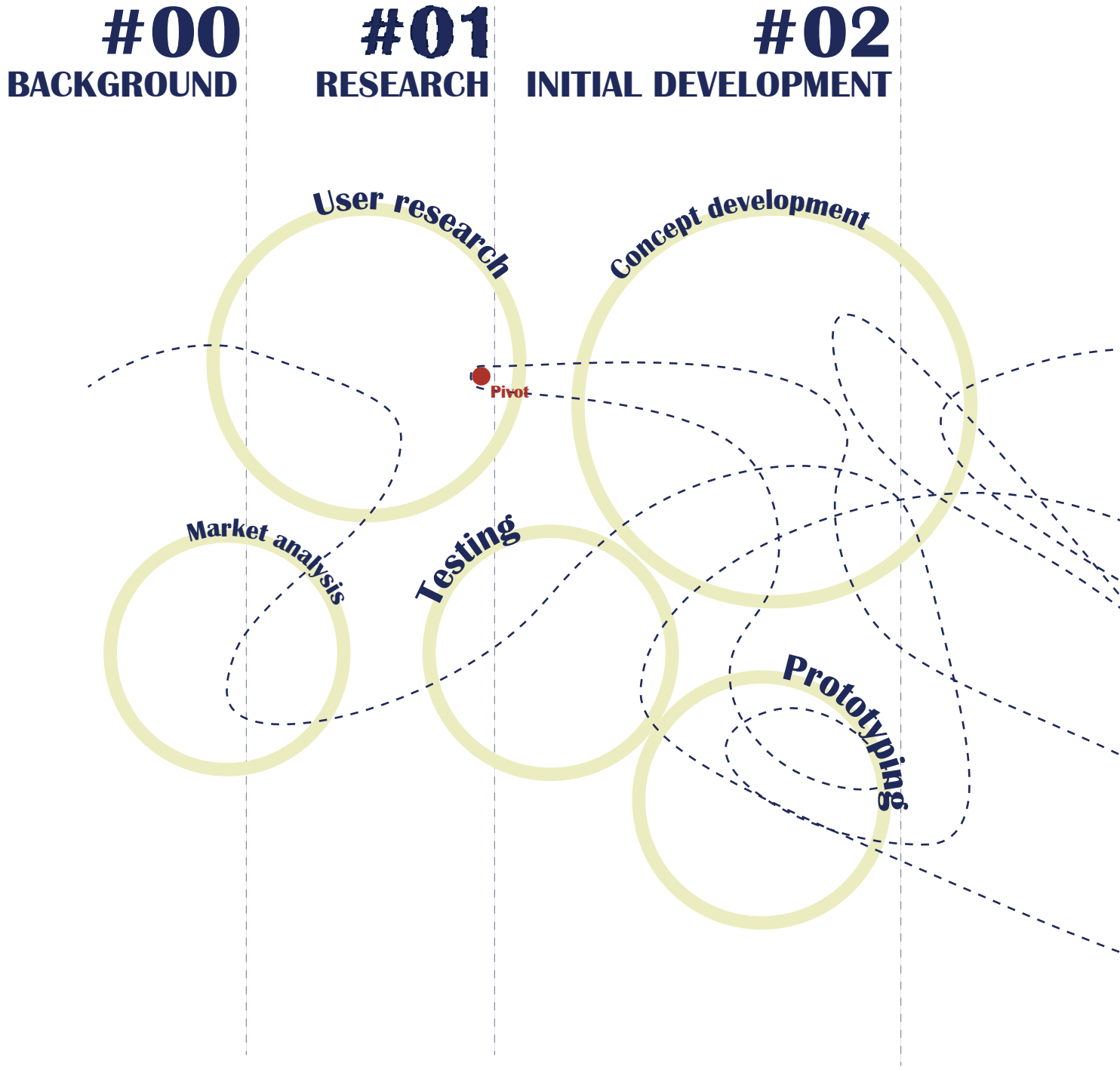
Caroline Beck

Ida Nielsen

Ill. 2

Process overview

The general process of the master's thesis has been structured through the use of the Double Diamond model dividing the process into four stages of discovering, defining, developing and delivering the final product proposal. (Anon, n.d.)
A fuzzy front end was defining the beginning of the process and to understand the problem, requirements had to be determined to open the solution space, by continuously gathering insights through an iterative process, through desktop research, interviews with users and experts, mock ups and observations. The wicked problem has further been managed through problem slicing to fully understand each part of the problem while working on them simultaneously.

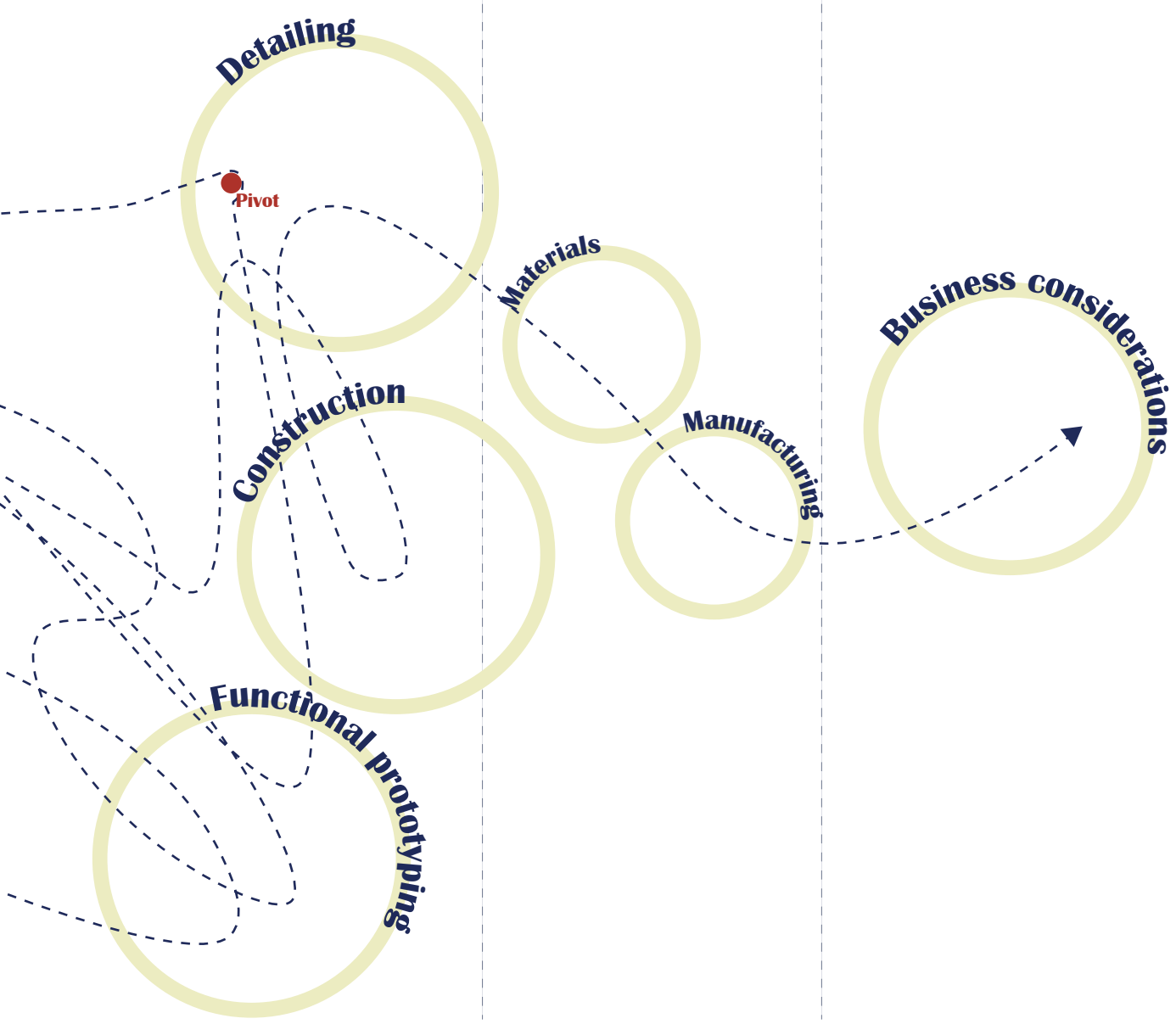


Ill. 3 Process overview.

#03
FINAL DEVELOPMENT

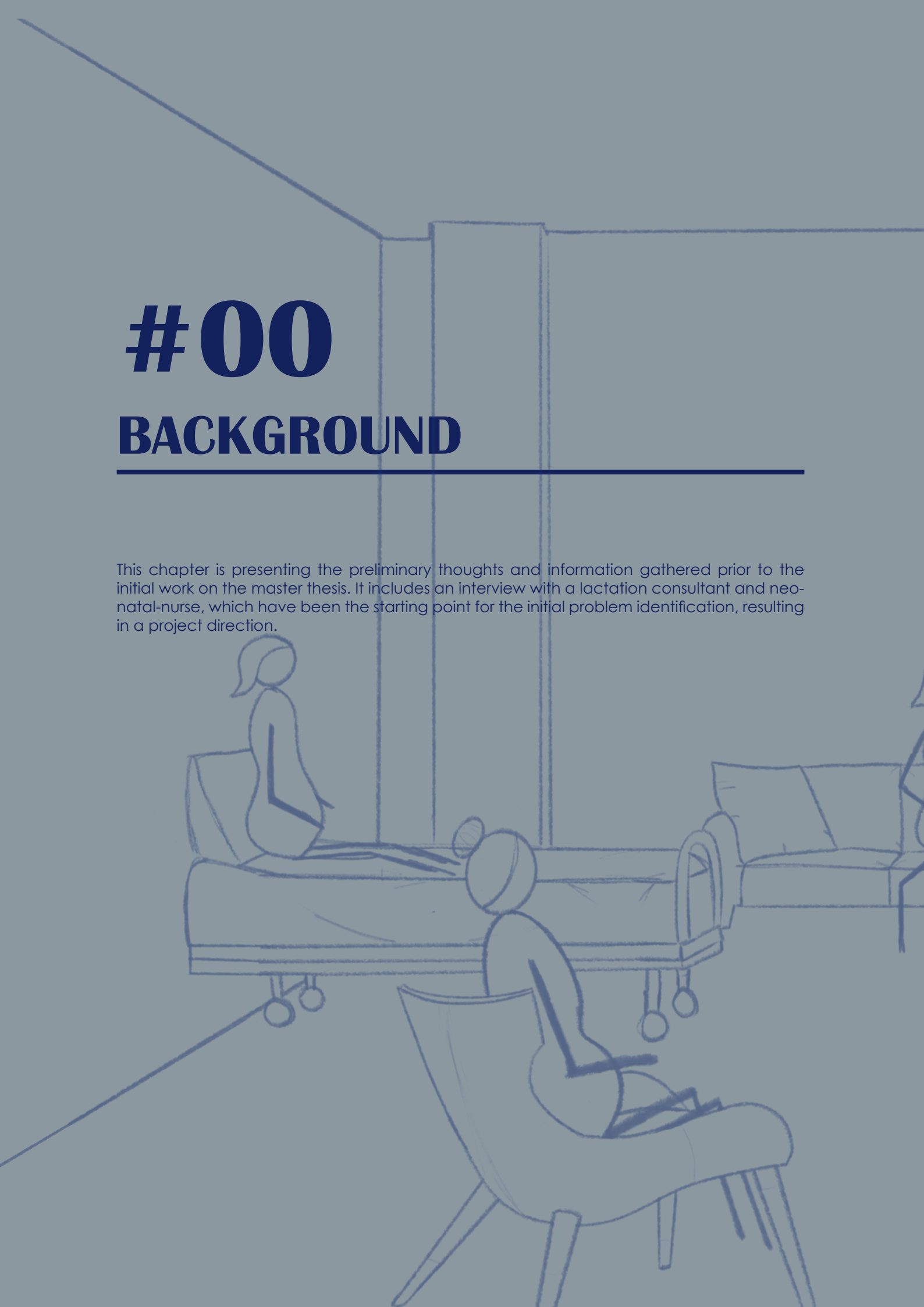
#04
DETAILING

#05
IMPLEMENTATION



#00
BACKGROUND

This chapter is presenting the preliminary thoughts and information gathered prior to the initial work on the master thesis. It includes an interview with a lactation consultant and neo-natal-nurse, which have been the starting point for the initial problem identification, resulting in a project direction.



0.1 Motivation and initial interview

When hospitalized with twins, many mothers are having a hard time tandem breastfeeding without assistance from a nurse and therefore spends countless stressfull hours of the day feeding them one at a time or have to call for assistance when attempting to tandem breastfeed. The motivation for this master´s thesis has thus been to improve the mothers overall experience with tandem breastfeeding by allowing her to do it independently and stress-free, easing her level of oxytoxine making her relaxed, rather than the stress-hormone adrenaline and easing the nurses workload, and in the end secureing the babies growth and early discharge.

Ill. 4 Current workaround

An initial interview with Pernille Hurup Lyn, nurse and lactation consultant at the Neonatal Ward at Aalborg University Hospital, was conducted prior to starting the project, where she explained the lack of inexpensive, ergonomic and timesaving twin nursing solutions on the market. In addition, the nurse is spending up to 1,5 hours during an 8 hour shift, on helping the mother to prepare for tandem breastfeeding, consult her while breastfeeding and help her put away everything once the babies have been fed, because there are no great solutions to easing her workload(Ill. 4-5).

Ill. 5. The mother currently acquire a bad posture

Tandem breastfeeding at Neonatal ward

During the interview three problem-areas appearing once hospitalized at the Neonatal ward, was discussed and exemplified (Appendix 1 and 5)(Ill. 6-8).

Ill. 6 Mothers needs help breastfeeding.

Ill. 7 No space for extra equipment.

Ill. 8 No back support

During the interview, Pernille explained the struggles of preparing the mothers for tandem-breastfeeding premature twins at the ward. Something both her and her cowokers experience on a daily basis, because of lack of space at the hospital ward and restricted funds for buying equipment suited for improving this process.
The current solution caused by lack of space, having the mothers sitting on the hospital-bed, is not allowing the mother to have her back properly supported and relax her body, resulting in her milk to flow poorly, leading to a vicious circle of chaos and stress trying to get the babies to latch on, which stimulates the milkflow even further.
This will ultimately result in tandem breastfeeding to start off inadequatly. An otherwise time saving process that allows the mother to feed both babies at once, influencing the babies success of gaining weight and having an early discharge from the hospital.

Needs and prioritization

From the initial interview three potential problem spaces have emerged, based on the three problems derived from the interview with Pernille. One joint solution is expected to take form from these individual problems, However it is difficult to solve multiple problems at once which is why the needs derived from the insights gathered have been prioritized (Appendix 1 and 5).

Ill. 9 No back and arm support.

Ill. 10 Utilizing furnitures.

Ill. 11 Minimize aid.

The most crucial problem to solve is ensuring the right egonomic support for the mother because the current solution provides a bad posture resulting in the mother not being fully relaxed while breastfeeding, ultimately affecting the babies to latch on and become well nourished and ready for discharge. Nonetheless, utilyzing exsisting furniture at the ward should be incorporated as well as minimizing the aid from nurses.

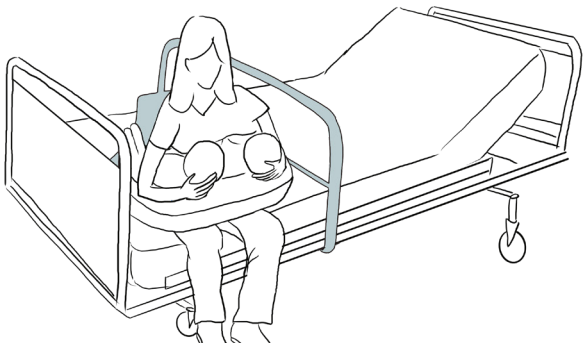
Evaluation

When tandem breastfeeding twins at the neonatal ward, the mother is in need of help to prepare, carrie out and put away all unorthodox equipment used for the process, because there is no room for a stationary solution at the ward, and all current solutions are too expensive for the hospital to purchase. This aid is very timeconsuming for the nurses and tiredsome for the mother and in addition does not provide the correct ergonomic posture to spare the mothers lower back and ensure a relaxed position, resulting in a vicious circle of the babies not latching on because the milkflow is inadequate. These initial problems, previously prioritized, are in need of further examination. An initial ideation of concepts should be carried out to start off the solution space.

0.2 Preliminary direction

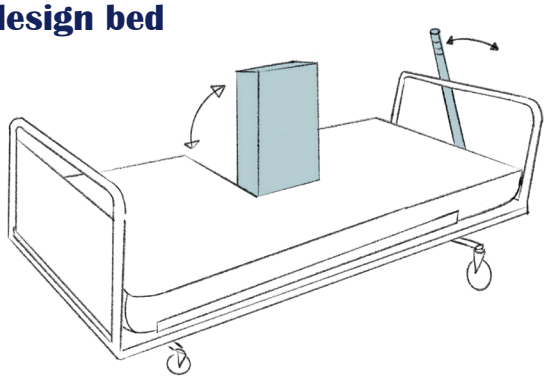
Based on the initial interview and the presented probem area focusing on supporting the mothers back and arms and utilizing hospital furniture, and aiding the mother three preliminary directions to a solution space have been set up;

Backrest add on for bed



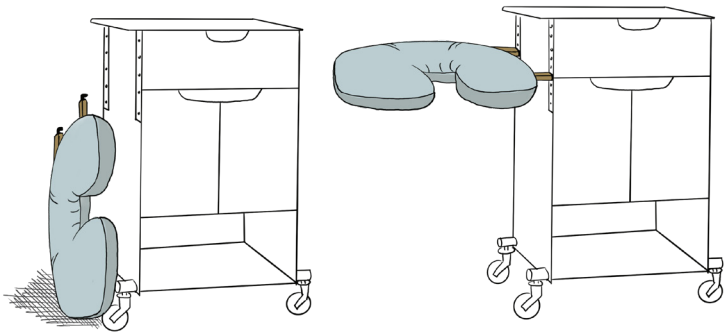
Ill. 12 A back support intended to fit the hospitalbed and adjusted to the size of the woman.

Redesign bed



Ill. 13 The hospitalbed in a redesigned version that allow for a section of the mattress to elevate across the bed.

Nursing pillow add on for table



Ill. 14 A nursing pillow meant to be attached to the hospital table, allowing to hold the babies and be "served" to the mother thereby saving time on preparation.

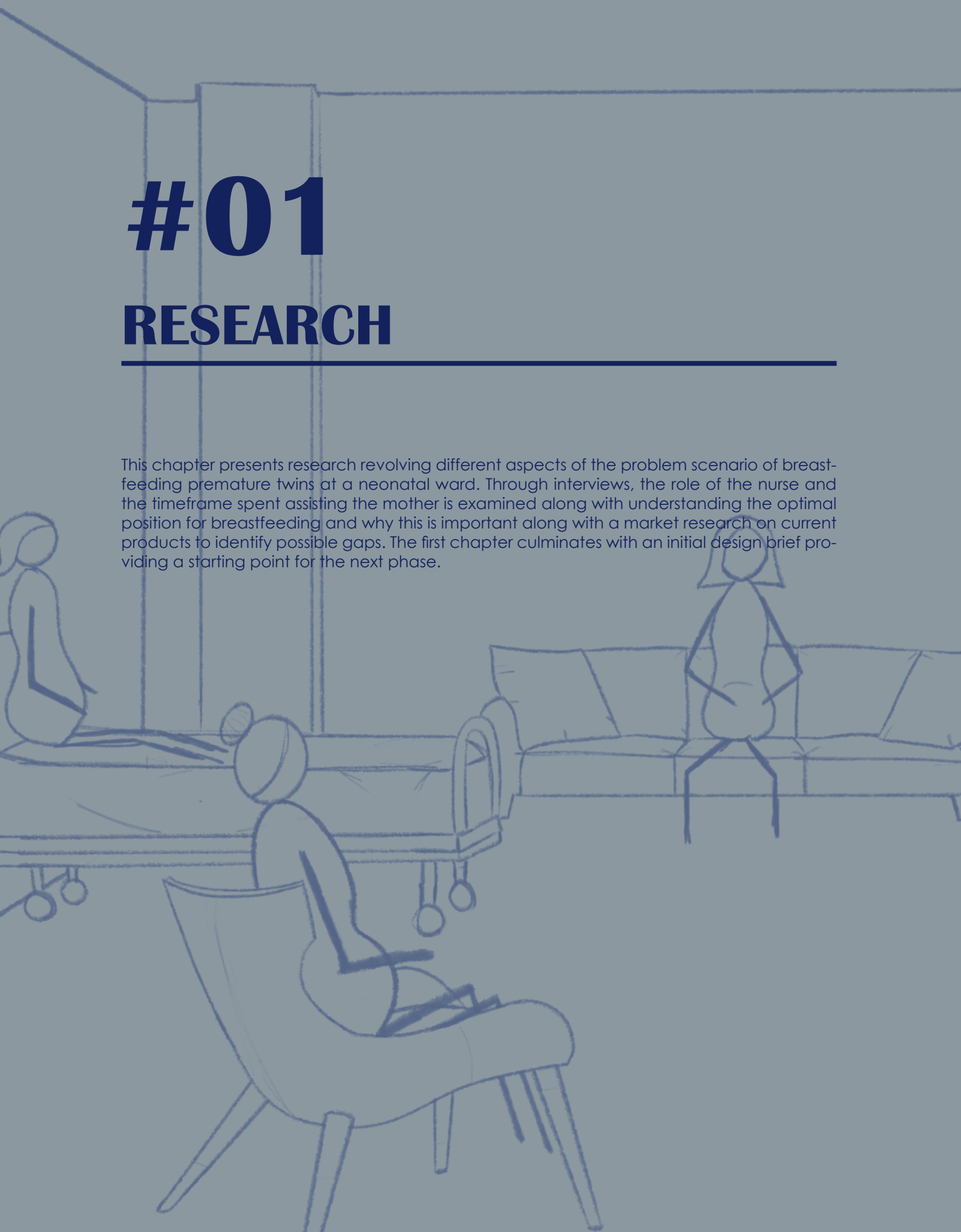
Evaluation

Advantages and disadvantages are seen in all preliminary directions. The add on for the hospital bed is allowing for the backrest to be adjusted to each individual woman, thereby fitting all sizes. However not all hospitalbeds are nessecarily alike. The redesign of a hospitalbed is solving the problem of back- and arm support when sitting across the bed, but is most likely very expensive to produce and hard to clean. The nursingpillow is saving time on preparation and takes off the load of holding the babies, but might result in the mother having a bad posture. Therefore, research of the three different directions in the solution space, has to be examined. Therefore knowledge on twins, premature babies and tandem breastfeeding has to be investigated through desktop research and interviews with nurses and twin mothers, along with scouting the current market solutions.

#01

RESEARCH

This chapter presents research revolving different aspects of the problem scenario of breastfeeding premature twins at a neonatal ward. Through interviews, the role of the nurse and the timeframe spent assisting the mother is examined along with understanding the optimal position for breastfeeding and why this is important along with a market research on current products to identify possible gaps. The first chapter culminates with an initial design brief providing a starting point for the next phase.



1.1 Initial Research

The purpose of this section is to understand the circumstances further, connected to the identified problems. Initial research on breastfeeding in general has been performed along with studies of premature babies and getting an understanding on the difference between having twins and singletons. Semi-structured interviews with Anne Lucht (Appendix 4) from the National Hospital of Denmark and a twin mother, Holly Beth (Appendix 13) have contributed to deeper understanding of the problem.

Breastfeeding - why is it important?

1.1 The very first day after being born, babies have to learn how to breastfeed and are therefore attempting to breastfeed 4-5 times a day on average, but from **day 2 this will increase with a minimum breastfeeding of 8 times a day up to 12 times a day.** It is very individual, for how long a baby is breastfeeding and is dependent on the interaction between mother and baby. Some babies will get full after 30 minutes while for others it will take up to **60 minutes**. The frequent breastfeeding straight after birth is important for the lactation to increase and the baby will thrive minimizing the risk of them catching diseases, as breast milk contains antibodies. The amount of milk is adjusted according to the baby's need. If babies are breast- and bottle fed it can cause 1.2 confusion for the baby because the suckle technique is different which can make it hard to establish breastfeeding. **The Danish Health Authority recommends to carry on full-time breastfeedingfor 6 months** before switching to other means of nutrition. Breastfeeding is especially important for multiple babies who frequently have low birth weights and who are often born before term and may have to spend more time hospitalized. (Rigshospitalet.dk, 2024; Birkholm-Buch, H,2011)

The difference between breastfeeding twins and singletons

Twin births are increasing due to many women giving birth at an advanced age and are therefore more likely to conceive a multiple pregnancy naturally than younger women. In addition older couples are more likely to make use of IVF treatments which also increases a multiple pregnancy. (Jurado-García et al., 2021)
A qualitative study on breastfeeding twins shows that, even when professionally advised and taught at the hospital, mothers are having a hard time simultaneously breastfeeding.
One of the main reasons 9/10 women are ending tandem breastfeeding taught at the hospital was because of lack of assistance once discharged, 1.3 and even with assistance from a nurse, some mothers prefer doing it themselves. With twice as many mouths to feed, breastfeeding two babies, one at a time, is taking up most hours of the day and is exhausting, with little spare time for the mothers to relax. Restlessness and crying babies are interpreted by many women as insufficient breastmilk, and the mothers are afraid and stressed that their milk will not be sufficient for their twins, when in reality the production is a matter of demand and supply. (Cinar et al., 2014)

"Breastfeeding is twice as hard with twins who are often born prematurely and needs to spend a long time in the neonatal ward" – Anne Lucth

Ill. 15 Stressed and overwhelmed mother.

Ill. 16 9/10 mothers end tandem breastfeeding when discharged.

When interviewing Holly, a single mother of two singletons and a set of twins, she mentions how much more difficult it is breastfeeding twins as opposed to a singleton.

"***There is such a big difference between breastfeeding a singleton and twins. Breastfeeding twins is a marathon***"
– Holly Beth

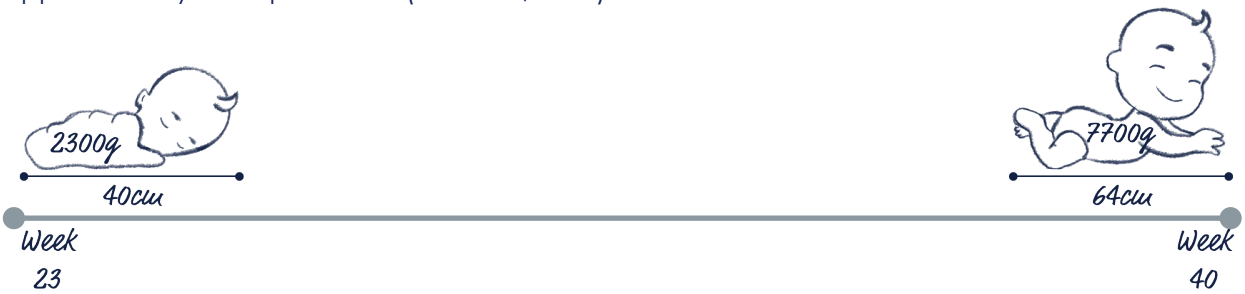
1.4

A twin mother feels like all she does all day is to feed the babies and because of this, she has absolutely no spare time. Having two babies at once is in Holly´s perspective overwhelming for any parent and you need a lot of mental support as a mother and confidence in your ability to breastfeed.

Premature babies

Twins are very likely to be born prematurely and often have weeks to months of hospitalization due to health conditions and to stabilize their weight and growth. A premature baby weighs less than 2300 g and is born before week 34 and should gain 25-30 g a day and grow proportionally approximately 1 cm per week. (Pri.rn.dk., 2024)

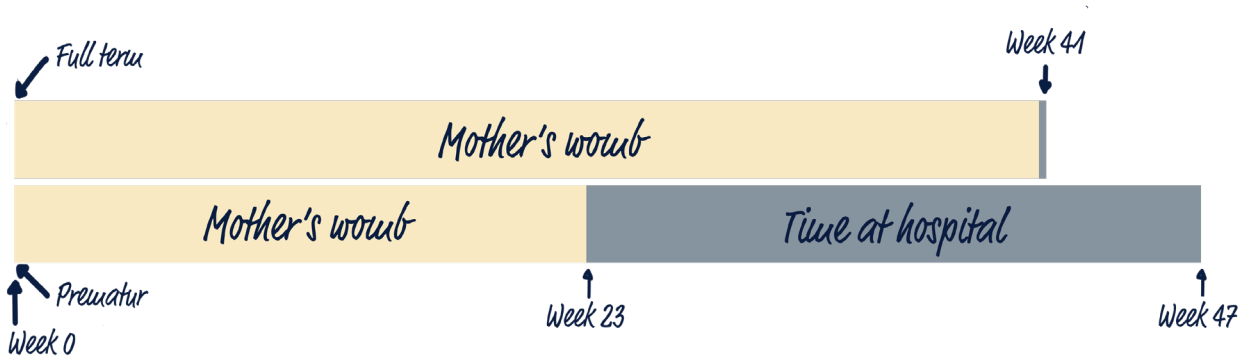
1.5



Ill. 17 Growth of premature baby.

Premature babies are tube-fed in the beginning, but are still put into the position of breastfeeding to practice the scenario and to start the process of stimulating milk flow and the babies´willingness to suckle, before it is too late to establish a healthy pattern. Typically, once the babies have a postnatal age of 33 weeks old or as soon as they show sign of interest, the process of breastfeeding begins. Even if they do not latch on, **the skin-to-skin contact still provide stimuli for the milk to flow and the babies feel comfortable.** If the mother isn't relaxed and stimulated, the milkflow will worsen which is not optimal for a premature baby who might only have the strength to latch on for a second before falling asleep and therefore needs to make the most of it. It is important that the mother and babies have the best circumstances to establish breastfeeding while being hospitalized, so they can carry on a healthy routine once discharged. (Appendix 4)

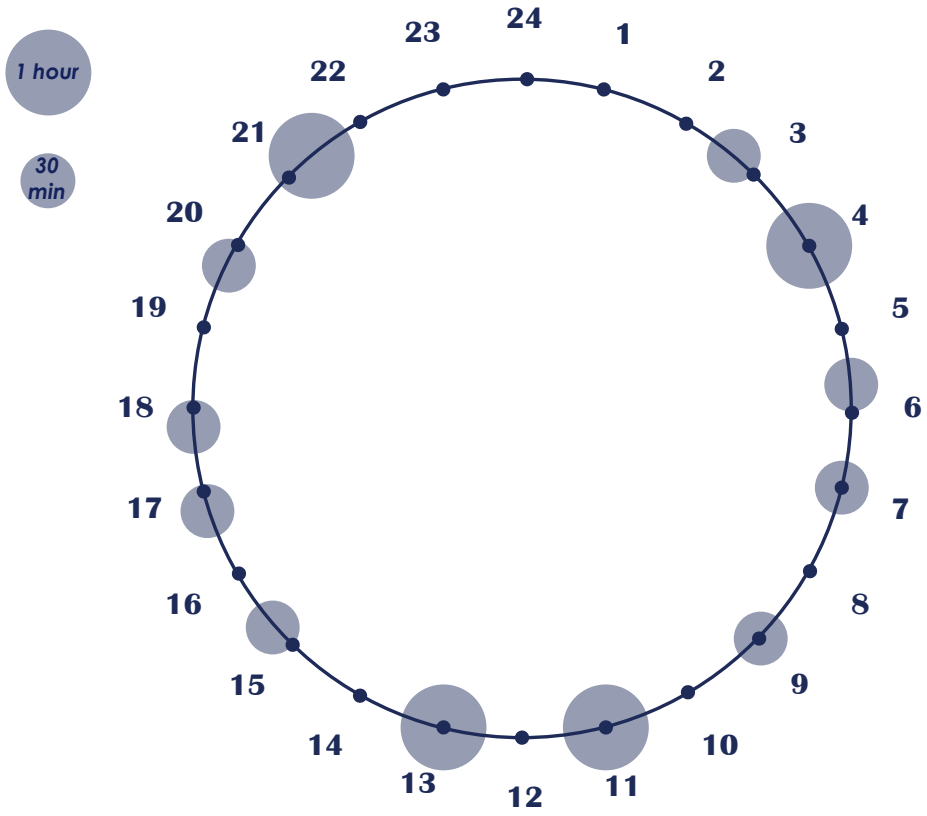
1.6



Ill. 18 Time spent at hospital for premture babies versus babyr born fullterm

In an interview with Anne Lucht, lactation consultant and nurse at the neonatal ward at the National Hospital of Denmark, she described how the nurses' recommend tandem breastfeeding, but a lot of the mothers think it is very overwhelming and hard to get the babies to latch on and ends up breastfeeding one baby while bottle feeding the other. Nevertheless the mother still has to spend time pumping out milk to feed both babies. If a product is available, Anne Lucht is certain that this will have a positive motivational impact on the mothers confidence in tandem breastfeeding and thereby optimizeing their time spent with their babies and **synchronizing the babies´ patterns will give the mother time to rest.** (Appendix 4)

1.7



Ill. 19 Time spent on breastfeeding per day.

Evaluation

It is important for the premature babies´growth and health that the mother is positioned in a relaxed position to secure the lactation and that the babies practice breastfeeding from the beginning to ensure skin-to-skin contact since it in addition increases the milkflow. However mothers are having a hard time tandem breastfeeding because it is such a overwhelming and stressful experience that is taking up most hours of the day and is exhausting for the mother, who needs assistance and mental support every time the babies are to be fed, as opposed to having a singleton. It should be examined next, what the current solutions at the hospital are and what the optimal position for breastfeeding is, both for the mother and babies.

- Mother should be able to sit relaxed for up to 12 hours a day.
- The product should fit a baby with a length of 40-64 cm and with a weight of 2300-7700g.
- The product should allow skin-to-skin contact.

1.2 Investigating the problem

The purpose of this section is to thoroughly investigate the problems related to tandem breastfeeding at a hospital ward, how they are currently solved and what is lacking with these solutions. The knowledge is based on qualitative semi-structured interviews with three neonatal nurses and a retired nurse; Anne Lucht (Appedix 4) from the National Hospital of Denmark and Hanne Thrane Mikkelsen (Appedix 4) from Randers Region Hospital, Karina Westergaard Rolf (Appendix 5) *from Slagelse Hospital and Anne Lund(Appendix 33) previously employed at Aarhus University Hospital.*

Breastfeeding in chair

Most Danish Neonatal Wards are not well equipped to support the establishment of breastfeeding twins, either because **the size of the wards are not big enough to fit customized twin-nursing-chairs** or because there are not enough finances to buy these solutions. (Appendix 5)

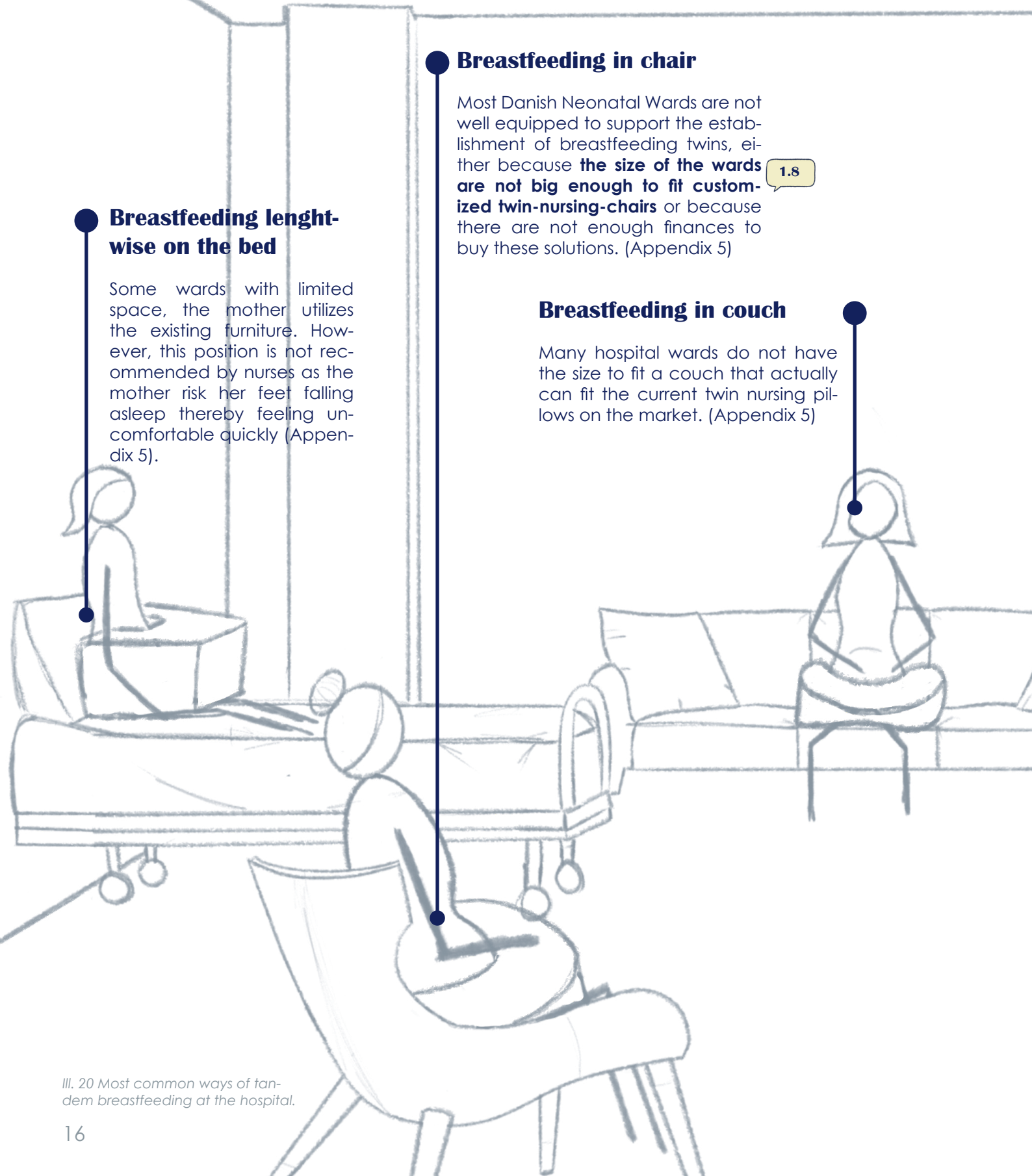
1.8

Breastfeeding lenghtwise on the bed

Some wards with limited space, the mother utilizes the existing furniture. However, this position is not recommended by nurses as the mother risk her feet falling asleep thereby feeling uncomfortable quickly (Appendix 5).

Breastfeeding in couch

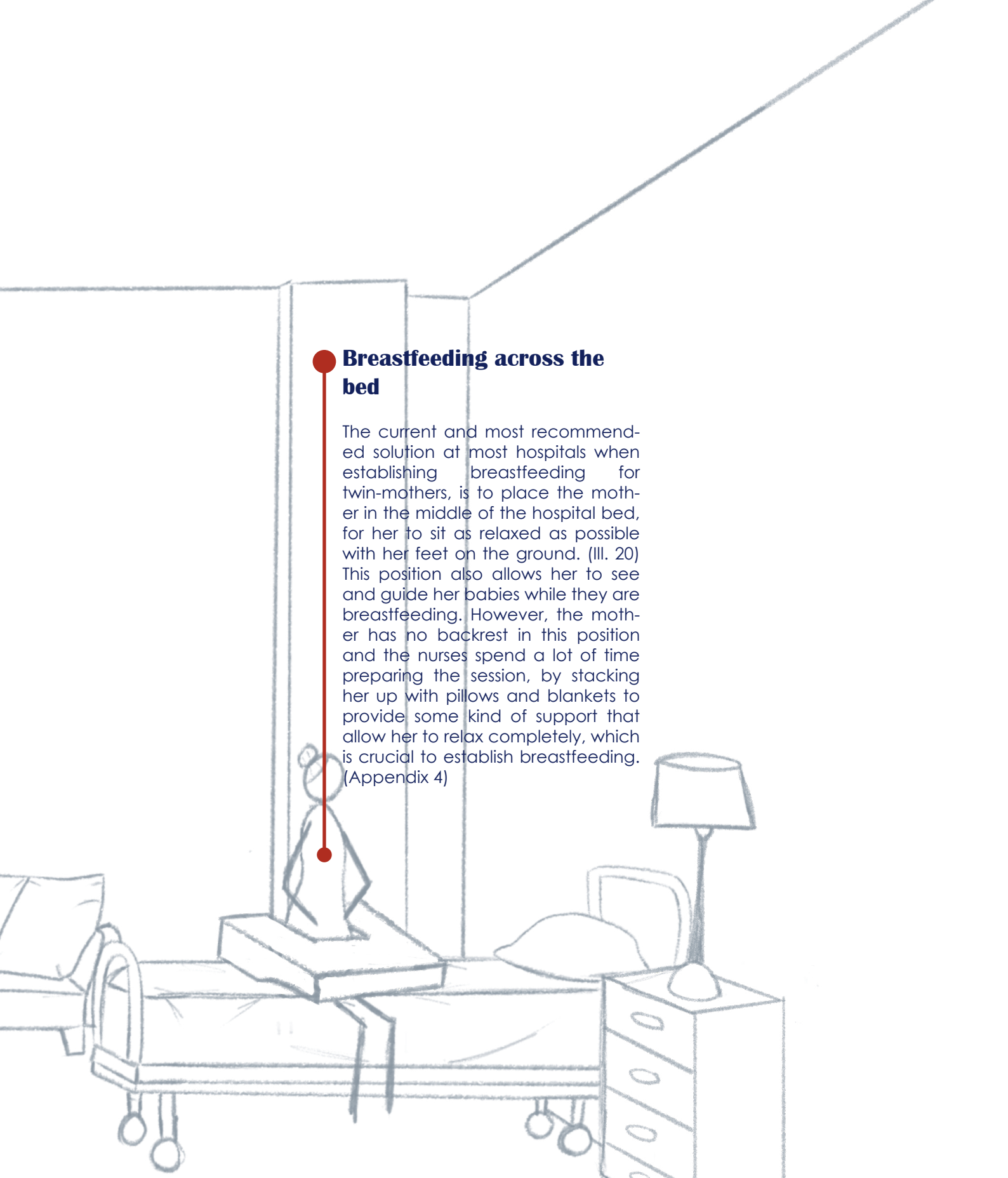
Many hospital wards do not have the size to fit a couch that actually can fit the current twin nursing pillows on the market. (Appendix 5)



Ill. 20 Most common ways of tandem breastfeeding at the hospital.

Breastfeeding across the bed

The current and most recommended solution at most hospitals when establishing breastfeeding for twin-mothers, is to place the mother in the middle of the hospital bed, for her to sit as relaxed as possible with her feet on the ground. (Ill. 20) This position also allows her to see and guide her babies while they are breastfeeding. However, the mother has no backrest in this position and the nurses spend a lot of time preparing the session, by stacking her up with pillows and blankets to provide some kind of support that allow her to relax completely, which is crucial to establish breastfeeding. (Appendix 4)



According to Anne Lucht, a product that allows for the mother sit comfortably and relaxed, help ease the workload for the mother and provide a better teamwork between mother and babies, would most likely motivate the mother to try tandem breastfeeding and boost her confidence during the process, which could essentially result in earlier discharge from the hospital. (Appendix 4)

"If it is there and available I think it would motivate the mothers to get the confidence to tandem breastfeed. ***Easing the mother's workload could potentially result in early discharge****"*
– Anne Lucth, Nursing-supervisor, Rigshospitalet

1.9

Scenarios

When tandem breastfeeding at the hospital ward, the nurses most often assist the mother with fetching the babies and stacking her up with pillows and blankets for optimal comfort (Ill. 21). However the mother has to practice the scenario independently, since no assistance is possible once discharged (Ill. 22). Both scenarios have been acted out to understand the problem of preparing for tandem breastfeeding. (Appendix 9)

The mother is sitting down on the hospital bed.

The nurse arranges the pillows and blankets in the bed behind her to create a supportive and comfortable backrest.

The nurse is handing the mother a nursing pillow.

The nurse puts additional pillows underneath the mothers arm for her to sit relaxed and supported.

The nurse is handing the mother the first baby.

The nurse helps the mother put the baby into position.

The nurse fetches the second baby and help the mother put it into position.

The mother can now tandem breastfeed with supervision from the nurse.

When the mother is done breastfeeding the nurse collects the first baby.

The nurse then fetch the second baby.

The nurse collects the pillows used under the arm.

The nurse helps free the mother from the nursing pillow.

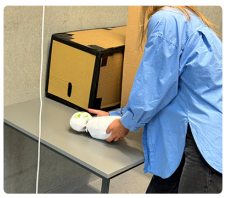
The nurse collects the pillows used for the mothers back.

The mother can now leave the bed.

Ill. 21 Scenario where the mother gets help from nurses

The mother arranges the pillows and blankets in the bed to create a stable backrest that supports the mother's back and arms.

The mother goes to the first crib and carefully lifts the first baby.



She places the baby to her left on the bed.

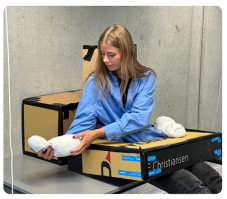
The mother lidt the second baby from the crib.

She place the baby next to the first one.

She retrieves a nursing pillow, which she places on her thighs.

The mother starts by lifting up the first baby.

She ensures that the baby is well supported against her body.



The mother lifts the second baby which is hard when simultaneously trying to prevent the first baby from rolling off.

Both babies are now properly positioned, and the mother begins to tandem breastfeed.

The breastfeeding session ends successfully, and both babies show signs of being full and tired.

The mother lays the first baby down on the bed, which is hard when simultaneously trying to prevent the first baby from rolling off.

The mother then place the second baby on the bed.

The mother removes the nursing pillow and puts it away.

Mother fetches the first baby.

And puts it in the crib.

She then fetches the second baby and puts it in the crib.

The mother puts all the pillows and blankets back into place.

Ill. 22 Scenario where the mother does it independantly

Evaluation

When tandem breastfeeding a lot of steps are involved. The nurse has to help the mother set up the pillows and blankets for her to sit properly. When attempting to prepare for breastfeeding independently, the mother has a hard time reaching the babies because the nursing pillow is locking her into one position. A more thorough investigation on the optimal position has to be carried out along with understanding the consequences the current workflow has for the nurses.

The optimal position

When tandem breastfeeding the recommended position from the nurses is the twin position. **The mother should sit with her back straight and supported, her arms resting and with both feet in the ground**, allowing her to relax her body completely thereby easing the lactation (Ill.23). In this **optimal twin position she has a full overview of the babies** and are able to see if they are latching on or need help suckling. Even though the nurses recommend this position, the mothers might find other alternatives once discharged and at home where they have more space and a more permanent spot for breastfeeding.

1.10

When breastfeeding in twin position, the babies are placed on each side of the mother underneath her armpits, with their chin at the mothers breast and their feet exceeding her back. **The babies should lie horizontally on a firm surface and preferably with a slight angle to avoid reflux**. However, most mothers find it very difficult and confusing and with two babies it takes twice as long to learn how to breastfeed, which is why most of the time one baby ends up being bottle fed while the other is breastfeeding. (Appendix 4 and 5)

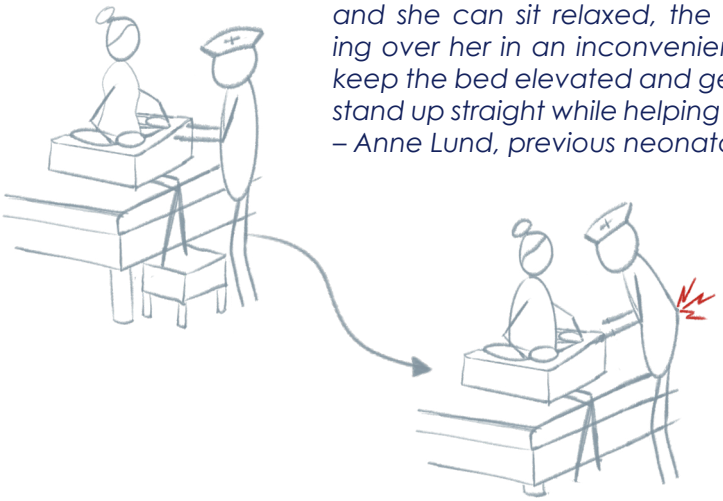
1.11

Ill. 23 Optimal tandem breastfeeding position.

Mother in need of assistance

At the ward several different ergonomic solutions, such as an adjustable bed, allow the nurse to perform her task according to a correct ergonomic position. However most nurses are not prioritizing a correct posture in order to help the mothers because they are not good at making these ergonomic solutions a part of their routine. Instead they sacrifice a correct ergonomic position, stretching and crouching because they want to make the experience as stress free for the mother as possible.

"If I would lower the bed so the mother´s feet can touch the ground and she can sit relaxed, the bed is so low, I would end up bending over her in an inconvenient manner. It never occured to me to keep the bed elevated and get a stool for her feet instead, so I could stand up straight while helping her. It was just not a part of my routine" – Anne Lund, previous neonatal nurse at Aarhus University Hospital



Ill. 24 Nurses acquire a bad ergonomic working position.

In addition, the most comfortable way for the nurses to help guide the mothers while breastfeeding is from the side. At Slagelse Hospital they are fortunate enough to have room for couches that are big enough to fit nursing pillows designed for twins. However the only way for the nurse to help the mother, when in a twin position, is from behind or the front . (Appendix 5)

In fact, according a nurse at Roskilde Hospital, Merete, the best way to guide the mother in how to tandem breastfeed, is for the **nurse to interfere as little as possible** using mainly her words to describe to the mother what she should do if the baby is not latching on. In this way the nurse is not overstepping the mothers intimate space. When asked about this at the Neonatal and Maternity Wards at the other national hospitals, all nurses unanimously agreed.

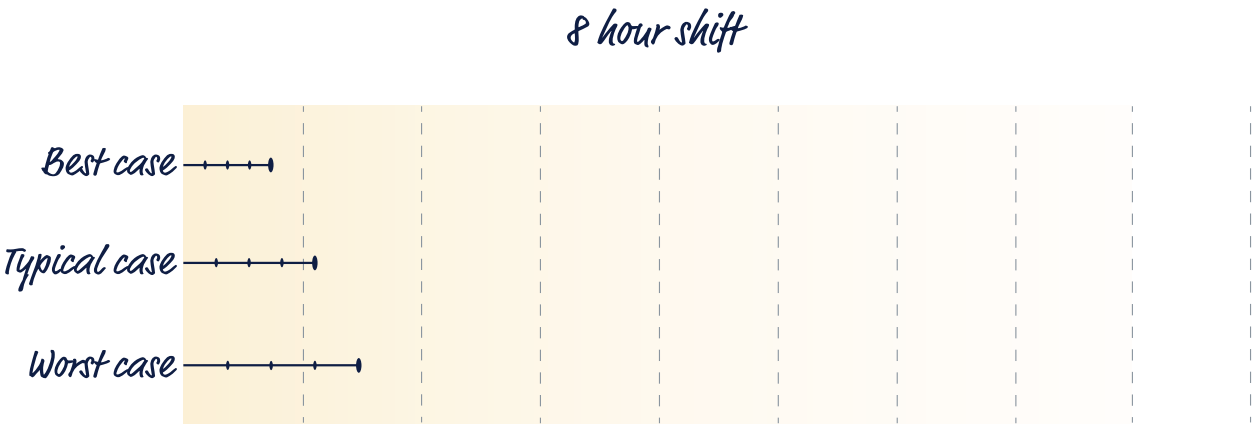
1.12

"As a nurse, you should actually be able to guide the mother through the tandem breastfeeding without entering her intimate space. Of course you sometimes have to be hands-on, but preferably by using your own body and handgesturerings." - Merete Pedersen, Roskilde Hospital .

Nurses workload

During an 8 hour shift the nurse spends 1,5 hour on helping the mother prepare for, assist and take away all equipment used for tandem breastfeeding (See section 0.1). At a very busy hospital the nurses have plenty of other tasks to consider during their shift, and have to run fast because they are often understaffed. (dsr.dk., n.d.)

1.13 **A shortening of the time spent helping the mothers** prepare for and wrap up breastfeeding would therefore give the nurse more time on her hands to perform other tasks at the ward, while she should still assist with mental support while the mother is learning how to breastfeed.



Ill. 25 Time spent by nurses on assisting with tandem breastfeeding.

Evaluation

The current possible positions at the hospitals are not optimal to secure the establishment of a healthy lactation and breastfeeding because the mothers do not sit correctly. This is crucial for multiple babies who frequently have low birth weights and are often born preterm, because it could result in longer hospitalizations, which is taking a toll on the families involved. In twin position the babies should lie horizontally on a firm surface and preferably with a slight angle to avoid reflux and the mother should sit up straight and well supported in her back and arms, with her feet in the ground to be fully relaxed allowing the lactation to run smoothly.
The nurses spend a lot of time preparing for, assisting and wrapping up the tandem breastfeeding, exposing her body to bad postures in order to make the experience as comfortable as possible for the mother. However, there is not much need for physical help during the breastfeeding because the nurses should practice guiding the mother with as little hand-on help as possible. Even so, the preparation and wrapping are hard on the nurse's bodies because they are not good at making the ergonomic solutions available, a part of their routine. A further elaboration explaining the mothers general experience with tandem breastfeeding at the hospital as well as at home needs to be investigated further, along with a market analysis of the current products available.

- Babies should lie with a slight angle on a firm surface.
- The mother should sit in the optimal twin position.
- Minimize hands-on from nurses.
- Easing the mothers workload.
- Should no take up additional floor space.

1.3 The mothers experience

The purpose of this section is to understand the mother´s experience with tandem breastfeeding in twin position at the hospital and at home. Semi-structured interviews with mothers found during an enquete on the Facebook page "Amning af tvillinger og flerlinger i Danmark" have been conducted to gain insights into the mothers experience with tandem breastfeeding in terms of their preferences and thoughts behind it. Notes from the interviews are presented in appendix 3, 4, 13 and 15.

In section 1.1 it was covered how the mothers experience a huge difference in breastfeeding singletons and twins and how it is an overwhelming and stressful experience and how feeding two babies at once requires a lot of self-confidence and mental support.
Since a multiple pregnancy can be located quite early before giving birth, the families have plenty of time preparing for the delivery and post-delivery.

Most nurses interviewed have recommended the mothers-to-be, the "Peanuts and Piglets" nursing pillow because it is one of the only nursing pillows on the market intended for breastfeeding twins. All mothers interviewed had purchased this nursing pillow prior to their delivery.

Ill. 26 Peanuts and Piglets nursing pillow.

Sine Daugaard however, had a hard time placing both twins on the "Peanuts and Piglets" pillow and since it is not tied around the waist **the pillow slides out leaving a gap between her body and the pillow** that the babies would fall into during breastfeeding. This is something Hanne, a neonatal nurse at Randers Regional Hospital experiences often when assisting mothers breastfeeding and her workaround is to fill the gap with a cloth diaper to secure the babies. In addition, Hanne mentions how the mothers mental health, in terms of her knowing and feeling like her babies are secure, is very important for her to relax her body in order for lactation to take place. (Appendix 4)

1.14

1.15

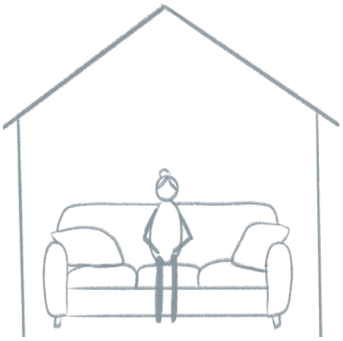
Another mother, Dorthea Nylander, feels like the back-pillow for the product **is not supporting her lower back** very well, also confirmed by the reviews of the product online (Appendix 3), since it is just a firm foam square, and it was hard on her back to sit like this because a tandem breastfeeding could easily take up to 1 hour and 30 minutes in the beginning.

When asked about the experience with the breastfeeding in a twin position on the Peanuts and Piglets pillow once discharged, Caroline Beck described how her babies often took turns on having breaks from latching on, but winding one baby while the other was breastfeeding was almost impossible, because she could only have one free hand since the other was supporting the breastfeeding baby from rolling off the pillow. Caroline ended up breastfeeding her babies one at a time because tandem breastfeeding seemed impossible and dangerous to do without assistance.

"I wish I could have succeeded in tandem breastfeeding to avoid breastfeeding 24 hours a day but that would require me to have both hands free to feel like my babies were secure."
- Caroline Beck, twin mother

1.16 Holly Beth was pleased with the Peanuts and Piglets pillow because **the babies were elevated preventing her from cringing her back and the pillow carrying the babies was mainly resting on the couch,** however she agreed that it is locking you into a position where you can not do much 1.17 else but breastfeed because **you need both hands to keep the babies from rolling off the pillow.**

"There aren't really any products to buy when looking for a twin nursing pillow and the ones available are not functioning well. A lot of babies get a great start in life if you could buy a product that serves all purposes"
- Holly Beth, twin mother.



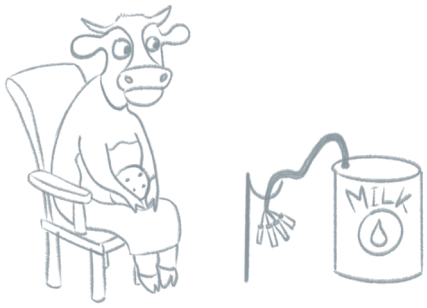
Ill. 27 Mother living in couch.

1.18 Even though the nurses recommend the twin position when tandem breastfeeding, Holly liked the option of being able to sit in different positions once discharged and at home, since she was not restricted to moving the nursing pillow like **at the hospital, where she needed the bed for sleeping as well as breastfeeding.**

"I practically lives on my couch the whole time I was breastfeeding"
- Holly Beth, twin mother.

Evaluation

During the interviews with the twin mothers it became evident that the most important factors for a mother while breastfeeding is to be able to have both hands free while breastfeeding, have a feeling of security towards her babies while breastfeeding and sit comfortably. In addition a lot of stress can be taken off the mothers shoulders by allowing her to tandem breastfeed without assistance, which gives her some time to rest without feeling like a dairy cow producing milk 24 hours a day.
There is a difference in tandem breastfeeding at home in regards to breastfeeding at the hospital since the bed at the hospital is used for sleeping too and the nursing equipment has to be taken on and off every time the woman is breastfeeding. At home the mother practically lives on her couch because she is breastfeeding all the time and has the option of sitting in different positions once the breastfeeding is established. Many mothers use the Peantus and Piglets nursing pillow. Therefore this nursing pillow along with other solutions on the market should be investigated.



Ill. 28 The mother feels llike a dairy cow.

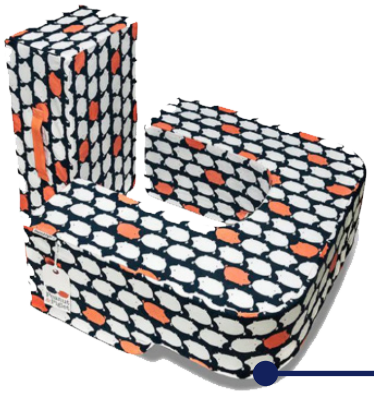
- Mother should have both hands free.
- Mothers should feel a sense of safety.
- Mothers should be able to do it indebendantly.
- The solution must be mobile.
- Should not leave a gap the babies can fall into.

1.4 Market research

This section explores the market of existing twin nursing pillows and potential competing products are examined through desktop research.

Competing twin nursing solutions on the market have been examined, since it needs to be identified whether these products could be competitors to a product proposal. Four products have been identified and compared with the functionalities of a potential product proposal clarifying the advantages and disadvantages of these products. (Appendix 3)

Home



Hospital

Ill. 29 Nursing solutions on the market.

Twin Feeding Pillow

This nursing pillow, with the option of fleece, cotton or waterproof upholstery, is ideal for mothers recovering from a cesarean, because the cushion is protecting the delicate abdominal area and is secured around the mothers waist so it won't slide off while breastfeeding. The pillow is multifunctional and can be used as back support for the mother and for the babies once they get older. However the back support is not firm and will not give the right posture and support in a hospital bed. Also with this product, the mother will need assistance when placing the babies and have to use both hands holding them, preventing them from rolling off the pillow. The price of this nursing pillow is 887 kr. (Things for Twins UK., n.d.)

Lady Nursing Chair

This product is solving the problem of poor back support, since the mother can sit in a nursing chair rather than relying on a bed or couch, because it is wide enough to fit two babies and have room for the babies feet when in twin position. In addition it is supporting both the mothers back and arms allowing her to relax. Many of the neonatal wards contacted, have looked into nursing chairs but they either do not have space for it or it is too expensive. Even though the nursing chair is solving the problem of a well supported back, the mother is still in need of assistance to place both babies and has to secure them using both hands. The price of this nursing chair is 4.595,00 kr. (Ammestol.dk, n.d.)

My Brest Friend Twin Nursing Pillow

This twin nursing pillow made of 100% polyurethan foam and with an upholstery of 100% polyester, can be buckled around the waist, ensuring the pillow won´t slide off making a gap for the babies to fall into. Furthermore the mother will still need assistance to fetch the babies and secure the babies with a hand on their back, while breastfeeding. It does not allow the mother to sit in the optimal position and she cannot prepare and wrap up the breastfeeding independently. The price of this nursing pillow is 724 kr.(Ubuy Denmark., n.d.)

Peanuts and Piglets

This product, consisting of a U-shaped nursing pillow and a back pillow upholstered in 100 % cotton, is recommended to the mothers by most nurses since it provides the right kind of posture and support and allow for the babies to lie in the correct position on a firm and flat surface, as most of the pillow is resting on the bed or couch. However the product leaves a gap between the mothers waist and pillow for the babies to fall into, in addition to the risk of them rolling off onto the other side. The price of this nursing solution is 1.165 kr. (Peanut & Piglet., n.d.)

Evaluation

It has been discovered that a competing product, allowing the mother to breastfeed without assistance thereby easing the nurses workload, does not exist. In addition no products have been made specifically for the hospital, leaving a market gap and "blue ocean" of B2B product proposals to explore. The mothers are most of the time bringing their own nursing pillow to the hospital, since not many are provided at the wards as the families end up taking them home and forgetting to return them. The hospitals are therefore not interested or can afford a big investment in nursing pillows. This opens up a solution space specifically for the hospital wards, creating an affordable nursing solution that fit the hospital ward, which has become the focus point of the initial ideation. To confirm the potential of creating a twin nursing solution directed at the hospital the initial market potential has to be investigated.

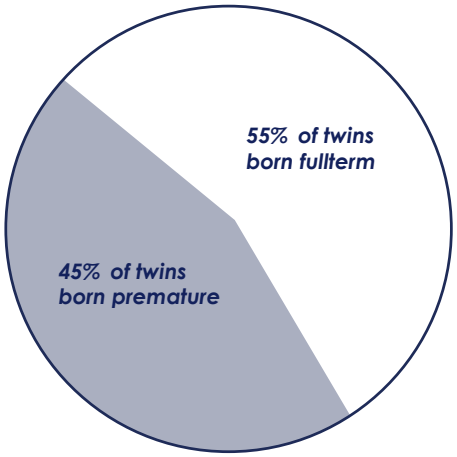
1.5 Initial market potential

The purpose of this section is to explore the market potential for a product aiding nurses when helping and guiding twin mothers while breastfeeding. The potential market for a product is examined through desktop research, while the quantity of products that could potentially be sold are examined through a semi-structured interview with lactation consultant and nurse at Aalborg University Hospital, Pernille Hurup Lyn (Appendix 1 and 5).

There is no product currently on the market that solves the problem previously described and it is therefore relevant to look into the market potential of the product, which has been examined through desktop research and an interview with lactation consultant, Pernille Hurup Lyn has been conducted to verify the problem.

How many twins are hospitalized?

During the interview, the importance of a correct positioning is confirmed as well as the potential for a new product. The Danish neonatal wards have room for between 5 - 36 babies, with a various number of twins hospitalized each month. At the moment of the study, Aalborg University had 4/20 spots occupied by twins, meaning 1/5 of the space at the ward was reserved for twin-mothers. However, Pernille describes that this number could look completely different if the study had been carried out a month prior, although the neonatal ward usually has more than one set of twins hospitalized, due to the fact that 45 % of all twins are born prematurely. (Appendix 1)
In addition to the 17 neonatal wards in Denmark, where the twins can be hospitalized up to 6 months, there are 33 maternity wards where twins born on time are hospitalized for a few days to get the breastfeeding established. (sundhedsplejersken.dk,2012)
1,5 % of all births in Denmark are twin births, meaning 478 sets of twins were born in 2021. (videnskab.dk.,2024; sdu, n.d.; sundhedsdatastyrelsen.dk, n.d.) 45% of these twins require a hospitalization at a neonatal ward, meaning each ward has approximately one set of twins hospitalized per month. (www.regionshospitalet-randers.dk, n.d.) In an enquete amongst all Danish neonatal wards, a lack of a good twin nursing solution was unanimous, and since most twins are hospitalized for a long time, the ward should acquire at least 2 nursing solutions to fill their need. (Appendix 5) Pernille estimates that around 100 products in total could be sold in Denmark, to both neonatal- and maternity wards and says there is a market potential for such a product since it would aid the nurse, saving valuable time and ensure the correct position of the mother while breastfeeding, giving her a better experience with it.



Ill. 30 Statistics on twin births.

It is presumed that this is the general perception of all European neonatal- and maternity wards. 113.000 twins were born in Europe between 2010 and 2015 and the number is increasing due to fertility treatment and the fact that the age of couples having babies are increasing. The market potential would therefore be higher if sold outside of Denmark. (www.eshre.eu, n.d.; Monden et al., 2021

Evaluation

A market potential of aiding nurses and ensuring the correct position for the twin mother, when tandem breastfeeding, has been identified. However the product should not be sold exclusively in Denmark with a market potential of merely 100 products. For this reason it is relevant to look at the potential outside of Denmark and expand the sales to the European market or further.

INITIAL DESIGN BRIEF

Intro

This project aims to develop a solution to facilitate breastfeeding for twin mother at the neonatal ward, minimizing the aid and thereby the workload for the nurse by utilizing existing furniture. By recognizing challenges faced by both mothers and nurses, the focus is to create a product that enhances comfort and independence for the mother.

Problem statement

How can a product facilitate and make tandem breastfeeding more comfortable for twin mothers hospitalized, enabling them to initiate nursing independently, thereby easing the assistance from nurses, reducing their workload?

Aim

To ease the workload of the nurses by making it possible for the mothers to breastfeed independently.

Vision

To improve the chaotic tandem breastfeeding experience and encourage an earlier discharge from the stressful environment at the neonatal ward.

Target group: Hospitals

User: Nurses and twin mothers

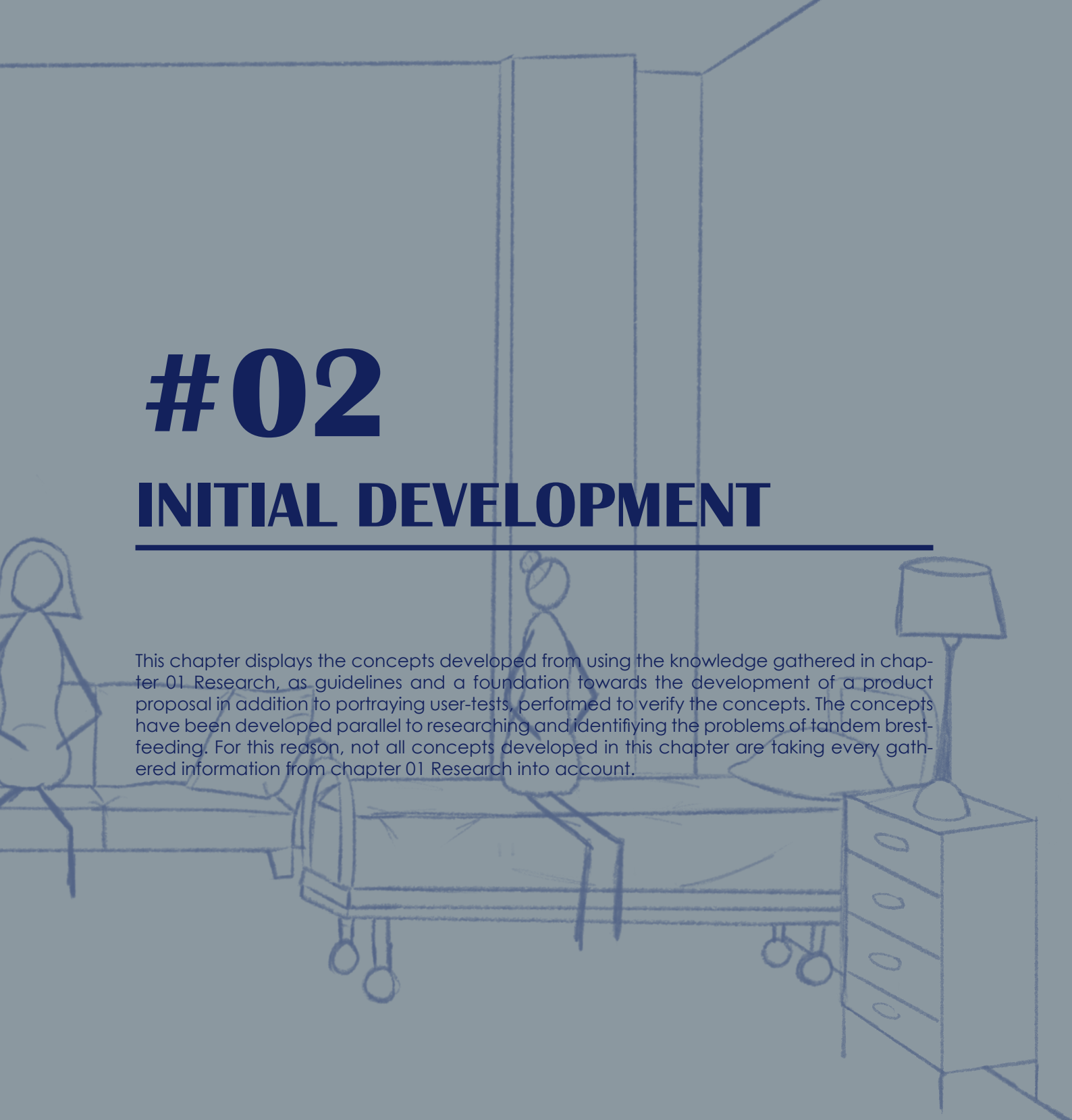
Context: The hospital ward

! Requirments

1	1. Minimize hands-on from nurses.	1.11	7	7. The solution must be mobile.	1.18
2	2. Easing the mothers workload.	1.4, 1.9	8	8. Should not leave a gap the babies can fall into.	1.14
3	3. Should not take up additional floor space.	1.8	9	9. Mother should be able to sit relaxed for up to 12 hours a day.	1.1
4	4. The mother should sit in the optimal twin position.	1.10	10	10. The product should fit two babies with a length of 40-64 cm and with a weight of 2300-7700g.	1.2, 1.5
5	5. Mother should have both hands free.	1.17	11	11. The product should allow skin-to-skin contact.	1.6
6	6. Mothers should feel a sense of safety.	1.17	12	12. Babies should lie with a slight angle on a firm surface.	1.12, 1.13

#02

INITIAL DEVELOPMENT



This chapter displays the concepts developed from using the knowledge gathered in chapter 01 Research, as guidelines and a foundation towards the development of a product proposal in addition to portraying user-tests, performed to verify the concepts. The concepts have been developed parallel to researching and identifiying the problems of tandem brestfeeding. For this reason, not all concepts developed in this chapter are taking every gathered information from chapter 01 Research into account.

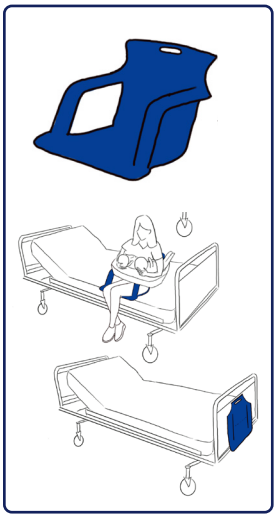
2.1 Initial concepts

The purpose of this section is to open up the solution space and develop initial concepts based on the knowledge gained from interviewing the mothers and nurses, focusing on the optimal twin position and on allowing the mother to do it independantly, to secure a relaxed position for the mother and reduce the nurse's working time. The concepts have been shown to both nurses and mothers to gain feedback for future ideations (See appendix 6, 12 and 13 for all concepts and feedback). These insights have been compared to previous requirments enlisted in the initial design brief.

2.2

"The fact that it saves space between use is great and it seems easy to set up." - Pernille Hurup Lyn, Nurse, Aalborg University Hospital

"It would probably have to be made in different sizes so they fit all women." - Pernille Hurup Lyn, Nurse, Aalborg University Hospital

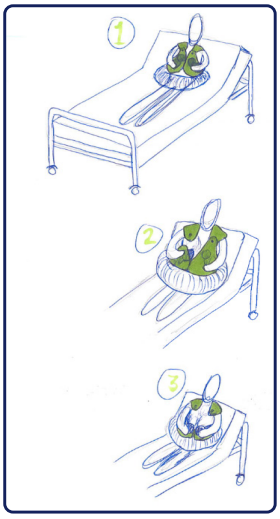


Ill. 31 Foldable backerst

The concept focuses on providing a correct posture and consists of a foldable backrest, with inspiration in a camping seat where the mother uses her own weight to hold the backrest in place. The seat can be stored away while not in use, by hanging it at the end of the bed.

Solves:
- Saves space
- Reduce preparation
- Allow optimal twin position

Missing:
- Sense of safety
- Independency



Ill. 32 Sling nursing bra concept

"Some mothers tie a cloth diaper to the bra-strap, allowing her to have two hands free as this concept which is nice" - Pernille Hurup Lyn, Nurse, Aalborg University Hospital

"It looks really good in terms of giving a feeling of security! ***It seems easy to get on and off as opposed to other baby slings****"* - Holly Beth, twin mother

2.1

The concept is developed with the principles of a nursing bra in mind. The mother can place the babies in the enlarged pockets, carrying them from the crib to the bed, breaking the current flow of trying to do it independantly (See current flow in section 1.1). When seated, the mother can unbuckle the babies and place them directly on the nursing pillow.

Solves:
- Saves space
- Reduce preparation
- Freeing both hands
- Sense of safety
- Independency

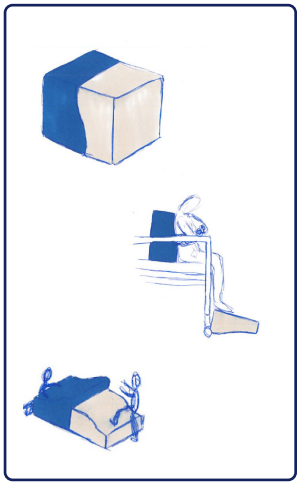
Missing:
- Allow optimal twin position

2.3

"It is a great idea for moms who have had a c-section"
- Merete Pedersen, nurse, Roskilde Hospital

"I am afraid the mother will get a bad posture. ***Breastfeeding has a lot of soft values*** *which products should reflect. This seems cold as the babies are being served which doesn't feel right "*
- Pernille Hurup Lyn, Nurse, Aalborg University Hospital
"I would be afraid of the babies rolling off"
- Holly Beth, twin mother

Ill. 33 Table nursing solution



Ill. 34 Mulit-functional solution

2.4

"It will not work at a hospital because of hygiene, in terms of placing one part on the floor. ***It should be easier to clean*** *if it should fit the hospital. The part supporting the mothers back seems very big but without good support at the lower back"*
- Lotte Bjørnskov, nurse, Viborg Hospital

"I like that is can be used for something other than breastfeeding"
- Holly Beth, twin mother

The concept focuses on shortening the preparation time and allowing the mother to breastfeed independently. It is a combination of a rolling table with a nursing on top. The table is constructed to open up in the middle and be pulled in close to the bed.

Solves:
- Independency
- Reduce preparation
- Freeing both hands

Missing:
- Allow optimal twin position
- Sense of safety

The concept is focusing on the mother having the correct posture. The concept is stored in a foam square that can be divided in two, when in use. Once the babies get older the concept can be turned into a playground developing their motor skills.

Solves:
- Allow optimal twin position
- Reduce preparation

Missing:
- Independency
- Freeing both hands

Evaluation

Amongst the broad set of concepts presented to the mothers and nurses, the sling nursing bra in particular, stood out. The concept resembles a workaround already used by the nurses, that allow the mother a sense of security and free both her hands while breastfeeding which is equally important to a relaxed seating position and independence. In addition the sling does not take up much space on the hospital ward and seems easy and fast to take on and off, giving the mother the possibility to prepare and wrap up on her own. Furthermore it eliminates a step of the mothers current process, when trying to prepare for breastfeeding independently which is the stepping stone for the next ideation.
A new ideation of concepts should focus on pairing it with some kind of back and arm support and in collaboration with a nursing pillow for the babies to lay on, that is secured around the mothers waist, and adjustment-options should be considered, since it should fit women of different sizes and growing babies previously described.

! Easy to set up, enter and exit.

! Should be adjustable for all women.

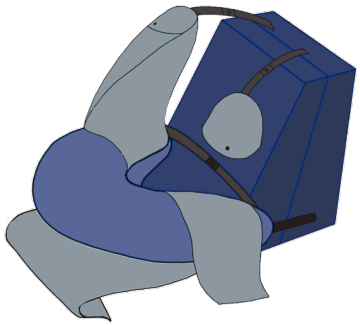
! The solution should accommodate soft values.

! Should be able to clean.

2.2 Combining the parts

The objective of this section is to conceptualize a solution to easing the mothers experience in tandem breastfeeding that could be found by changing the flow of how the mother is currently trying to prepare breastfeeding independently and make it much easier for her by eliminating some of the current steps or making them more convenient, thereby easing the workload of the nurses. The concept has been showed to nurses to get expert feedback on the concept (Appendix 16)

The sling nursing bra concept, allowing the mother a sense of security and the possibility of breastfeeding without assistence, altering the flow of preparation was well received by both mothers and nurses. However it should be in collaboration with a nursing pillow and a backrest to solve the scenario, bringing comfort and support to the mother when seated in a twin position. Therefore a joint concept was conceived and presented to mothers and nurses from four different hospitals to provide feedback on a joint concept consisting of a 1; sling nursing-bra, 2; nursing pillow, 3; backrest.

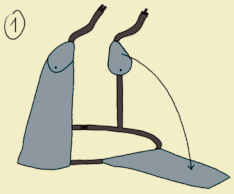


Ill. 35 Combined concept

Feedback

The nurses liked the joint concept, since it lets the mother have two free hands to fetch the babies and guide them while breastfeeding. The main takes from the feedback (Appendix 16 for full feedback) regarding each part is described below:

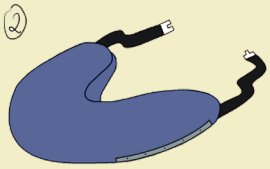
1. Sling nursing bra



One advice was to make sure the sling is large enough to fit the baby and the operation of opening the sling and **placing the baby has to run smoothly by using one hand only.**

2.5

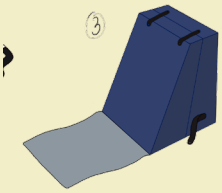
2. Nursing pillow



A focus point has to be on making the nursing-pillow long enough to include the babies feet, since babies find comfort in limitation of the feet and will try and **curve their body around the mother for more skin-to-skin contact**. The material should be firm where it carries the babies, but also cling to the body preventing gaps.

2.6

2. Backrest



The width of the backrest has to be considered in order to make room for the babies feet. Making a foldable backrest would save space while not in use and adjustable angles allows the mother to sit as she wishes, adding comfort while breastfeeding.

2.7

Ill. 36 Combined concept 1, 2, 3

Evaluation

A confirmation of a joint concept has been established. The insights on each part of the joint concept should be investigated further one by one and the market potential of using a sling as the dominating element of a nursing solution should be investigated.

! The width of the backrest should allow room for the babies feet.

! The pillow should allow the baby to curve around the mothers shape.

! Should be able to open the sling pocket with one hand.

2.3 Market analysis

The objective of this section is to bring transparency to the inspiration behind the concept og the sling nursing bra presented in section 2.1, where inspiration has been drawn from existing baby slings (appendix 11). The previous market analysis for the twin nursing pillow investigated in section 1.1 is taken into consideration.

Different baby slings are explored because they offer parents a convenient way to carry their children hands-free. By drawing inspiration it would help giving the mothers more independence and thereby easing the nurses workload.
Prior to developing and testing prototypes of different sling-concepts, the JPMBB sling has been tested to understand the functionality of it. The JPMBB sling is only meant for one baby but the principles could be used in a sling for twins. The sling is a bit complex and time consuming to put on. However the simplicity of it being one piece of fabric is something to consider for a future product proposal and the simple closing mechanism by tying a knot is appealing.
Other baby slings come in various designs, ranging from sturdy to elastic materials, with some specifically tailored for twins from the age of 4 months. Designs include both single fabric pieces to be tied in knots and more structured carrier bags with buckles and adjustable straps. However, **many sling carriers appear somewhat complex to use, posing a potential challenge for users.** Simplifying use or adopting more intuitive designs could serve as a competitive advantage in a new product propsal. The demand for sling carriers primarily stems from mothers seeking a way to free both hands while carrying her babies.

2.8

Ill. 37 Baby slings on the market.

Evaluation

The market analysis displays the convenience of baby slings offering hands-free options to carry your baby while being close to them. However, the complexity and lack of intuitive use needs to be considered as it might intimidate potential users when needing to be be done up to 12 times a day in relation to breastfeeding.
Simple interactions with the nursing sling bra are to be explored further, along with developing on the nursing pillow and backrest simultaneously.

! The solution should be simple to understand the use.

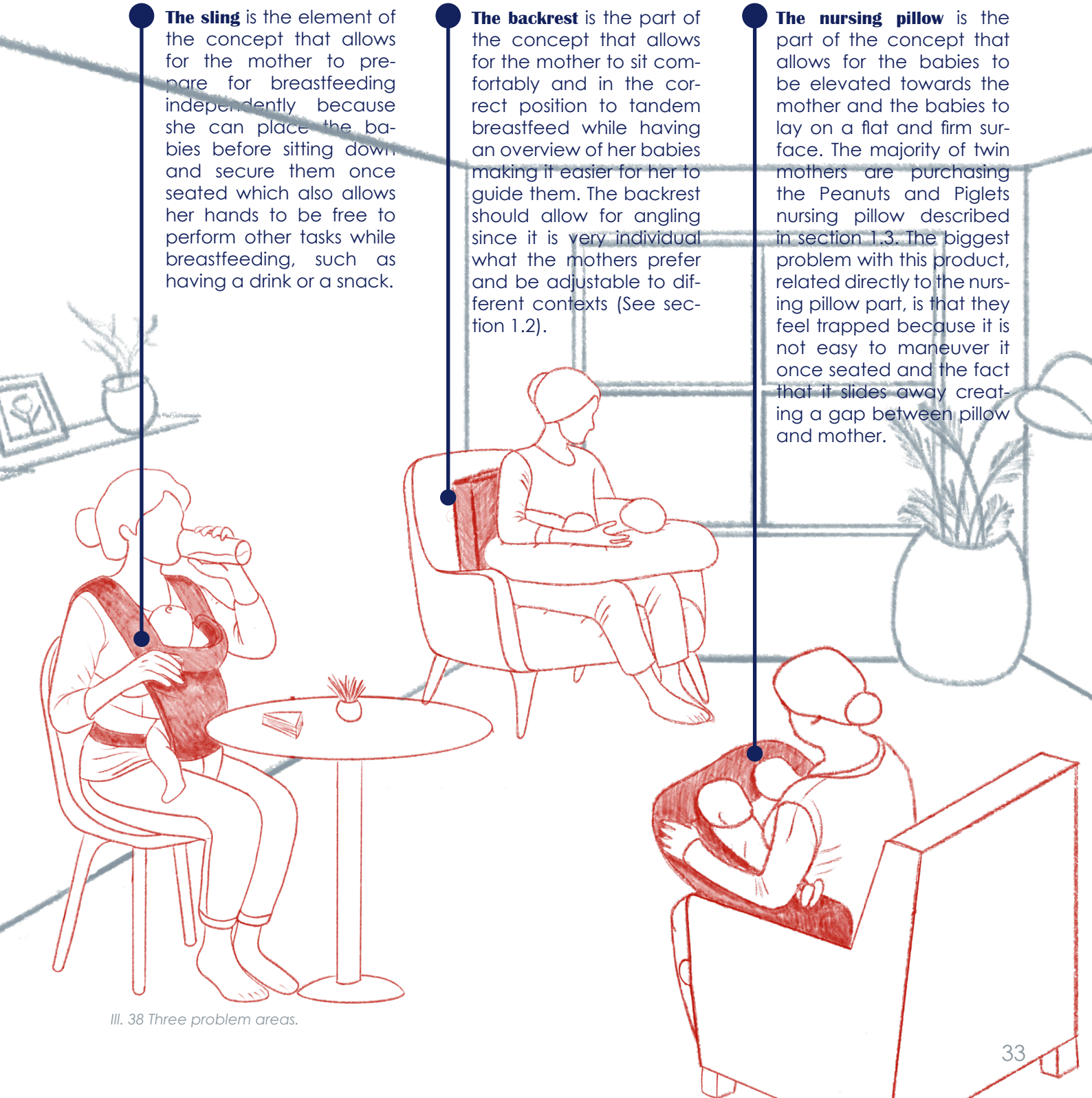
2.4 Further development and testing of each part

In this section, each part of the concept has been investigated and developed parallel to the other parts of the joint concept, to break up the solution space and explore the possibilities within each part, for further validation and feedback. Through the making and testing of prototypes, new ideas came into mind and further ideations have emerged, resulting in a thorough process of developing each part simultaneously depicted from page 34 and onwards. (Appendix 14, 17 and 23)

The sling is the element of the concept that allows for the mother to prepare for breastfeeding independently because she can place the babies before sitting down and secure them once seated which also allows her hands to be free to perform other tasks while breastfeeding, such as having a drink or a snack.

The backrest is the part of the concept that allows for the mother to sit comfortably and in the correct position to tandem breastfeed while having an overview of her babies making it easier for her to guide them. The backrest should allow for angling since it is very individual what the mothers prefer and be adjustable to different contexts (See section 1.2).

The nursing pillow is the part of the concept that allows for the babies to be elevated towards the mother and the babies to lay on a flat and firm surface. The majority of twin mothers are purchasing the Peanuts and Piglets nursing pillow described in section 1.3. The biggest problem with this product, related directly to the nursing pillow part, is that they feel trapped because it is not easy to maneuver it once seated and the fact that it slides away creating a gap between pillow and mother.



Ill. 38 Three problem areas.

Ideation of sling

Concept 1

A prototype of the nursing-bra from the joint concept (See section 2.2) with an adjustable belt and shoulder straps were made, to test out how to make it fit all sizes of women. The mother can open the pocket on one side, place her baby, and close it and do the same on the other side, having both hands free. The velcro-closing mechanism is not the final solution and needs to be investigated further.

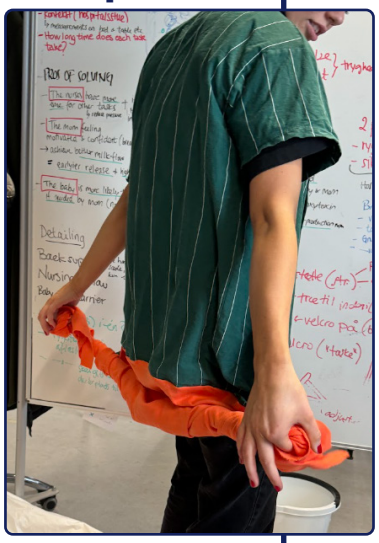
Ill. 39 Nursing bra

Concept 2

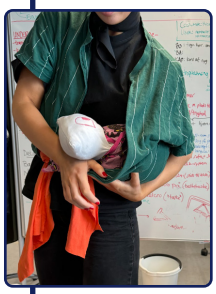
In the second concept, the simplicity of using only one piece of fabric and tying it with a knot was investigated further by making a t-shirt harness that wraps around the mothers waist and is tied in a knot. However as it turned out, this solution does not allow for much adjustability besides around the waist, and will therefore have to be made in a size S-L to fit all women. It was not as easy to pull off the sleeves, once the babies were placed as first anticipated.

Ill. 40 T-shirt sling 1

Concept 3



Another t-shirt concept was investigated. This time by adding more length to it, that would allow for the pockets to become bigger as the babies grow and fit different kinds of women's bodies, by rolling down more fabric. It was adjustable to mother and babies, however, the material should be more stretchy for the babies to fit, which could result in the pockets becoming too loose eventually.



Ill. 41 T-shirt sling 2

Concept 4

Ill. 42 Crossback and knot

Moving on from the t-shirt idea, but keeping the fabric waist-belt from concept 1, a crossed back was investigated allowing space for the baby's feet while still having skin-to-skin contact. In addition it took a while to tie the waist-belt because it has to go around the body a couple of times to give a sense of safety.

Concept 5

The crossed back solution was tested out with a padded buckle waist-belt and buckle pockets, for easy and quick interference, however, the buckle requires two hands to close. A rod pocket was installed in the waist-belt so the pockets would be adjusted along with the belt when buckling it, instead of having the fabric accumulating in one spot. (Appendix 10 for scenario)

Ill. 43 Crossback, buckle waistbelt and click pocket

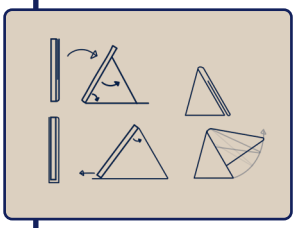
Evaluation

The tests of the many different sling concepts all focused on allowing an easy interference while using it and changing the current flow of preparation. In addition, the correct placement of the babies, laying on a firm and slight angeled surface and as close to the mothers body as possible, to allow skin-to-skin contact is important for the milkflow to be stimulated. (See section 1.2) The crossed back from concept 4 is working great in terms of not getting in the way of the babies' feet allowing them to exceed the mothers body. A padded and buckled waist-belt is to be preferred over tying a knot, despite the simple design, because the buckle is quick and easy to adjust and feels secure to wear.The pockets will have to be adjusted on the shoulder; however this mechanism will have to be investigated further, since the buckling requires two hands and therefore only works for the waist-belt that is put on before fetching the babies. In addition the collaboration with the nursing pillow and backrest will have to be explored, tested and showcased to get feedback.

Ideation of backrest

Concept 6

The principle of an iPad cover was transferred to a backrest allowing it to be flat packed and easy to store away, but having the option of being positioned in two different angles.



Ill. 44 Ipad cover

Concept 7

Ill. 45 Sunbed

Ill. 46 Sunbed principle

Inspiration from the principals in a sunbed has been drawn, where one part of the backrest folds and is placed into slits, allowing different angles and flat packed.

Concept 8

The same principles as in the sunbed concept, allowing the backrest to be angled, were investigated in a third solution, where strings on the side of the backrest allow it to be placed in different angles or closed flat. An additional padding in the bottom is securing support for the lower back.

Ill. 47 String adjustemnt

Concept 9

Ill. 48 Ergonomic backrest

A combination of the iPad cover and the sunbed principals have been investigated further is the last concept, where the folding of the backpiece will allow for it to lean against the hospital bed, and a slit in the backrest will keep it into place once in use. This solution will be possible to use in a couch, as well as a bed, since the adjustable backpiece can be merged into the backrest. In addition the backrest resembles the width of a fitness bench that also requires the shoulders and arms to move freely. In addition the concept is exploring the shape of an ergonomic chair used at the university, that supports the lower back in particular by forcing it into an ergonomic posture. A prototype has been made of this concept and tested by people of different sizes, all agreeing on the backpiece providing good comfort.

Ill. 49 Backrest inspiration

Evaluation

With inspiration in the researched optimal position of the mother and the babies and the places she sits while breastfeeding, an ideation of the backrest was explored through testing mockups. It has resulted in a preliminary backrest consisting of several different principals described in concept 9. Even though the research suggests the optimal position for the mother is to sit up straight while breastfeeding, it was decided to develop and test out the option of angeling the backrest allowing the mother to choose the position she finds most comfortable to sit in while breastfeeding since this is very individual. This has been done to challenge the premise and consider the mothers opinion over the nurses, since they will be the ones leaning against the backrest. The collaboration with the sling nursing bra and -pillow has to be investigated further and tested to gain feedback from mothers and nurses on each part of the joint nursing solution.

Ideation of nursing pillow

Concept 10

Ill. 50 Nursing pillow with a waistbelt buckle

A new nursing pillow solution should have a belt that can secure it around the waist (See section 1.3) which has been investigated using a buckle belt, that can be adjusted accordingly. The dimension and shape of the nursing pillow has to be investigated further to match the size of two babies placed along the side of the mother.

Concept 11

Ill. 51 Nursing pillow with waist belt tied knot

The second concept resembles concept 10, but instead of a buckled belt it is tied in a knot as a sling.

Evaluation

When testing out the two different types of closing mechanisms to secure the nursing pillow around the waist, the fastest and most preferable one was the buckled belt, because of its convenience. The belt has to be secured tight around the waist for there to not be a gap once the babies are placed. However it is nice that the pillow is following you, as you adjust your seat while breastfeeding. The collaboration has to be investigated further and tested to get feedback on a joint product proposal.

2.5 Test and feedback

The objective from this section is to get feedback on each part of the concept from nurses to verify the positioning of the mother and the babies that the preliminary product proposal provides (Appendix 16 and 19) Additionally it is to gain feedback from twin mothers (Appendix 13) and to showcase it to a retailer to get a business point of view on the proposal. (Appendix 18)

Sling nursing-bra

Ill. 52 Three problem areas.

"Good thinking with a sling so the baby is laying safely, just make sure it is wide enough so it doesn't cut into their skin"
- Hanne Thrane Mikkelsen, Randers Regional Hospital

"I would worry that the mothers would not want to walk around with their babies hanging like that, but it is a great option once seated"
-Pernille Hurup Lyn, AAU

"I like how it saves me time that I only have to pick my babies up once when preparing for breastfeeding"
- Holly Beth, twin mother

2.9

Backrest

Ill. 53 Three problem areas.

"It is really nice that the backrest is compatible so it doesn't take up much space"
- Hanne Thrane Mikkelsen, Randers Regional Hospital

"I feel like this is where your focus should be if you are making a solution for the hospital and not so much on making it work without help "
- Pernille Hurup Lyn, AAU

Nursing pillow

Ill. 54 Three problem areas.

"I like how you have considered the gap between mother and nursing pillow. Perhaps the material should be considered too. Something that follows smoothly against the mothers body"
- Hanne Thrane Mikkelsen, Randers Regional Hospital

"You should consider the shape of the nursing pillow and make sure there is enough room for two babies and it exceeds the mothers back, perhaps have it high enough to rest on the bed instead of the couch "
- Lotte Bjørnskov, nurse, Viborg Hospital

General feedback

Generally the feedback from the nurses is centered around the sling being a nice idea, since it results in the desired security of the babies and allows the mother to have free hands to help guide the babies while breastfeeding. However the pocket should not be so wide that it interferes with the baby while breastfeeding causing it to lose its concentration on being fed and the pocket should be attachable using one hand only. In addition there is a concern that the mothers wouldn't want to walk around with their babies hanging, however **it is a great idea to have a sling once seated.** A questionnaire was posted on the Facebook page; "Amning af tvillinger og flerlinger i Danmark", asking different questions about the twin mothers breastfeeding experience and habits. When asked if they would use a sling, more than 50% said they could not emagine trying it or they did try it, but it was too difficult or the babies became too heavy quickly. (Appendix 20)

2.10

Another focus point has to be on making the nursing-pillow long enough to support the entire body of the baby, feet included, since babies find comfort in limitation of the feet and will try and curve their body around the mothers. It could be an idea to let the nursing pillow be big enough to exceed the width of the thighs, letting the pillow rest on the bed, so the mother won't have to carry all the weight.
It is a great idea to make the backrest foldable and making it with adjustable angles is nice since the mother should sit in a straight position while breastfeeding, but allow for a more laid back position too. It is nice that it fits both beds and couches but it should probably be upholstered to make it nice to sit against.

Feedback from retailer

Following the milestone, the concept was taken to Luksusbaby to get feedback from a retailer, considering the B2C market. The sales woman's thoughts on the concept was that it would be too heavy to hold two growing babies in a sling and that the mother wouldn't want to walk around with it besides when the babies are very small. In collaboration with the backrest and nursing pillow it seemed more likely to use the sling as a way to get your hands free while seated. She found the expected lifetime of the product, being 6 months, very short. However a product would not be hard to sell even if it can only be used for a short period of time if it solves the problem, but a higher price could be charged if the product can follow the baby or mother for a longer period of time. In general she thinks it has great potential if the product can solve the problem of tandem breastfeeding independently.

"I can sell a stressed out mother almost anything if it makes her problems go away and eases her mind"
- Cecilia Haraldsen, Luksusbaby

Feedback from milestone

The feedback revolved around looking into a three fold value proposition of flow, safety and comfort, by for instance minimizing the flow rather than changing it and how to exit the product by looking at different scenarios e.g. if one baby is asleep, how is the baby secure then. Aspects that have been considered, but not yet integrated. An additional consideration is if the scenario at home is the same as at the hospital, possibly altering the primary user to being the mother, developing a B2C product instead.

Evaluation

By getting feedback on the product from several viewpoints it is evident that the main user should be the mother rather than the nurse, because when presented to a retailer she could see great potential in a product solving how to tandem breastfeed independently at home and thereby can be used in both contexts.
However, the product should be as easily accessible for the mother as possible, and make the breastfeeding experience effortless and safe, which the preliminary product proposal does not succeed in. When asked through a questionnaire, more than half of the twin mothers wouldn't want to carry their babies because it is too insecure and this should be considered especially when altering the user. However the nurses like how the sling allow the mother to have both hands free, because it is easier for her to guide the babies when breastfeeding, and this should therefore be incorporated into the product proposal, merely as a way to support the babies while placed on the nursing pillow. To make a definitive decision on changing the main user and developing a B2C product, the market potential amongst the twin mothers has to be explored.

! Change the flow of the current preparation.

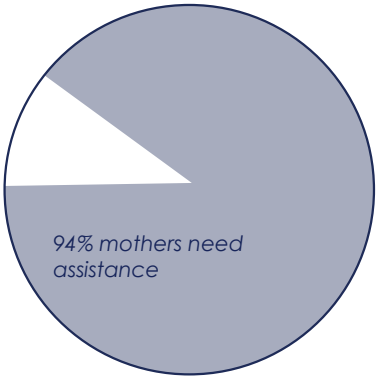
! The sling should be used only when seated to support the babies

2.6 Market potential

The objective of this section is to explore the market potential of a B2C product, subsequent to the possibility of altering the main user to be the twin mother who is then intended to purchase the product to use it at home as well as the hospital. (Appendix 20)

To explore the market potential amongst twin mothers, a questionnaire was posted on the Facebook page; "Amning af tvillinger og flerlinger i Danmark", asking different questions about the twin mothers breastfeeding experience and habits. One of the questions being, if they use the twin position once discharged and whether they need help while breastfeeding. 50 out of the 53 women answering the questionnaire, use the twin position at home with need of assistance, whereas 3 women could not make it work, but wish to do so. The majority of the women succeeding however, are in need of help the first 3-4 weeks and find it hard to do without. This indicates a market potential for a product that can help the mothers succeed in tandem breastfeeding without assistance.

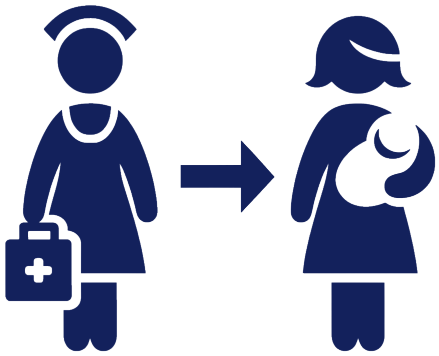
According to the questionnaire, a theoretically potential of selling 94% of the product, (see section 1.5), since the majority of mothers asked in the questionnaire are willing to tandem breastfeed if made possible and would like for it to be easier to do independently.



Ill. 55 Mothers using twin position with assistance

Evaluation

The result of the questionnaire indicates a big market potential, since almost all twin mothers are tandem breastfeeding or would like to, if made easier to do independently, since the majority are currently in need of assistance the first couple of weeks and find it difficult to do without assistance. A rising number of twin births worldwide make it possible to sell the product outside of Denmark, assuming that the market research of solutions (section 1.4) is adequate and no products solving this problem have been made before. **This indicates that the main user should be the twin mother**, since a larger number of units can be sold when making a B2C product, that should also be purchased by the hospitals, since the problems experienced at home are the same as on the wards, only with more assistance possible from the nurses. 2.11



Ill. 56 Changing primary user

#2 DESIGN BRIEF

Intro

This project aims to develop a solution to facilitate breastfeeding for twin mothers at the hospital and the home, minimizing aid and thereby the workload for the nurse by utilizing existing furniture. By recognizing challenges faced by both mothers and nurses, the focus is to create a product that enhances comfort and independence for the mother.

Problem statement

How can a product facilitate and make tandem breastfeeding more comfortable and ease the mothers mind when nursing at home as well as at the hospital, enabling them to initiate nursing independently, thereby reducing the assistance from nurses or a partner?

Aim

To make it possible for mothers to breastfeed independently to ease their mind resulting in a reduced workload for the nurse during the mothers hospitalization.

Vision

To improve the chaotic tandem breastfeeding experience and encourage an earlier discharge from the stressful environment at the neonatal ward and improve the mothers ability to breastfeed without assistance at home as well as at the hospital.

Target group: Hospitals and privates

Primary user: Twin mothers

Secondary user: Nurses

Context: Hospital ward and homes 2.11

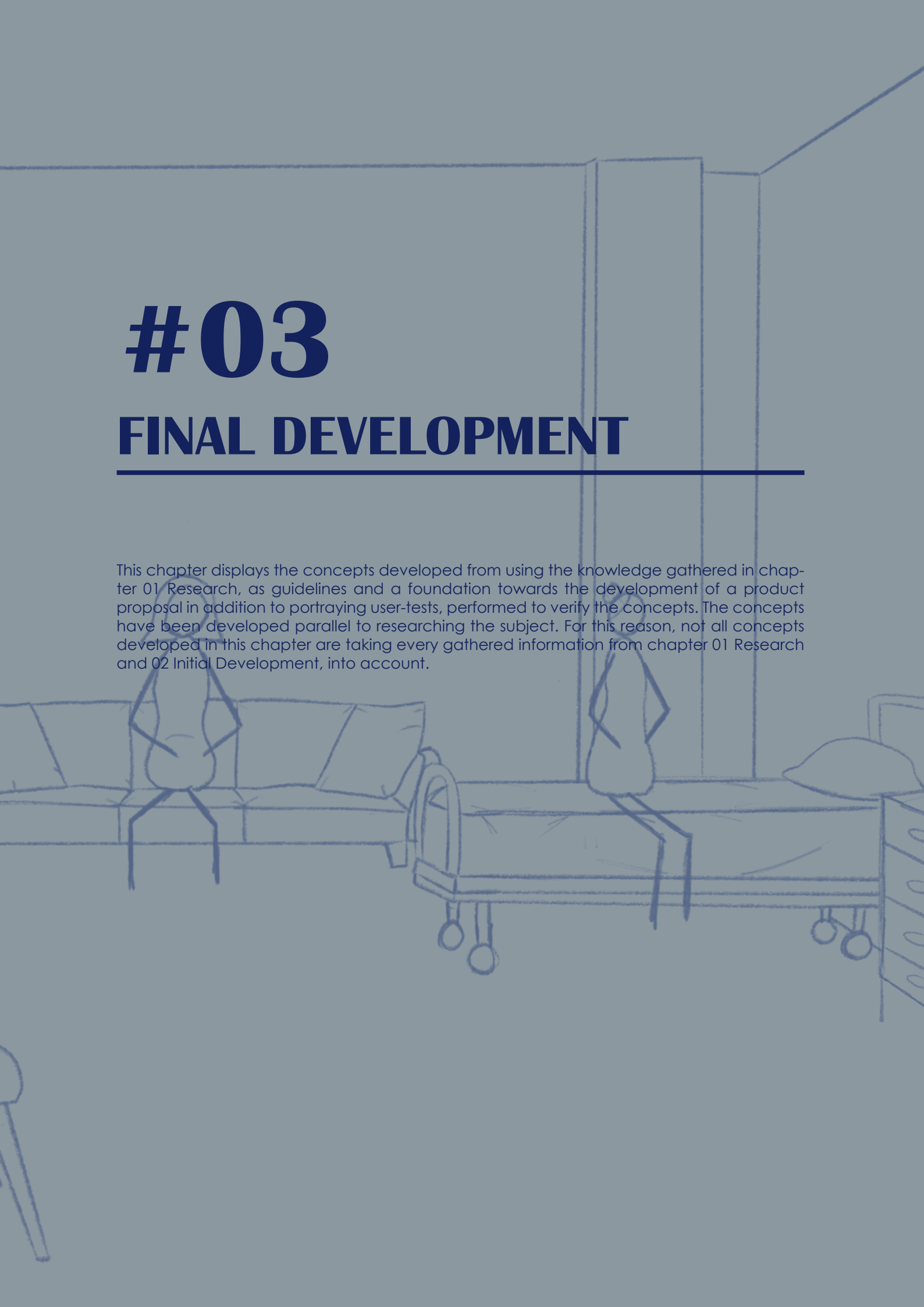
! Requirments

1	13. Mothers should be able to do it indebendantly. 1.3	11	16. The solution should accommodate soft values. 2.3
2	14. Reduce the flow of the current preparation. 2.9, 2.10	12	12. Babies should lie with a slight angle on a firm surface. 1.12, 1.13
3	4. The mother should sit in the optimal twin position. 1.10	13	9. Mother should be able to sit relaxed for up to 12 hours a day. 1.1
4	2.→13. Easy to setup, enter and exit for the mothers. 2.1	14	10. The product should fit two babies with a length of 40-64 cm and with a weight of 2300-7700g. 1.2, 1.5
5	5.→14. Should be able to open the sling pocket with one hand. 2.7	15	11. The product should allow skin-to-skin contact. 1.6
6	6. Mothers should feel a sense of safety. 1.17	16	8. Should not leave a gap the babies can fall into. 1.14
7	15. Should be adjustable for all women. 2.2	17	20. Should be able to clean. 2.4
8	17. The width of the backrest should allow room for the babies feet. 2.5	18	18. The pillow should allow the baby to curve around the mothers shape. 2.6
9	7. The solution must be mobile. 1.18	19	19. The solution should be simple to understand the use. 2.8
10	3. Should not take up additional floor space. 1.8	20	1. Minimize hands-on from nurses. 1.11

#03

FINAL DEVELOPMENT

This chapter displays the concepts developed from using the knowledge gathered in chapter 01 Research, as guidelines and a foundation towards the development of a product proposal in addition to portraying user-tests, performed to verify the concepts. The concepts have been developed parallel to researching the subject. For this reason, not all concepts developed in this chapter are taking every gathered information from chapter 01 Research and 02 Initial Development, into account.



3.1 Final development - Altering the user and expanding the context

This section is continuing the conceptualization and idea generation of a nursing solution for twin mothers, but with the primary user being the twin mother, and the context being her home as well as the hospital. The joint product proposal should focus on minimizing the steps of preparation for the mother while allowing her to sit in the optimal tandem breastfeeding position and keep her babies safe and hands free. Tests and mockups have been made simultaneously (Appendix 54 and 31)

Context mapping

3.1 In addition to being used at the hospital for the duration of the twin mother´s hospitalization, the setting for a new nursing solution is **primarily going to be at the home.** When interviewing a twin
3.2 mother looking at her home it is evident that it **does not matter to her that things take up much space** as long as it serves a purpose. (Appendix 54)

"Our current nursing solution is permanently placed on the couch and takes up a lot of space, like most other baby stuff surrounding us. It is not a problem for us because we have a lot of space. Maybe if you live in a small apartment it would be a problem, but I doubt that parents expecting twins will keep on living like that."
- Ida Nielsen, twin mother.

Evaluation

The twin mothers do not have a need for a space saving solution when tandem breastfeeding, since they practically live in their couch for the duration of their babies breastfeeding and are surrounded by items solving specific problems in regards to raising a baby. A new nursing solution is therefore not restricted in terms of size as long as it serves the overall purpose of aiding the mother. The nurses and lactation consultants should still be providing expertise knowledge in the further development of the product focusing on incoorporating the sling into the nursing pillow to achieve a nursing solution fullfilling the requirments from Design brief 2.

Ill. 57 Home of a twin mother

From sling to swaddle

A new concept direction was established, to simplify and merge the parts introduced in section 2.4, since the mothers consulted, would like for it to be as stress free and easy as possible to prepare for tandem breastfeeding at home, where they usually do not have any help provided. (Appendix 13)
Through online feedback from one of the nurses consulted, she suggested using a swaddle to support the babies instead of a sling to carry them. A **swaddle imitates the babys tight space in the womb and imitates touch to help the baby calm down and prevent involuntary movements** when lying on the nursing pillow prior to breastfeeding. (Appendix 25) Therefore the idea of incorporating a swaddle into the design and using it to support the babies so the mother can free both her hands, was investigated, keeping in mind that the process of preparing for breastfeeding should still be shortened.

3.3

Ill. 58 Development of swaddle

Test on iterations

At first, a neck strap was incorporated into a belt attached to a nursing pillow, allowing one side of a modified swaddle to be attached to the mothers shoulder (Appendix 29). When testing the concept, it became obvious that this solution provides a bad posture for the mother and a feeling of dragging her neck down (Ill. 59). Therefore the strap was tied around each shoulder like a bolero which was much more comfortable (Ill. 60) (Appendix 24). However the straps would fall off the shoulder too easily and instead the bolero was combined with the crossed back from the sling nursing bra concept presented in section 2.4 and paired with the nursing pillow (Ill. 61-62). This allowed for the concept to be put on like as a backpack and shoulder straps ensures **adjustments according to the mothers height of upper body and circumference of waist**. (Appendix 26)

3.4

Ill. 59 Neck strap incooporated

Ill. 60 Straps tied like a bolero

Ill. 61 Backpack

Ill. 62 Backpack with swaddles

Feedback

The general perception of the proposal was that using the swaddles to hold the babies by attaching them to the shoulder was a great solution to give the mothers more mobility and ease during breastfeeding. However it has to be adjustable to both growing babies and fit the mothers upper body and it can not touch the babies head since they will find this disturbing and they lose their concentration. The harness was not as easy to handle as anticipated. The mother can easily unbuckle the harness when exiting it, however this means she needs to remember to buckle the shoulder straps before putting it on again, which can easily be forgotten in a stressed situation with two hungry and crying babies. In addition, the nursing pillow needs to be of **a more firm material than polyester-filling** and be bigger in size to fit the babies since they take up more space when laying in twin position and preferably made of a material that is **easy to clean for spit ups etc**.

3.5

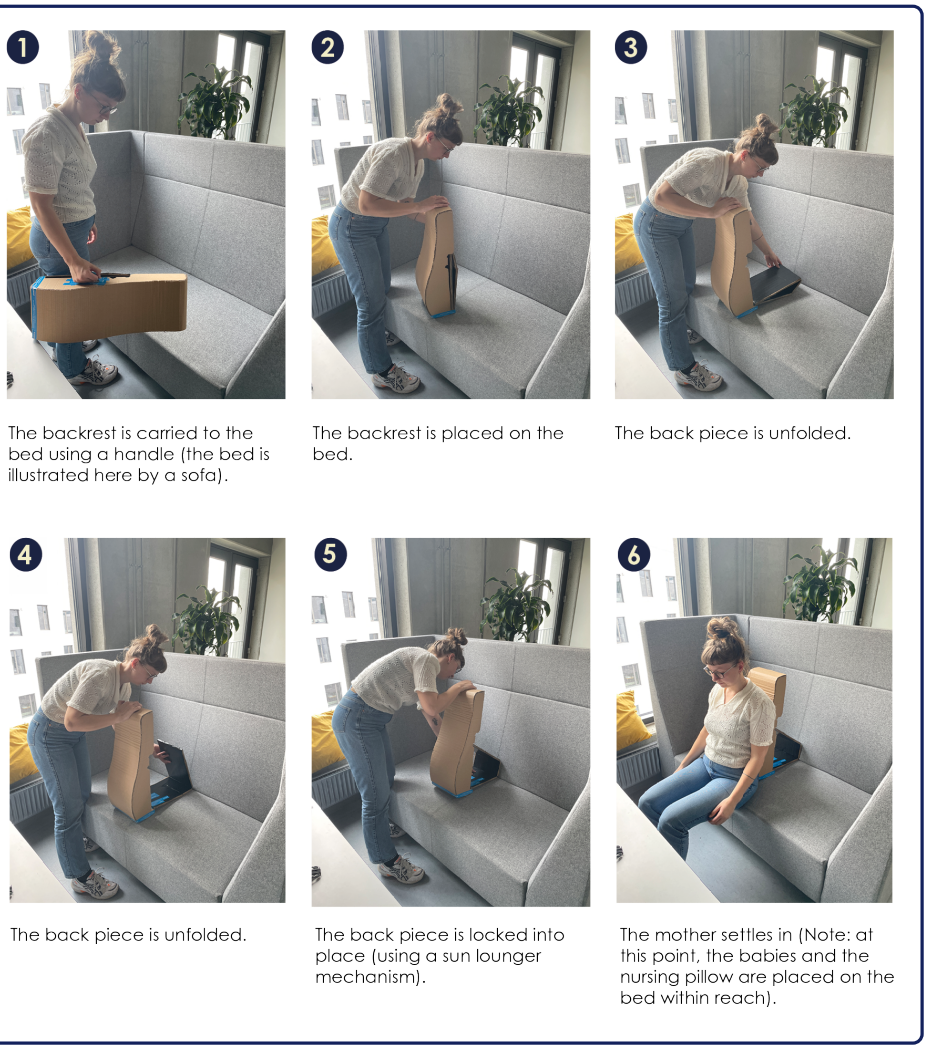
3.6

"My biggest problem when tandem breastfeeding was that one baby needed to be burped while the other was suckling. It is really nice that the swaddles makes this possible by freeing both of my hands. "
- Caroline Beck, twin mother

Scenario using backpack with swaddle in collaboration with backerst

A scenario illustrating the new and improved process of preparing for breastfeeding at the hospital and at home by using the new concept (Ill. 61-62) in collaboration with the backrest, was showcased to mothers and nurses to provide feedback on the proposal. (Appendix 27)

At the hospital ward



Ill. 63 Scenario at hospital ward

At home

Ill. 64 Scenario at home

The swaddle

Ill. 65 Scenario with swaddle

Evaluation

When testing the concept it was evident that the harness was not as easy to handle as anticipated, giving the opposite feeling than intended. In addition, fetching the babies by securing one in the swaddle has become easier than the prior solutions, but it is still hard and it feels awkward to reach over the baby that has already been put into position and it is not intuitive how to reach for the baby in order to place it correctly. The swaddle, that has been well received, needs to be attached to the mothers shoulder in a simpler way as well as an easier way to feetch the babies as this still causes inconvenience. In addition the backrest has to be integrated into the solution.

- Should prevent the babies involuntary movements.
- Should be adjustable according to the mothers upper body.
- The surface the babies are layed on should maintain its structure.
- Easy to clean for domestic use.

Test of fetching the babies

It has been tested how to fetch the babies from the couch og bed using a swaddle because the current solution is inconvenient. (Appendix 31)

Ill. 66 Current fetch of the baby

Ill. 67 Fetching the baby using the swaddle

Evaluation

It is difficult, almost impossible for a small woman to lift the babies from the ground onto the pillow. Therefore the swaddle was tested as a tool to carry the baby towards herself. A size small mother has to use both hands and rearrange her legs to have enough strength to lift the baby onto the side. It was equally difficult for a medium and large sized woman to reach for the babies on each side, but possible because she has longer arms and upper body. Therefore a different approach on how to put the babies into position needs to be examined.

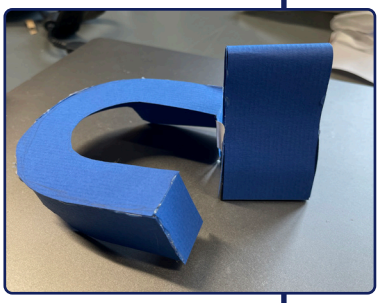
Merging the backrest and nursing pillow

An ideation of mock ups, focusing on merging the nursing pillow and the backrest into a nursing solution, was performed and six concepts was derived. The harness and swaddle has been the secondary focus of most concepts in order to work out the main structure of the proposal, where the mother is sitting and where **the babies are placed before the mother sits down and start the breastfeeding to change the flow of preparation.** (Appendix 28)

3.7

Concept a

Concept a is designed to be opened from the side and the mother can sit down and swing the nursing pillow across her legs and start breastfeeding.



Ill.68 Mockups of oncept a

Concept b

The nursing pillow is embracing the backrest, providing stability and is buckled in the front once the mother is seated, allowing it to fit all sizes with the sides exceeding each other.

Ill. 69 Mockups of oncept 4

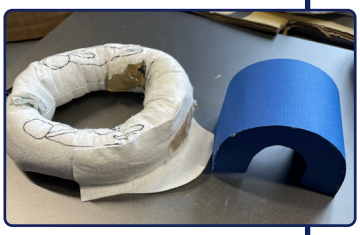
Concept c

In concept c the backrest has been integrated directly into the nursing pillow making a uniform construction, The backrest is placed on the inside of the loop in order to make room for the babies feet behind it.

Ill. 70 Mockups of concept c

Concept d

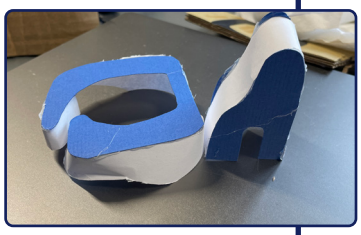
The backrest of this concept can be placed across the nursing pillow like a jigsaw puzzle, or taken off and used as toys once the babies have grown.

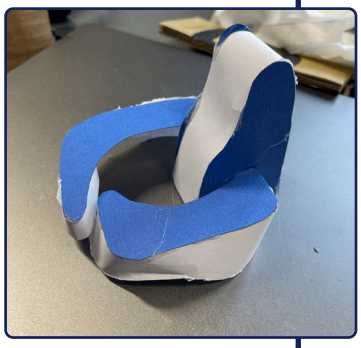


Ill. 71 Mockups of concept d

Concept e

Concept e is examining the interaction of the components by shape and exploring modularity and unity and shaping the backrest to support the lower back, much like the previous backrest in section 2.5. The nursing pillow is open in the front and has a flat surface for the babies to lay on.





Ill. 72 Mockups of concept e

Concept f

The concept is integrating the idea of a swing arm from the first concept and the convenience of entering the nursing solution from the front and placing the babies directly on each side of the nursing pillow, turning the solution into a chair without a seat or legs. The incorporation of a shoulder strap in the backrest allows for the swaddle to be attached to the rest of the structure. (Appendix 30)

Ill. 73 Mockup of concept f

Evaluation

The idea of turning the nursing solution into a semi stationary furniture with an incorporated back- and armrest is pushing the solution into a more stationary direction. In addition the product proposal should shorten the flow when preparing for breastfeeding by placing the babies directly on the pillow while providing easy access and comfort when sitting down. Furthermore the interaction with the nursing solution should be simple and done in only a few steps. Concept f has the most potential and is therefore selected for a 1:1 prototype where the adjustability of the backrest has to be investigated making it **fit different depths and width of sofas and beds**, and the shapes and sizes of each component should be considered. 3.8

! The babies should be placed prior to the mother taking a seat.

! The solution should fit both sofas and beds in both contexts.

3.2 Further development and testing

In this section concept f is tested in a 1:1 scale with focus on establishing the overall dimensions of the nursing pillow in particular. The tests have been carried out and tested on fellow students and a previous neonatal nurse, Anne Lund, has provided feedback. (Appendix 33)

The mockup of concept f was scaled in a size 1:1 firm foam prototype to test out the structure on different sizes of women and figure out the overall dimensions and shape of the sides of the nursing pillow and how it feels and reacts when in contact with the body.
Cutouts have been made for her thighs to fit, letting most of the structure rest on the ground, leveling the pillow when seated. A person in a size small, medium and large have tested out the scenario of tandem breastfeeding, to test the prototype´s.

Test 1: Securing the babies

Since the surface where the baby is laying is even, the possibility of attaching a border has been investigated to place the babies directly on the pillow thereby minimizing the steps of preparation, allowing the mother to place her babies directly on the nursing pillow rather than having to place them on the bed, sit down and then fetch them once again. (Appendix 36)

A surface border has been investigated as a mean of securing the babies and minimixe the steps of the flow of preparation.

Ill. 74 Securing the babies

Evaluation

This solution might allow for the swaddle to be unnecessary. The gray border is securing the baby and once the mother sits down she can free the border and use it to close the nursing pillow in the front. The solution was shown to a previous neonatal nurse, Anne, to provide feedback on the solution (Appendix 33). She would prefer the swaddle as a way to secure the babies because it feels more safe, but liked the idea of changing the flow of the preparation, because it makes the process much easier for the mother.

Test 2 - Sculpting the pillow for the legs to fit and determine the height of the pillow

In addition to the previous tests, the prototype was used to determine how to shape and size the nursing pillow sides for them to fit all sizes of women and allow for the babies to be placed horizontally.

3.10

Ill. 75 Testing the shape of the pillow

The gap between the thighs, waist and pillow is cut into an organic angle, ***to get the pillow as close to the body as possible to prevent the gap.***

The height of the nursing pillow needs to fit a size S to L woman *and the babies lie with a slight angle.*

3.9

Ill. 76 Testing the hight of the pillow

Evaluation

From the previous test it became obvious that the nursing pillow did not rest on the mother's thighs as intended, and an organic angle was cut into the foam, which helped the pillow to rest primarily on the surface, to ease the load of the babies, while keeping the pillow close to the mothers body. (Appendix 32)

Test 3 - Finding the surface area of the pillow

A test was carried out, set to determine the surface area of the nursing pillow, that should be able to fit both growing babies and function as an armrest for the mother. (See section 1.1)

The lines on the surface of the pillow resembles the placement of the babies and the mothers arms

Ill. 77 Top view of testing the surface space

Ill. 78 Testing the surface space

Evaluation

Lines were drawn on the surface to resemble the placement of the largest babies at 6 months of age and the position of the mothers arms, to determine a minimum surface area of one side of the pillow in order to make it less excessive. (Appendix 32)

Test 4: Testing means of adjustment

Ill. 79 Testing the material - inflatable pillow

An idea of an inflatable nursing solution has been investigated to adjust the sides to fit all sizes of women better. The front of the solution has separate inflatable chambers to adjust it to different sizes and allow the woman to selectively choose how close to her, her babies are being placed, by adjusting the height when inflating the chamber.

Evaluation

Through the previous testing it became evident that making a "one size fits all" nursing pillow would mean compromises on different measurements, depending on the woman using it. This proposal was also shown to Anne (Appendix 33). She liked the idea of angealing the babies slightly since a lot of mothers already use a nursing stool to raise their babies. It gives a better feeling of them being safe when gravity is forcing the babies towards the mother. However she did not believe an inflatable pillow was the right solution to make the product adjustable because it is not very stable.

Evaluation on the tests

Through testing the nursing solution on a 1:1 scaled prototype it has become evident that a "one size fits all" solution might be more difficult than first anticipated and a new tandem nursing solution might have to be produced in different sizes like the Peanuts and Piglets pillow with a petit and an original version for small or large women. However some measurements can be used for all women while others require the possibility of adjustments if only one product should fit all sizes. E.g. the surface area fits all women while the height might need adjustments. Changing the flow by placing the babies directly on the nursing pillow prior to sitting down saves priceless time for both mothers and nurses and spares them awkward working positions. However the material and structure of the nursing pillow has to be firm and steady if the mother should trust it in holding her babies.

! Should be adjustable according to the mothers waist to close the gap.

! Should fit mothers thighs from size S to L.

3.3 Establishing the overall look

In this section feedback and insights drawn from section 3.1 and 3.2 have set the foundation for developing three new product proposals, Bloom 1, 2 and Bean focusing on determining the shape of the pillow side pieces and overall structure of the nursing solution, which should ensure the pillow to stay in place and the babies to be placed safely and allow the mother to breast-feed without assistence. (Appendix 34 and 42) The concepts have been shown to both mothers, nurses and retailers to provide feedback and choose a direction.

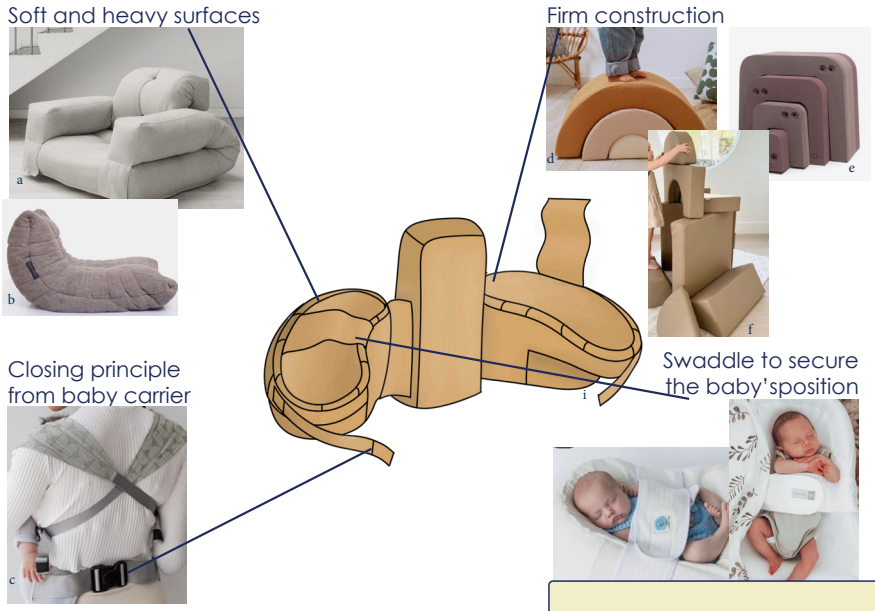
All concepts are equipped with a swaddle incorporated in each side piece that should either be attached using the shoulder strap described in concept f in section 3.1 or be attached directly to the mothers nursing bra. (Appendix 38)

Bloom 1

3.11

This concept is based on a solid foam structure. The **side pieces are shaped to follow the babies´ sideways position** and constructed with a gap in the front that will allow room for the mothers thighs, so the babies can be pulled in close to her body. A buckle is securing the position so the pillows won't slide. The side pieces have been constructed in a width that makes room for the mothers arms to have somewhere to rest. The sides are attached to the backrest with a piece of fabric that allows the nursing solution to be opened up.

Ill. 79 Mockups of Bloom 1

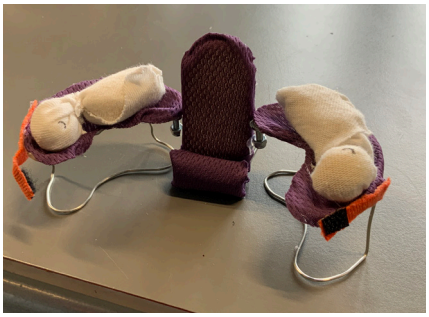


Ill. 80 Moodboard illustrating the intention with Bloom 1

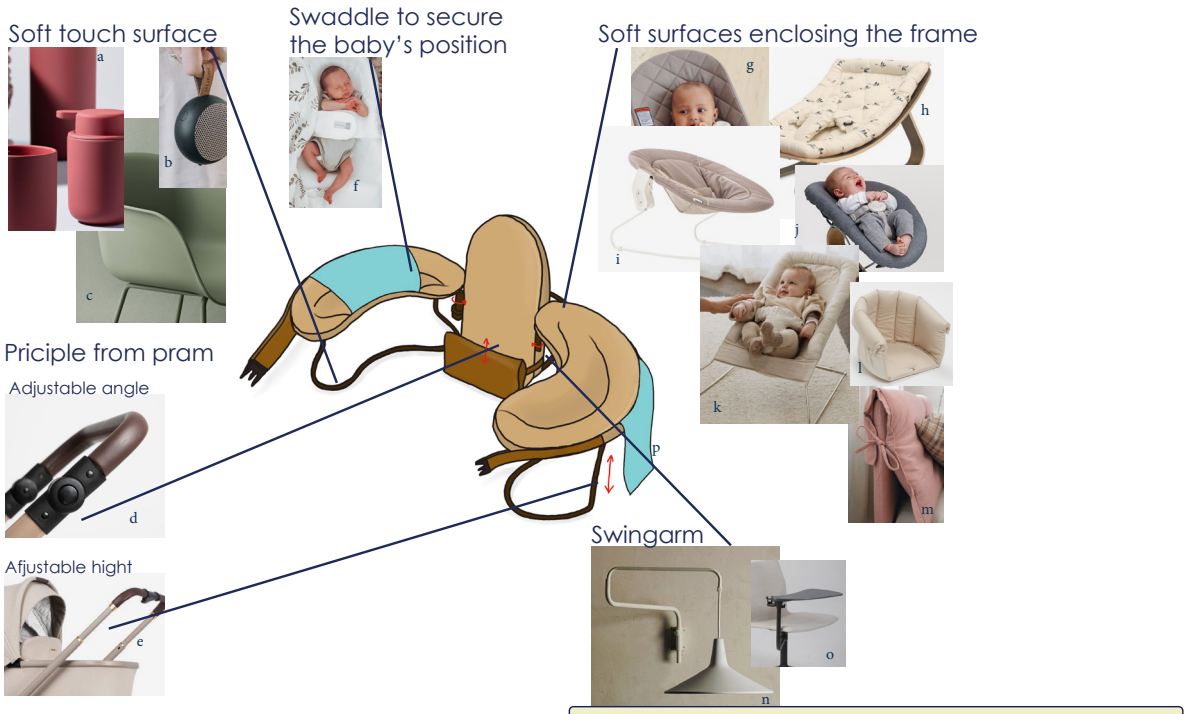
"I like the material and shape of this one! And the fact that you enter it from the front and are able to close it thigh no matter the size you are, as opposed to the nursing pillow from Peanuts and Piglets"
- Dorthea Nylander, twin mother

Bloom 2

This concept has the shape and functions portrayed in Bloom 1 but in addition it is structured with a metal frame that can be adjusted up and down on both sides and on the back to fit all mothers and be adjusted according to both bed and sofa. The mother is meant to sit on the frame of the side piece to keep it in place.



Ill. 81 Mockups of Bloom 2



Ill. 82 Moodboard illustrating the intention with Bloom 2

> *"I don't think this is the way to go. It gives me associations to an instrument rather than resembling soft values"*
> - Pernille Hurup Lyn, nurse Aalborg University Hospital

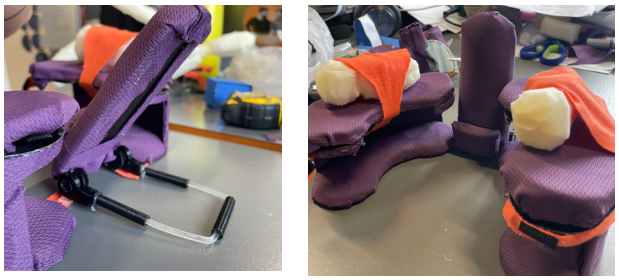
Evaluation

The general feedback on the concepts were that the women consulted liked Bloom 1 the best because of its shape and material resembling a soft welcoming environment as opposed to Bloom 2 where they believe it would become irritating to sit on the wire frame because you breastfeed for many hours a day. In addition the design language did not tap into the warm universe of breastfeeding. However they liked the idea of adjustments that this concept provides. A merged product proposal with a hard and stable structure on the inside and upholstered on the outside should therefore be examined. In addition they liked the idea of incorporating the swaddle into the nursing pillow and using a **nursing bra to attach the swaddle to** rather than having something pulling their neck down. It gives the baby free movement to activate their reflexes while still being secured when breastfeeding. 3.12

! The solution should be able to be used in collaboration with a nursing bra.

! The solution should follow the babies sideway position.

Bean



Ill. 83 Mockups of the concept Bean

This concept is merging the structure from Bloom 2 with the softness from Bloom 1. The side pieces are attached to the backrest with hinges and connected in the front with a buckle. The backrest can be adjusted in an angle to fit the individual mother and the length of the back can be adjusted with a telescope pipe as seen on a vacuum cleaner. Furthermore the side pieces are constructed with a solid plastic plate, upholstered in foam and fabric. The mother is meant to place her thighs on the structure to gain the desired stability for the side pieces once the babies´ are placed on them. In addition, the swaddles have been incorporated into the pillow, securing the babies when placing them on the side pieces and a wedge has been added to each side piece to be able to elevate the babies to acommodate the mother's upper body and prevent reflux (Appendix 39) This elevation gives the mother a sense of safety towards the babies since gravity pushes them towards her body. (Appendix 33)

Feedback from retailer and supervision

The concept has been presented to a retailer, Cecilia from Luksusbaby along with inputs from the technical supervisor. (Appendix 42) He pointed out that all functions needed to be very mechanical solutions to work. Something that is hard to unite with a soft universe unless it is hidden in the structure.
When presenting the combined solution to Cecilia at Luksusbaby along with the previous Bloom 1 and 2, it was clear that she thought the new solution was too excessive and overwhelming and she liked the soft and simple look of Bloom 1 much better. She found the incorporation of the swaddle appealing and didn't think it would be a problem to lay the babies on the sides because twins are smaller than other babies when born and growing. She would make the backrest very simple by letting it have an extra piece that could be taken on and off instead of something that had to be adjusted and make the process less simple. Cecilia suggest that the solution is coated in Kapok foam which is hard and breathable

Evaluation

Through the feedback provided by nurses and mothers on Bloom 1 and 2 and additional feedback from a retailer and technical supervisor on Bean, a direction for the product proposal has been determined. The entire product has to be made in foam and in a solid structure to secure the babies´ position once placed on the side pieces. The shape of the side pieces needs to be detailed to ensure it fits most women and the backrest has to be incorporated and detailed along with a backpiece providing adjustments. The incorporation of the swaddles should be investigated further and the additional wedges were approved by nurses as a great way to avoid reflux and elevate the babies to fit the mothers height. Lastly the design language of other nursing solutions and significance of feedforward mechanisms should be investigated along with the context of the home.

3.4 Design language

The objective of this section is to detail the different parts of the product proposal in terms of analyzing the context it is used in and looking at benchmark products (Appendix 3).This is done for the side pieces, the backpiece and backrest along with the swaddles and wedges, while translating the core values of baby equipment into physical elements including how the product should look and be perceived by the user. (Appendix 50 and 54)

It is important that the product proposal will represent the soft values of breastfeeding mentioned by Pernille Hurup Lyn (See section 2.1) and should give the warm and welcoming feeling that is associated with breastfeeding. These core values should be translated into the product, displaying them in the physical elements used by the mothers.
The home

Analyzing the home context

The home of a twin mother is analyzed to ensure that design language of the product proposal will fit the context.

Material and color

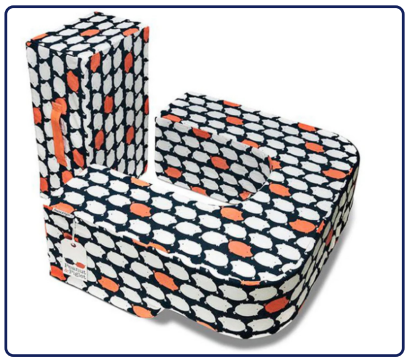
- Wood
- Muted colors
- Fabric
- Mixed colors
- Cushion foam

Perception

- Warm
- Known environment
- Cosy
- Personalized
- Comfortable

Ill. 84 Home for context.

Analyzing benchmark products




Ill.85 Benchmark products

Material and color

- Pastels that are associated with many baby products
- Patterned fabric
- Foam and cotton fabric of different kinds
- Zippers and buckles

Shape

- Rounded corners
- Squared
- Curves

Perception

- Comfortable
- Soft
- Warm
- Robust/stabile
- Playful
- Light
- Convenient
- Unity

In addition to analyzing the context of the home (Appendix 54), some of the nursing solutions researched in section 1.4 have been analyzed in terms of color, material, shape and perception along with an investigation in the significance a change of color can have as a feedforward mechanism (Appendix 50).

Evaluation

The main material of the product proposal has been determined to be a firm foam because it fits the soft and comfortable context and the purpose of altering a known environment of a couch, into a nursing solution by using the product proposal. The specific type of foam needs to be further investigated, along with what kind of fabric should be used for the upholstery that has been decided to cover the nursing solution, since a lot of the products analyzed are upholstered in order to clean the product by putting this in a washing machine.

3.13 The color scheme of most of the nursing pillows analyzed are subtle and often within the pastel range or with a personalized pattern while being **presented as a unity to create the calm perception of the product.** When analyzing the meaning of colors and textures used in babygear

3.14 (Appendix 50) it is evident that an alteration in material and color, contributes to the users perception of the product by **using color and textures as visual and tactical indicators** that help the user perform tasks correctly without the need for extensive instruction. The analyzed perception and materials has to be applied, by detailing each componant, shaping a final unanimous product proposal.

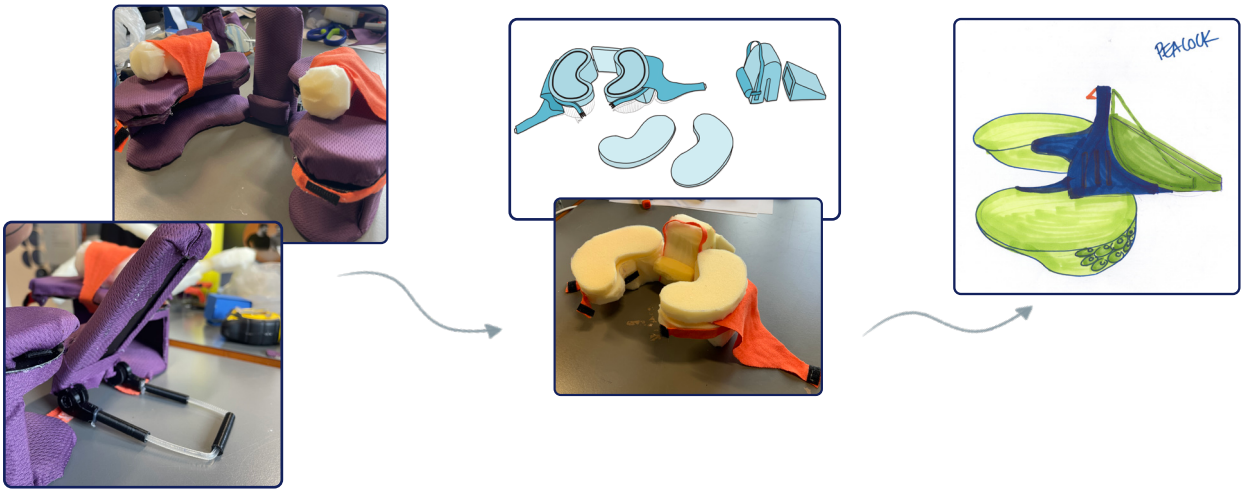
! Should be perceived as a unity.

! Use change in colors and textures to indicate interactions.

! Should be in subtle colors to fit both hospital ward and home.

3. 5 Detailing the components

Each part of the nursing solution has been shaped to fit the soft environment of breastfeeding and give a unanimous look to the final product proposal, through a final ideation of the entire nursing solution. (Appendix 35, 39, 41, 43, 45 and 47)



Ill. 86 Benchmark products

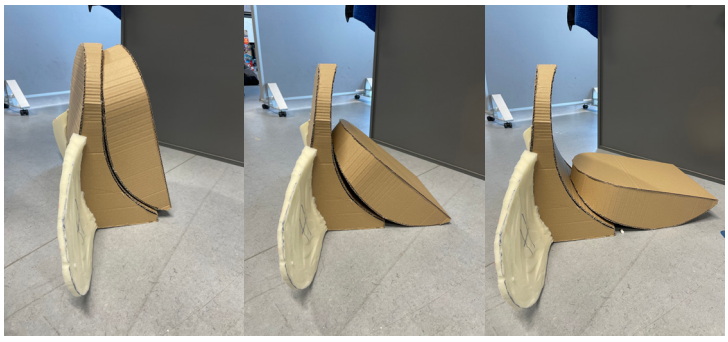
Side pieces shape

The shape of the product proposal´s side pieces have been investigated further by analyzing the shapes of other nursing pillows meant to follow the curvature of the waist and fitting two babies, along with testing the different shapes on several different sizes of bodies and exploring this shape through a final ideation of concepts illustrated in illustration 87. (Appendix 41and 47)

Ill. 87 Shapes of nursing pillows

Backrest and back piece shape

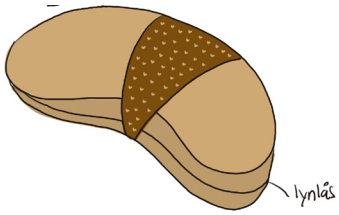
The backrest of a previous design proposal had slits cut into the bottom in order to place them over a backplate thereby adjusting it to which size the woman is. A rounded triangular backpiece, that could be placed differently depending on which context to fit, was incorporated into the backrest to give the product proposal a softer feeling than in Bean 1. (Appendix 45) However this shape still did not fit the soft environment it was intended for and the backpiece along with the backrest was modified through an ideation of sketches to form an ergonomic S-like shape. The semicircular backpiece held together to the backrest by velcro, is allowing for adjustments to happen gradually instead of having only two options like with the triangled backpiece. In addition, ideations were made on how to make the nursing solution feel like a uniform product proposal when in use, rather than the backrest and the side pieces looking like three different parts. This resulted in giving the backrest rounded "wings", as a way to attach the sides to the backrest and embracing the mother, giving her extra comfort while sitting. The previous proposal had a lower back pillow attached to the backrest whereas the final product proposal´s backrest is shaped with inspiration in an ergonomically shaped office chair and the sliding function in collaboration with the backpiece has helped deciding the shape. (Appendix 35, 43 and 47)



Ill. 88 Mockup of backrest and piece

Wedge and swaddle shape

The wedge introduced in Bean 1 has been shaped according to the final proposal of the side pieces with inspiration in existing products (Appendix 39) whereas the swaddle has taken inspiration in the cloth diaper normally used and folded into a triangle when swaddling babies, however with a rounded tip to fit the shape of the overall product proposal.



Ill. 89 Sketch of wedge and swaddle

Sprout - joint product proposal

When attaching the sides to the new backrest, all componants giving it a uniform, simple and subtle apperance of the nursing solution, Sprout, which fits context of the home since it is going to be an extension of the couch.

Ill. 90 Final product proposal

Evaluation

Each part of the final product proposal is organically shaped to form a unity in order to tap into the soft universe of breastfeeding, and fit the warm context of the home, where parts take inspiration in existing baby equipment. It consists of two rounded side-pillows, and is joined together by an ergonomic backrest and an adjustable back piece with attached “wings” that allow the mother to sit comfortably. A wedge in the shape of the side piece is placed on both and a swaddle is attached in the upholstery on each of the side pieces where a rounded end indicates the placement of the interaction. The entire product is to be upholstered in monochrome fabric to unite the product proposal further except for the places of interactment. With the overall design language decided, an investigation in the places of interactions has to be examined next using the insight from section 3.4.

3.6 Interfaces

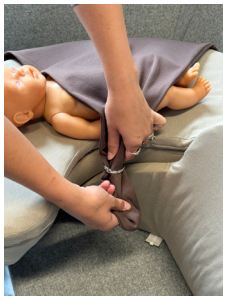
The intention of this section is to clarify the places of interaction and how they are indicated on the final product proposal by for instance using color and textures as indicators as described in section 3.4.

Swaddle, rings and clips

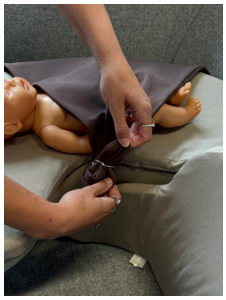
The intention of the swaddle is to keep the babies secure before, during and after breastfeeding. This is done through closing the swaddle with two rings on the opposite side of where it is attached, a well known and simple mechanism used in many baby slings. This kind of attachment allows the interaction to happen on top of the side piece by attaching the rings to a string sewn into the upholstery, rather than placing it on the inside of the side piece, that is closed off once the mother sits down. This would be the case when using an elastic band, a bow or buckle or velcro, that in addition is very loud next to a drowsy and well-fed baby. The swaddle is produced in a much darker nuance than the majority of the product to clarify the place of interactment, as described in section 3.4. The interaction of attaching the tip of the swaddle has been examined using different solutions such as buckles, velcro, and buttons. However, since no part of the product ended up providing a shoulder piece, the interaction of the attachment of the swaddle has taken inspiration in the existing workaround of tying the cloth diaper to the nursing bra the mothers is wearing (See section 2.1). Instead of a knot, the end of the swaddle will be provided with a "negative" clip that fits the "positive" clip on the nursing bra that has become free by opening up the bra to start breastfeeding. By clipping on the swaddles to the nursing bra, the mother frees her hands and the babies are secure while being able to use their motor skills, movements and reflexes. (Appendix 46)

Ill. 91 Closing mechanism with two rings from a sling

Ill. 92 Closing mechanism from a nursing bra



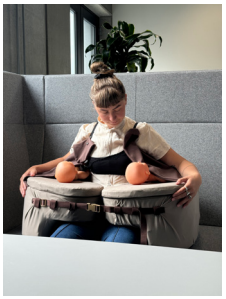
The tip of the swaddle is placed through both rings.



The tip is then placed in the upper ring and pulled tight to secure the closing mechanism.

The mother is attaching the swaddle to her shoulder by clipping it to her nursing bra.

The "negative" clip on the tip of the swaddle fits the "positive" clip on the nursing bra.



The mother and babies now have skin to skin contact and the babies can move freelance.

Ill. 93 Micro-scenario of interactions with swaddle

Wedge

The wedges that keep the babies elevated at an angle to avoid reflux are shaped according to the side piece, making the interaction of placing them easy to understand. In addition the elevated end of the wedge makes it obvious how to place it, since the babies heads are to be elevated as opposed to their feet, quite like using a baby wedge in their crib. (Appendix 39 and 47) Furthermore the wedges have velcro on the backside that fits the velcro on the side piece and the subtly change in texture indicates an interaction (see section 4.1) and makes it impossible to place them the wrong way. The color of the wedges has been kept monochrome because the interaction of placing the swaddles only happens when assembling the product after purchasing it or washing the upholstery. When washing the upholstery, a zipper in the same color sewn into one end of the wedge can be opened to take it off.

The wedge is shaped like the surface of the side piece.

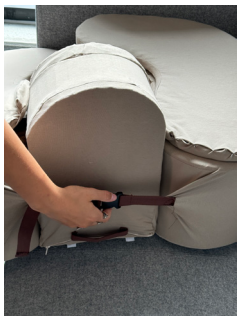
The wedge is attached to the side piece with velcro

Ill. 94 Micro-scenario of interactions with the wedge

Backpiece

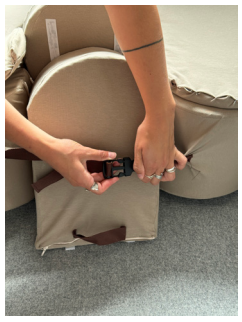
The backpiece of the backrest is intended to be able to be extended, depending on the context, when preparing for using the product. The pieces are held together by lines of strong velcro attached to each part that, along with the shape, indicates the direction of the extension. A handle in a darker nuance of color is placed at the end of the backpiece and indicates where to grip to start the interaction, which only happens when changing the context, for example when going from using it in the hospital bed to using it in the couch at home. A zipper is sewn into the bottom of the backpiece, since this interaction of taking off the upholstery only happens very rarely when washing it, which also is the case for the side pieces and backrest.

The backpiece is fully attached to the backrest.



The belt is unbuckled.

The backpiece is grapped with one hand on the top and the other on the handle in the bottom to slide it out.



The belt is buckled.

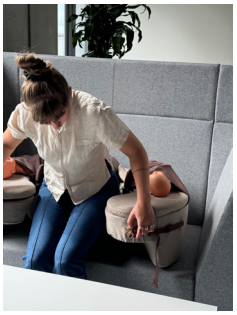
Ill. 95 Micro-scenario of interactions with the backpiece

Zipper attachment and buckle belts

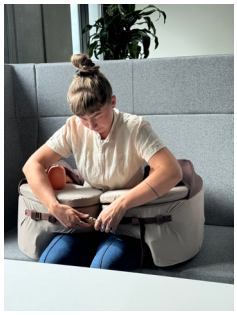
The side pieces are in the final product proposal attached to the backrest with a detachable zipper that is sewn into the cover of each part. This allows for the product to be disassembled in order to take off the covers of each part to wash it when needed. Depending on the size of the woman, the "negative" zipper on the wing can be zipped onto one of three "positive" zippers attached to the upholstery of the side piece, placing the backrest according to the correct size. The zippers are placed in opposite directions, so it is impossible to zip them onto the wrong side piece. The wing is covering the zippers that are not in use while also functioning as an extra support for the mother. (See section 4.5 and appendix 47 and 49)

The side pieces are held together with a previously investigated buckled belt, (Appendix 26) in the front and back that allows for adjustments of the nursing solution and secures the product around the mothers waist so it won't slide off when in use along with being an indicator of where to pull when exiting the nursing solution.

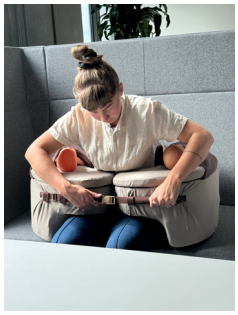
Furthermore it provides a feedforward mechanism where the sound ensures the mother of the babies´ safety, as seen in the baby swaddles currently on the market (Appendix 11) . The belt is made in a darker nuance of most of the product as it indicates an interaction that happens every time the product is in use (see section 4.1) In addition the belts are pulled tight when the product proposal is on stand by and not in use, since both belts can be used as a handle to carrie the nursing solution from a to b or when placing it on the bed or the couch. (See section 4.5 and Appendix 47)



The mother is getting into position.



She closed the nursing solution by buckling the front belt.



She can now adjust the belt by pulling the string tight.

Ill. 96 Micro-scenario of interactions with buckle belt

Evaluering

The interactions of the product have been investigated and inspiration has been drawn from existing baby products in terms of using feedforward mechanisms in color as well as sound to indicate an interaction and ensure the babies safety (See section 3.4). The interactions have been determined to stand out by using different nuances of color from the upholstery or are indicated by a shift in texture when using velcro. A darker nuance indicates interactions that happen every time the product is in use whereas lighter nuances indicate action that only happens quite seldomly. Nuances has been chosen over different colors, in a way to unite the componants of the product proposal. With the design language and functions in place, an analysis of the meassurements of the producrt proposal has to be examined.

#3 DESIGN BRIEF

Intro

This project aims to develop a solution to facilitate breastfeeding for twin mothers at the hospital and the home, minimizing aid and thereby the workload for the nurse by utilizing existing furniture. By recognizing challenges faced by both mothers and nurses, the focus is to create a product that enhances comfort and independence for the mother.

Aim

To make it possible for mothers to breastfeed independently to ease their mind resulting in a reduced workload for the nurse during the mothers hospitalization.

Target group: Hospitals and privates

Primary user: Twin mothers

Secondary user: Nurses

Context: Hospital ward and homes

! Requirments

Prioritized requriements are presented on the next page, indicating the order in which the requirements have been adressed throughout the following chapter.

Problem statement

How can a product facilitate and make tandem breastfeeding more comfortable and ease the mothers mind when nursing at home as well as at the hospital, enabling them to initiate nursing independently, thereby reducing the assistance from nurses or a partner?

Vision

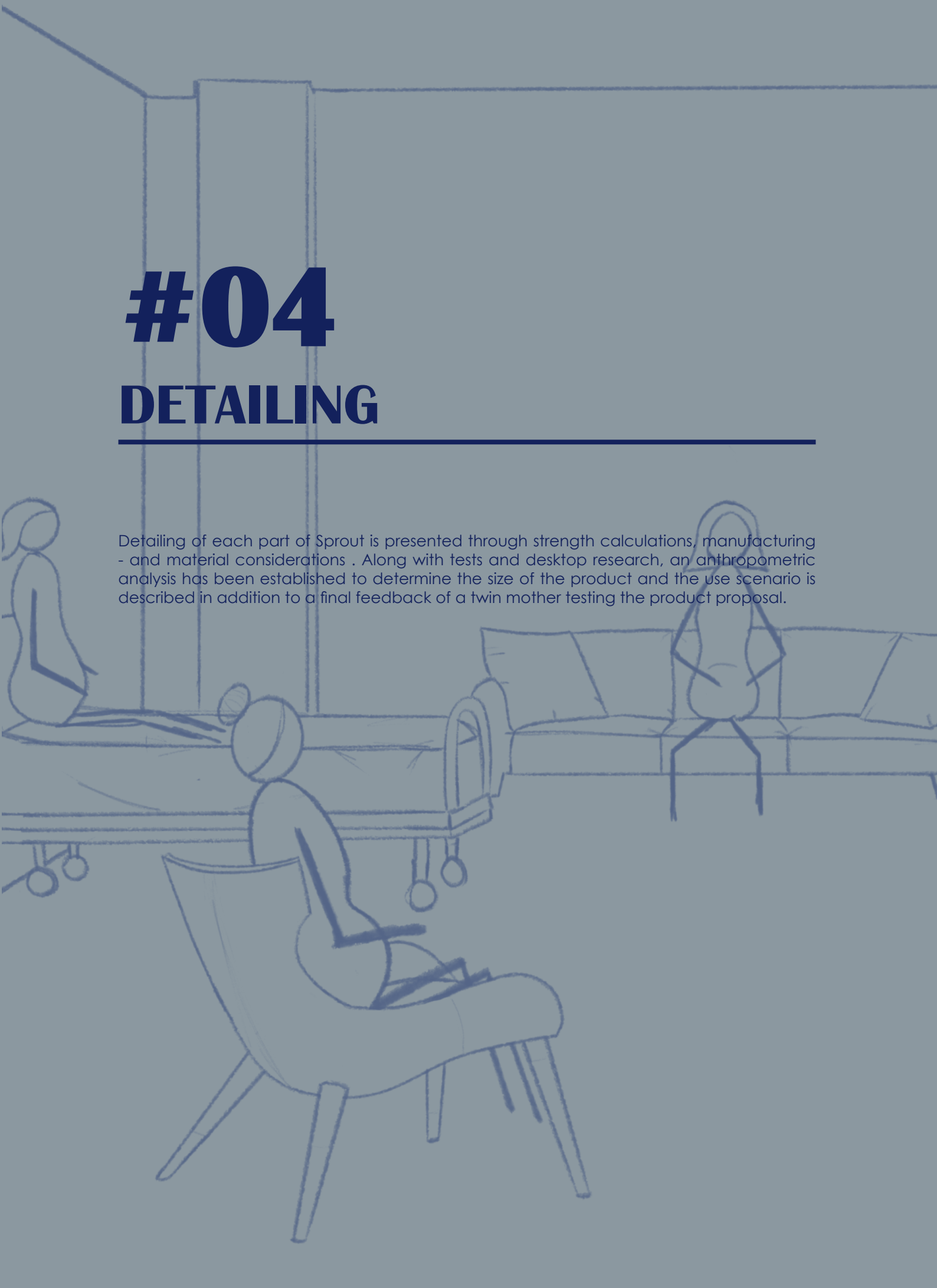
To improve the chaotic tandem breastfeeding experience and encourage an earlier discharge from the stressful environment at the neonatal ward and improve the mothers ability to breastfeed without assistance at home as well as at the hospital.

! Requirments

1	13. Mothers should be able to do it indebendantly. 1.3	15	21. The solution should prevent the babies involuntary movements. 3.3
2	14.→27. The babies should be placed prior to the mother taking a seat. 3.7	16	20. 29.Easy to clean for domestic use. 3.6
3	4. The mother should sit in the optimal twin position. 1.10	17	33. Use change in colors and textures to indicate interactions. 3.14
4	2.→13. Easy to setup, enter and exit for the mothers. 2.1	18	22. The surface the babies are layed on should maintain its structure. 3.5
5	6. Mothers should feel a sense of safety. 1.17	19	18. The pillow should allow the baby to curve around the mothers shape. 2.6
6	31. Should be perceived as a unity. 3.13	20	11. The product should allow skin-to-skin contact. 1.6
7	16. The solution should accommodate soft values. 2.3	21	30. Should be in subtle colors to fit both hospital ward and home. 3.1, 3.13
8	23. The solution should fit both sofas and beds in both contexts. 3.8	22	12. Babies should lie with a slight angle on a firm surface. 1.12, 1.13
9	15.→24. Should be adjustable according to the mothers upper body. 3.4	23	19. The solution should be simple to understand the use. 2.8
10	15.→25. Should fit mothers thighs from size S to L. 3.9	24	8.→26. Should be adjustable according to the mothers waist to close the gap. 3.10
11	17. The width of the backrest should allow room for the babies feet. 2.5	25	10. The product should fit two babies with a length of 40-64 cm and with a weight of 2300-7700g. 1.2, 1.5
12	14.→32. The solution should be able to be used in collaboration with a nursing bra. 3.12	26	28. The solution should follow the babies sideway position. 3.11
13	9. Mother should be able to sit relaxed for up to 12 hours a day. 1.1	27	7. The solution must be mobile. 1.18
14	3. Should not take up additional floor space. 1.8	28	1. Minimize hands-on from nurses. 1.11

#04
DETAILING

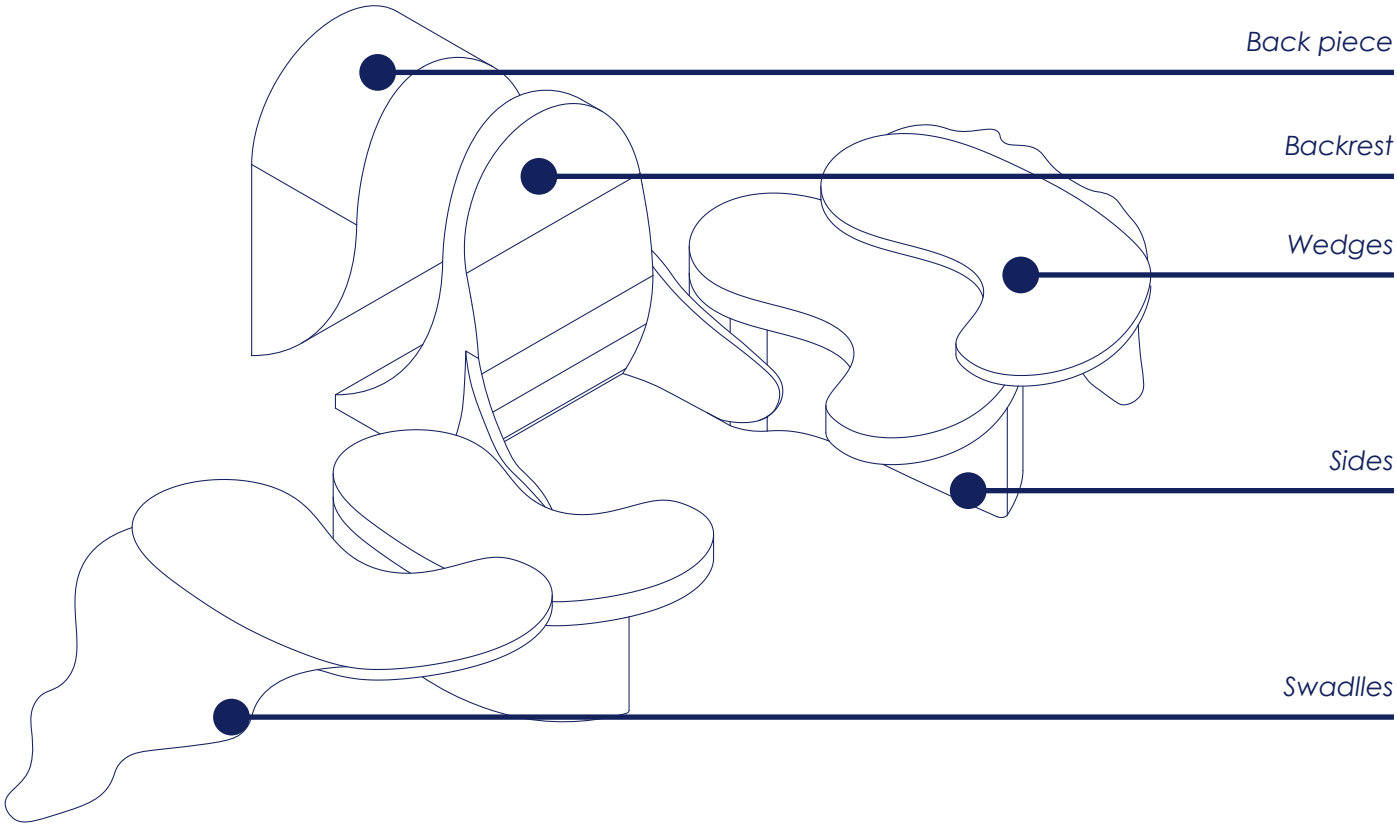
Detailing of each part of Sprout is presented through strength calculations, manufacturing - and material considerations . Along with tests and desktop research, an anthropometric analysis has been established to determine the size of the product and the use scenario is described in addition to a final feedback of a twin mother testing the product proposal.



4.1 Anthropometric analysis

The purpose of this section is to find information, through desktop research and testing, about the measurements of different body types of women in order to determine what ranges the product proposal should be able to be adjusted in and getting to know the maximum size requirements for all parts of the product proposal. Calculations and tests are presented in appendix 32, 45 and 47.

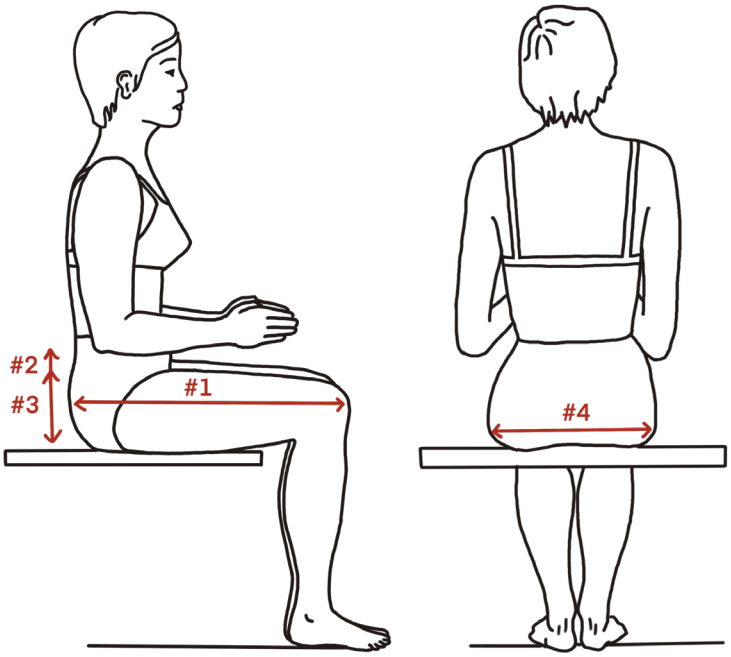
The concept should be adjustable in several different ways which is why it is necessary to find the measurements of women of different sizes, for the product to fit all sizes of women. It is essential, because this will define the maximum size of the different parts of the product. Anthropometric data, which is "[…] the science that defines physical measures of a person's size, form, and functional capacities." (CDC ,2024), has been considered for this task.



Ill. 97 Sprout componants

Anthropometric data

The data used in this project is based upon a Norwegian research paper investigating Anthropometric data on 200 women at the ages 20-39 years. (UNIMED, S., 1992)
An investigation into the anthropometric data from different European countries could be considered, however it is assumed that the values provided will be a good estimation on the approximate measurements of the product proposal. For each measurement a 5th, 50th and 95 th percentile has been chosen to represent a small, medium and large sized mother in order to consider all sizes of women. The minimum, median and maximum values obtained from the data are represented in table 2. (Appendix 32)



Ill. 98 Anthropometric data, woman

	# - Measurements	P5/S(cm)	P50/M(cm)	P95/L(cm)
Sidepiece	#1: Length of thigh	55	61	66
Sidepiece	#2: Length from seat to elbow	20	23	27
Sidepiece	#3: Lenght from seat to thigh	12	15	17
Sidepiece	#4: Width of seat	28	36	43

Table 2 Anthropometric data, woman

In order to determine the largest circumference composed when the two side pieces are closed together, a test on a size small to large waist measurement was performed. A cardboard cut out was made of a size small and large waist with the measurements derived from desktop research ; 85 cm and 105 cm (www.ellos.dk, n.d.) (Appendix 41). In addition, this test is describing the placement of the attachment between side piece and backrest, for the product proposal to function as a "one size fits all" product. (Appendix 45)

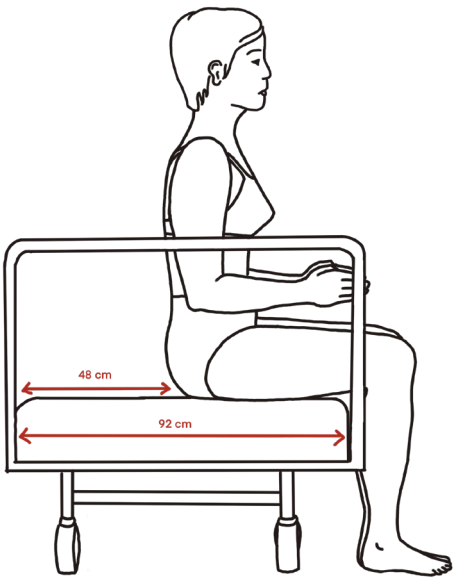
Room for growing babies

In addition, desktop research has been used to establish the curvature of the side pieces that should fit (www.netsundhedsplejerske.dk,n.d.) a growing baby. At birth the average length of a premature baby is 40 cm and it will grow approximately 1 cm a week for the next six months. (See section 1.1) This means that a twin baby, who is usually smaller at birth than average, will have a length of maximum 64 cm, which the length of the side piece should accommodate for. The side piece is shaped by the curved position the babies are put in when breastfeeding, however it should also fit the babies when they lay on their back, since this is how the mother will place them before sitting down. A baby's chest measurements at the age of six months is approximately 45 cm in circumference (Småfolk.dk, n.d.) which has determined the width of the side piece to be 15 cm, along with 10 cm of room for the mother to rest her arm, resulting in a total width of 25 cm tested in section 3.2. (Appendix 32)

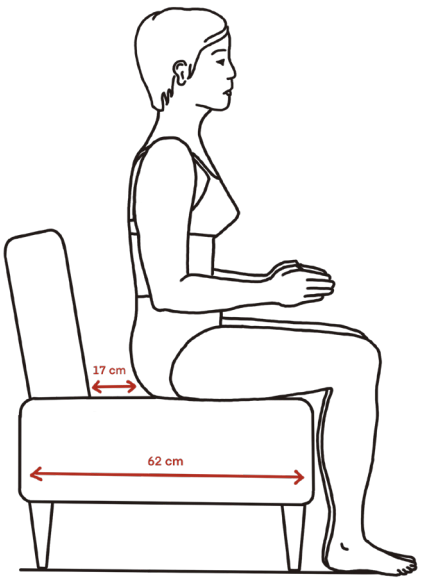
Ill. 99 Mesurements of a six month old baby

Context

Since the product proposal is to function in two different environments, they need to be able to be adjusted accordingly. At the neonatal- and maternity ward, the mother is placed on the hospital bed when breastfeeding. In an interview with Pernille, nurse at Aalborg University Hospital, she described how the beds have a depth of 92 cm. On the contrary, once discharged from the hospital, the mothers usually sit in their couch which can have a variety of sizes, some ranging up to 70 cm. Furthermore the firmness of the couch varies. The compression of a person sitting on a soft couhch has been tested to approximatly 5 cm which affects the hight of Sprout and has to be taken into considerations (IKEA.dk, n.d.) (Appendix 32)
In the market research in section 1.4, the Peanuts and Piglets pillow was investigated. The backrest had a depth of 17 cm, to make room for the babies´ feet, which has been determined to be the depth of the backrest in the product proposal, making the nursing solution fit in a regular sized couch of 62 cm, leaving 45 cm of seat-depth. To fit a hospital bed or bigger couches, a backpiece is necessary to give the backrest a range from 17 cm to 48 cm.



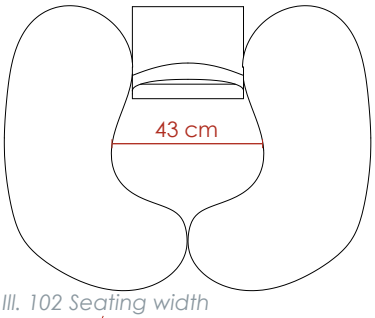
Ill. 100 Mesurements of woman in hospital bed



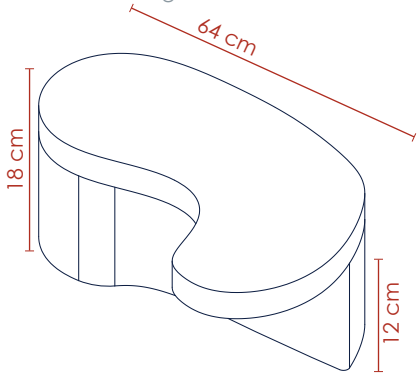
Ill. 101 Mesurements of woman in couch at home

Side pieces size

In order to accommodate the largest possible waist circumference of 105 cm found via the test, the side pieces should form a shape of this size when closed and ready to use and be able to be adjusted to a 85 cm waist. The bottom of the side pieces should then leave room for at least 43 cm of seating-width to fit a large mother (See ill. 102), as illustrated in table 2. This also determined the space for the thighs. The largest mother is dominant since it takes most women some time to lose the pregnancy weight and are therefore often bigger than usual. Additionally table 2 describes how the length of the side pieces should be approximately 66 cm, aligning with the lenght of a six month old baby, while the height of 23 cm is calculated from the seat to the mothers elbow. However, the 5 cm compression has been taken into considerations and is subtracted. The space for the thighs for a large mother is 17 cm, where the 5 cm is also accounted for, which is sufficient for smaller women too, since the pillow will rest on the surface beneath the mother. (See ill. 103) The surface shape of the side piece is determined by the growing babies´curved position previously described.



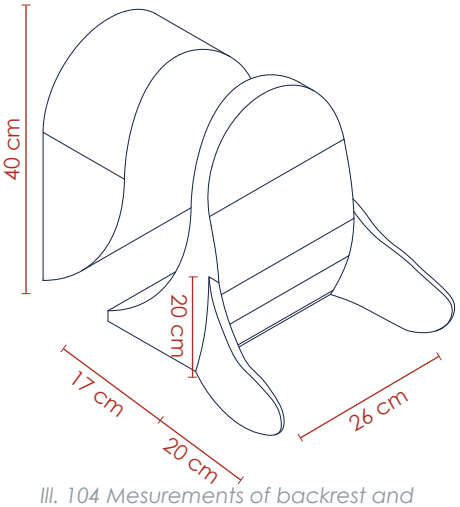
Ill. 102 Seating width



Ill. 103 Mesurements of side pieces

Backrest and back piece size

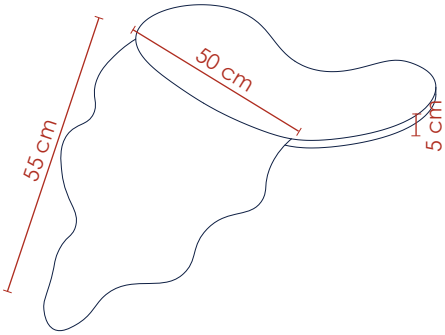
The size of the backrest and backpiece has been determined by the context it is used in, shifting from the hospital bed to the couch. The depth of the backrest is therefore 17 cm while the depth is 48 cm when the bacpiece is placed in its outer position. The option of sliding it down is prolonging the structure to measure 48 cm when assembled.
The width of the backrest is the same as a workout bench, measuring 26 cm, to allow room for mobility and the babies´ feet exceeding the mothers body, while the height of the parts is determined by the length of the back of a chair tested at the university, measuring 40 cm, (Appendix 32) The wing on the backrest have a measurement of approximately 20 cm in height and 20 cm in length in order to cover the zippers attached to the side piece. (Appendix 47)



Ill. 104 Mesurements of backrest and back piece

Wedge and swaddle size

The wedge has the same surface dimensions as the side piece in order to fit on top of it, and form a slope by being 5 cm high in one end, descending to 1 cm in the other end, and two wedges on top of eachother elevates the babies additionally in order to fit a mother with a longer upper body or a change in context from a couch to a bed. This has been determined through testing it on women of different sizes. (Appendix 39 and 47) The swaddle is of a triangular shape with the side attached to the side of the wedge being 50 cm and the length in the middle is 55 cm in order to reach a tall mother's shoulder and accommodate a growing baby.



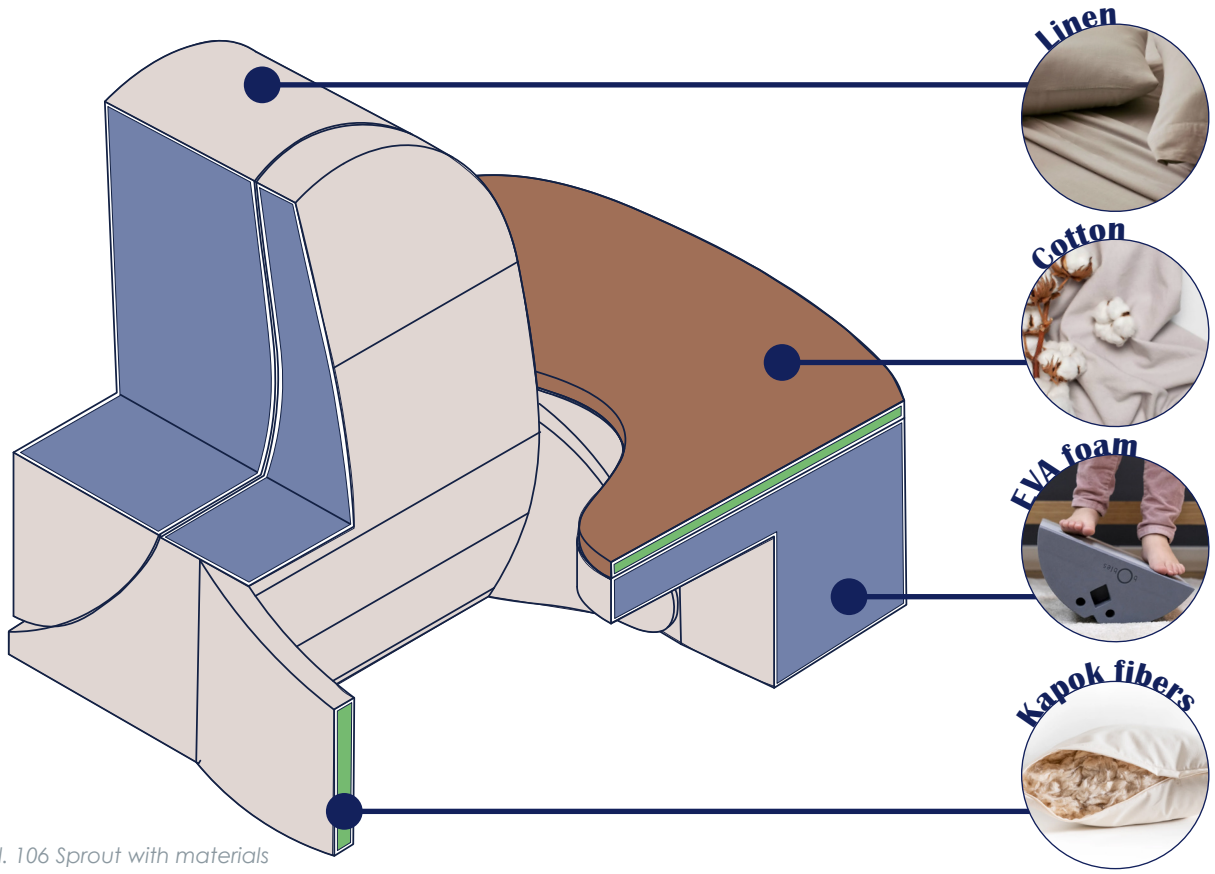
Ill. 105 Mesurements of wedge and swaddle

Evaluation

The anthropometric data has, along with testing the different measurements on women, determined the measurements of the product proposal. This includes the size of the side pieces, the adjustments and measurements of the backrest and -piece and the size and adjustment of the wedges and swaddles. Having the measurements determined, the materials have to be considered and invesetigated alomg with investigating product maintenance and durability.

4.2 Materials

This section is investigating and determining the materials for the different components, upon deciding the measurements for each part. (Appendix 9)



Ill. 106 Sprout with materials

EVA foam

The side pieces, the backrest and the backpiece are all constructed in EVA foam as it is a rigid and dense material, making it a great choice for structural support. EVA foam can be constructed with different kinds of densities and properties, whereas the product proposal should be similar to the EVA foam used in Bobles Toys (bObles.dk, n.d.) Furthermore, this type of foam is waterproof making it easy to clean for spit ups etc. A disadvantage from this material is the possibility of it being scratched if uncoated along with not being a very breathable material. To comply with this all parts are upholstered and the babies are intended to lay on the wedges that are of a breathable material. (D, H. + ,n.d.)

Cotton, 8% elastin

A cotton fabric has, on advice by a model constructor, been chosen for the swaddles and wedges that are in direct contact with the babies since it is breathable and can perform temperature regulations making it suitable for skin contact. The fabric is mixed with a small amount of elastin making it stretchable, to allow the babies movement in the swaddle and to fit the wedges evenly. (Industry, T. (2023)

Kapok fibers

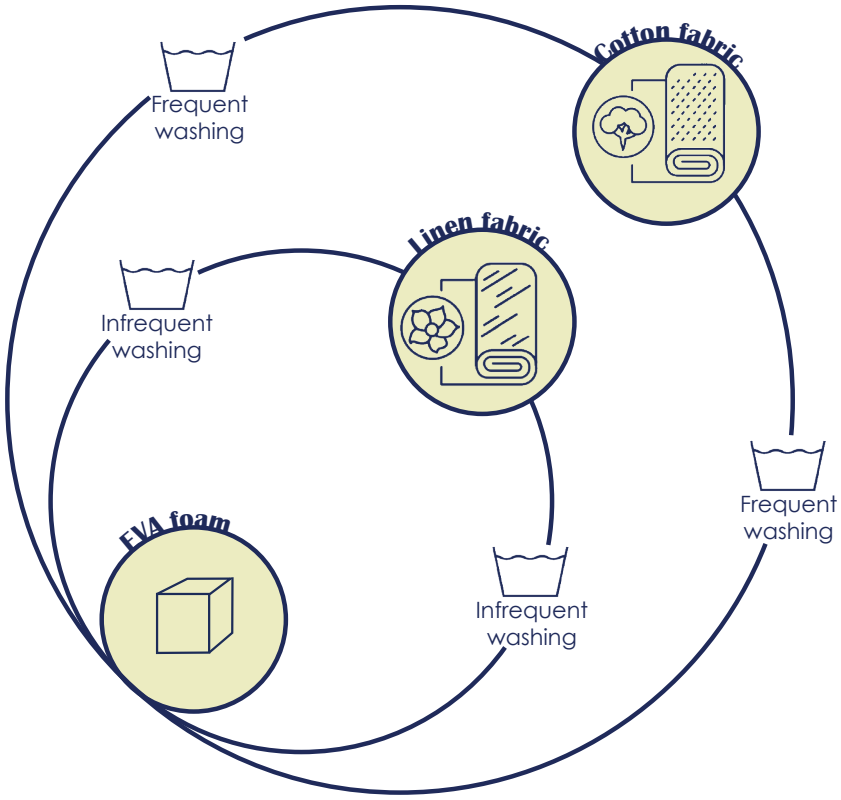
The wedges and padding on the backrest is made from kapok fibers, a breathable, organic and sustainable material used in many other products intended for babies. The benefits from kapok is that it can perform temperature regulations and requires a minimum of washing since it repels bacteria along with being allergy friendly. The fibers require an upholstery to stay in place in addition to a cover that can be taken off when in need of washing. (A/S, 1260, n.d.)

Linen

The side pieces, backrest and backpiece are all upholstered in linen, a fabric often used for cloths and bedsheets, because of its breathable and comfortable properties making it a great material to use in proximity with the skin. Furthermore linen is a durable material suitable for everyday wear and tear. (Banana Home., n.d.) In addition, the linen fabric should carry a STANDARD 100 label, stating every component has been tested for harmful substances and therefore is harmless for human health. (OEKO-TEX, 2023)

Product maintenance and durability

The materials for Sprout have been chosen because of their durability and distinctive properties suitable for a product in close contact with humans. The majority of the product is constructed in EVA foam which is durable enough to last for generations making it possible to resell multiple times (legeakademiet.dk, n.d.). The upholstery of the side pieces, backrest and backpiece are intended to stay on the product and spot-cleaned since it is not in direct contact with the babies and the possibilities for spit ups etc, however with the option of taking it off if needed. It is therefore made of durable linen fabric and is sewn together using wear-resistant flat-felled seams (Appendix 51). The cover of the wedges combined with the swaddles is made from cotton and intended to be washed more frequently as these covers are in close contact with the babies thus having a higher chance of getting dirty. The frequent washing affects the lifespan of this material, but is typically expected to tolerate 200 wash and use cycles before failure from natural wear and tear (www.visionlinens.com, n.d.).



Ill. 107 Sprouts washing cycles affecting longivity

Evaluation

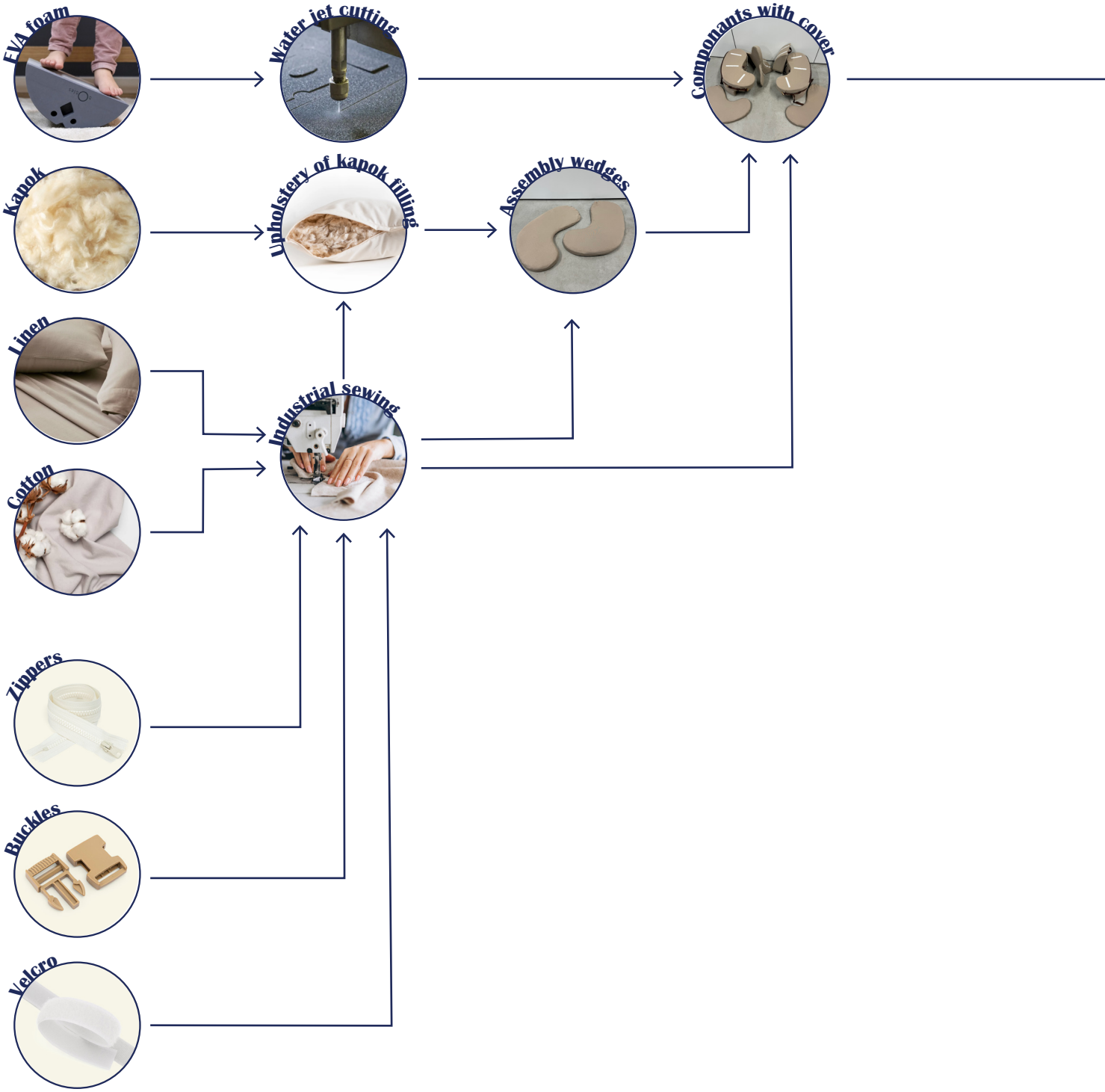
The majority of the product proposal is constructed in EVA foam ensuring structural support. These parts are upholstered in linen, a durable material that is easy to wipe off when in need of cleaning. The wedges holding the babies are made of breathable, allergy friendly kapok fibers and upholstered in an elastic cotton fabric, as are the swaddles since the material allows for the babies´ movement. The materials for Sprout have been chosen because of their durability and distinctive properties suitable for a product in close contact with humans and the upholstered covers enable a thorough cleaning of the product when passing it onto the next generation or mother. With the materials decided, manufactering methods favoring design for manufacturing has to be considered.

4.3 Manufacturing

This section is reviewing the production considerations regarding the materials and assembling of the product proposal. The assembling of the components in relation to each other is presented in an illustration whereas the production considerations of the EVA foam components and the wedge is described (Appendix 51).

Assembling

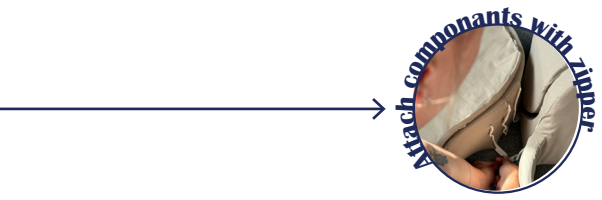
The assembling of the components are presented in illustration x, where an upholstery of the product will allow for the parts to be united in one structure and elements of interactions are attached in the form of zippers, buckles, belts, rings, velcro and clips.



Ill. 108 Manufactering of Sprout

Water jet cutting

The approach of designing for manufacturing has been used, to accommodate a thoroughly utilized production when trying to reach a competitive price on the market. Therefore water jet cutting has been chosen as opposed to CNC cutting. When water jet cutting the EVA foam components of the product proposal, the neatly organic shape of the side pieces, where the mothers thighs are placed, will need to be cut out less rounded off. However this will be accommodated by upholstering the component. The side pieces, backrest and backpiece are divided into parts and cut from standardized EVA foam plates of maximum 15 cm of height, whereupon they are glued together to form the correct structure of the component (Appendix 51).



Upholstery of kapok filling

The wedges are produced by stuffing a fitted linen upholstery with kapok fibers that are processed and sewn in hand alongside sewing the rest of the upholstery. (A/S, 1260, n.d.)

Industrial sewining

Each piece for the covers is assembled by industrial sewing it to maintain a high standard of quality. The pieces are sewn together with a flat-felled seam to ensure high durability.

Evaluation

Upon deciding the different manufacturing methods it should be analysed if Sprout can account for the different loads it is affected by.

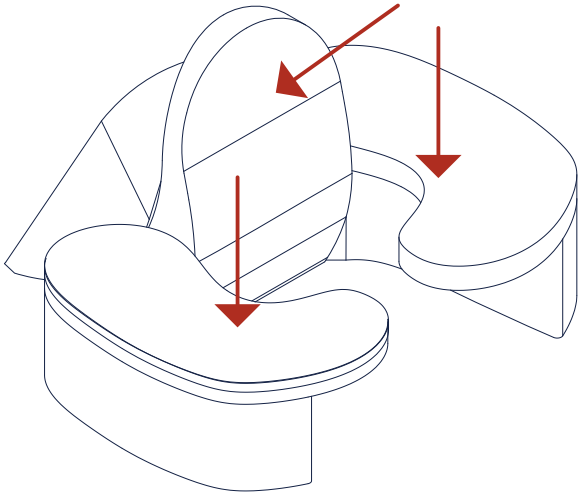
4.4 Construction affirmation

The purpose of this section is to make sure the product proposal can resist the different loads it is affected by, whether it is the mother leaning against the backrest or the weight of the babies when placed on the side pieces. (Appendix 52)

Product statics

Both the backrest and the side pieces which forms the structural base of Sprout is made entirely of high density EVA foam to ensure consistent stability while still being a soft and warm material. This base has to withstand a certain load from the weight of the mother and babies and must therefore be verified that they can endure these loads.

A tensile test on the EVA foam was conducted to determine the shear modulus and young's modulus, in order to investigate the deformation of the backrest when influenced by a load, by performing a fine elements analysis of the component. In addition it was investigated how the side pieces would be affected by applying the load of a 6 months old baby on critical points of the component. (Appendix 52)



Ill. 109 Loads affecting Sprout

Backrest

The backrest should be able to withstand the load of a person leaning against the backrest with the force of 300 N. The analysis shows that the applied force does not affect the backrest to breakage or critical deformation. On the contrary a slight deformation provides a comfortable seating position (Appendix 53).

Side pieces

The side pieces should each be able to withstand a load of approximately 8 kg equivalent to a 6 months old baby, since this is the period of use of the product, as the Danish Health Authority recommends (See section 1.1). When placing the babies the side pieces should stay in place and not risk tipping over. The finite elements analysis shows that the side pieces are able to withstand the load of a baby without any course of concern. However when placing a baby at a critical outerpoint, the center of mass is at the boundary of the supported area and should be considered. However, this analysis is made when the backrest is not atttached to the sides and thereby illustrates a worst case. To ensure that the babies are not placed at these critical points, the side pieces are designed with an area designated for placing the babies, by incorporating the swaddle in this area. (Appendix 51)

Evaluation

Through tests and analysis, it is concluded that the construction of the product proposal is able to withstand the load of both a mother affecting the backrest and the babies being placed on the side pieces, with the material and dimensions chosen. It has to be determined how to handle Sprout when preparing for breastfeeding in terms of assembling the product and handle it in different scenarios.

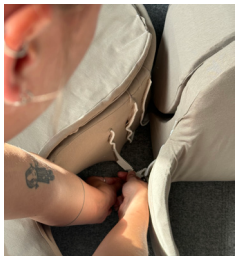
4.5 Use at home

This section is describing the different scenarios of use of the product proposal in terms of how to assemble it correctly, how to handle when lifted from one place to another and how to prepare it for breastfeeding.

Assembly

The product is designed with adjustability in mind making it fit several different kinds of bodies and contexts. However this requires it to be assembled upon receival as depicted in illustration 110.

The backrest and side pieces are put into position.



The "negative" zipper on the backrest is zipped onto the "positive" zipper on the side pieces, according to the size of the woman.

The belt on the back is buckled

The product is ready for use.

Ill. 110 Assembly of Sprout

The assembling of the side pieces and backrest only ever happens when adjusted to the specific mother, which can happen more than once since some mothers lose the baby weight over time. However the backpiece has to be adjusted when changing the context.

Product handling

The product proposal is designed to be a semi-furniture that is placed in a stationary position on the couch most of the time except for the time of hospitalization. The total weight of the product proposal is around 15 kg contributing to stability (Appendix 55). However the product is designed to be strapped together in the front and back keeping the product compact, and by turning the product sideways when carrying it, utilizing the belt in the front as a shoulder strap, allowing it to be lifted from the floor onto the bed. However, when handling the product some aspects must be taken into consideration since a mother recovering from a c-section would possibly face challenges, as it is advised to lift no more than 10kg in the first few weeks (Rigshospitalet.dk, 2024), making the product unsuitable for a portion of the intended user group. However, this will not be a problem in the home where the nursing solution is permanently situated in the couch and at the hospital the mother has the possibility of getting help from her partner or a nurse.

The mother is closing the belt tight.

She now grabs the front belt like a handle.

She can now transport the nursing solution by carrying it across her shoulder.

Ill. 111 Handling of Sprout

Arrangement

The product is expected to be used in two different contexts; at the hospital and at home. At the hospital the product has to be removed from the bed after every use, whereas at the home it takes a stationary position on the couch. The scenarios of using the product for breastfeeding are therefore slightly different depending on which context to use it in.

Use at the hospital

The mother, partner or nurse fetches Sprout and places it on the hospital bed.

The backpiece is adjusted to fit the bed.

The mother retrieves the babies and secures them in the swaddle one by one.

The mother sits down and secures Sprout around her waist with the buckle.

The swaddle is released and attached to the breastfeeding bra on each side.

She can now begin tandem breastfeeding.

The babies are fed and the mother fastens them to the side piece using the swaddle.

The mother can now get up and free one baby at a time to place them in their crib.

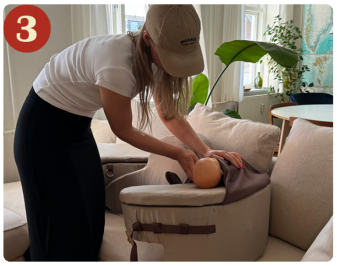
Sprout is taken off the bed and put on stand by until it is time for breastfeeding again.

Ill. 112 Scenario of Sprout in use at hospital

Use at home

Sprout is permanently placed on the couch, ready for use.

The mother retrieves the first baby.



She places the baby on one side of Sprout and secures the baby with the built-in swaddle. Step 2 and 3 are repeated for the second baby.

The mother sits down and secures Sprout around her waist with the buckle.

The swaddle is released and attached to the breastfeeding bra on each side.

She can now begin tandem breastfeeding.

The babies are fed and the mother fastens them to the side piece using the swaddle.

The mother can now get up and free one baby at a time to place them in their crib.

Sprout is taken off the bed and put on stand by until it is time for breastfeeding again.

Ill. 113 Scenario of Sprout in use at home

4.6 Test of final product and feedback

The final product proposal was tested by a twin mother, Ida and her 4 month old babies along with showing it to nurse, Pernille Hurup Lyn for expert knowledge on the case. (Appendix 56)

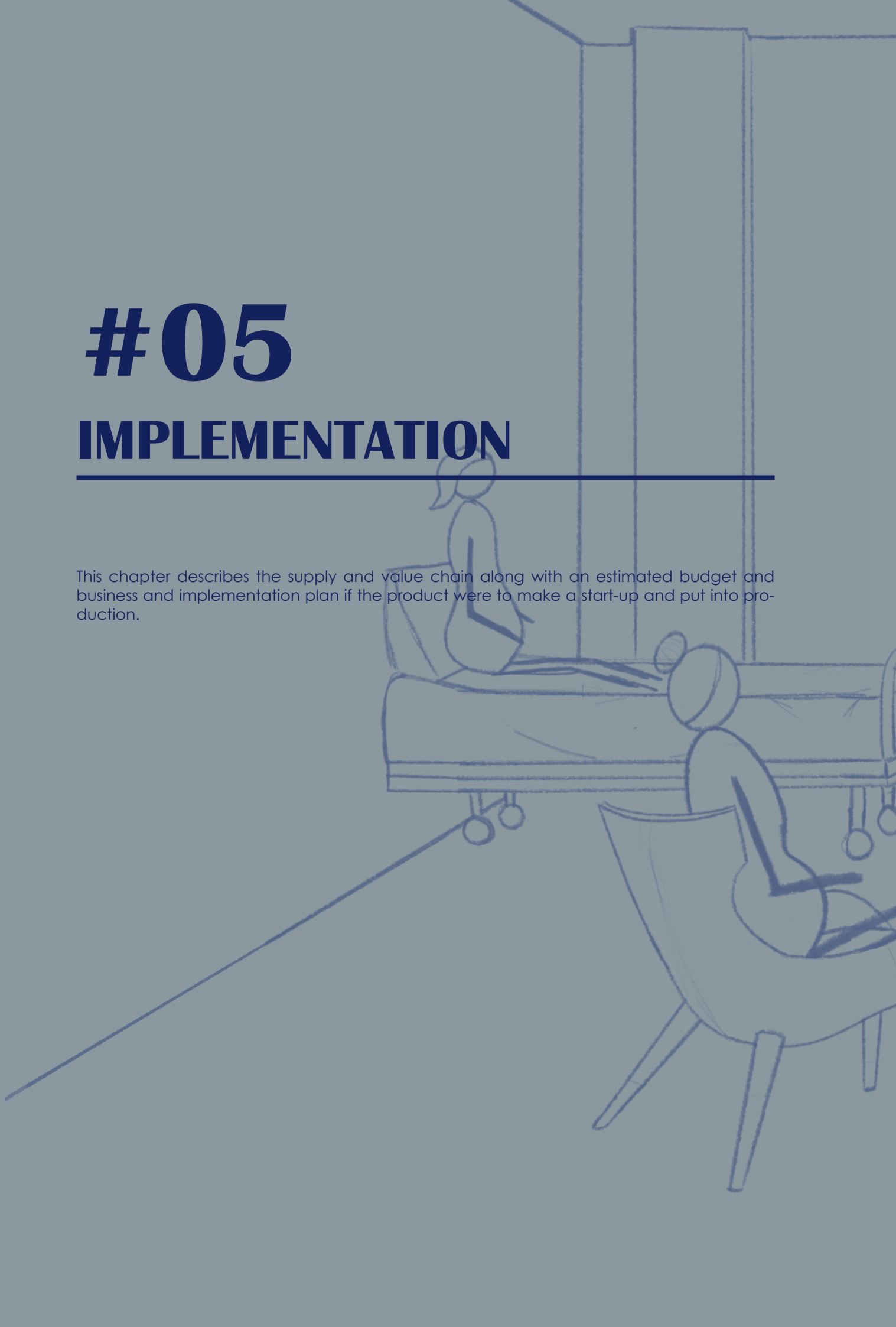
Ida was very fond of the swaddle's function of securing the babies to the side piece and ended up breastfeeding the babies directly from this position, by loosening the swaddle a bit. She finds this the greatest asset of the product as no other solutions on the market allow you to have both hands free while breastfeeding. She doesn't mind that the nursing solution has to take up a lot of space as long as it makes it easier for her to tandem breastfeed. Pernille found the nursing solution exciting and very fitting for a twin mother and likes how it brings a homelike feeling to the hospital ward. It is big in terms of transportation, but that is what it is like having twins.

Ill. 114 Ida using Sprout for tandem breastfeeding

#05

IMPLEMENTATION

This chapter describes the supply and value chain along with an estimated budget and business and implementation plan if the product were to make a start-up and put into production.



5.1 Supply chain

The materials for Sprout are gathered around the world because no suppliers are found within Europe, however the manufacturing will take place in Europe to keep the production as local as possible to be able to be part of the process. (Appendix 58)

Suppliers

China: The EVA foam sheets, which are the primary material of the product proposal, are produced in China. It is shipped to Denmark to finish the process of developing the basis for the components by water cutting the sheets into parts that can be assembled by glue.

India: Kapok fibers are harvested in India and transported to Lithuania for manufacturing of the wedges.

Lithuania: The upholstery of the product proposal is produced in.

Denmark: The EVA foam sheets are shipped to Denmark, water cut at AB Vandskæring and assembled into components. The upholsteries are received from Lithuania and put on the components. The product is packed and shipped to customers and additional products are stocked in Denmark.

Ill. 115 Supply chain map

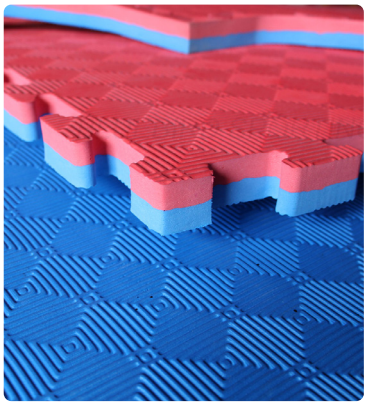
5.2 Value chain

Sprout is designed with longevity and user convenience in mind. Crafted from highly durable EVA foam, the primary component to wear is the upholstery. To enhance the value chain and support a circular economy, the design incorporates simple modularity, allowing users to easily replace or repair parts without third-party shops. This modular approach ensures three main key points of the product;

Users can peform repairs themselves

Ill. 116 Users can peform repairs

Longevity of EVA foam

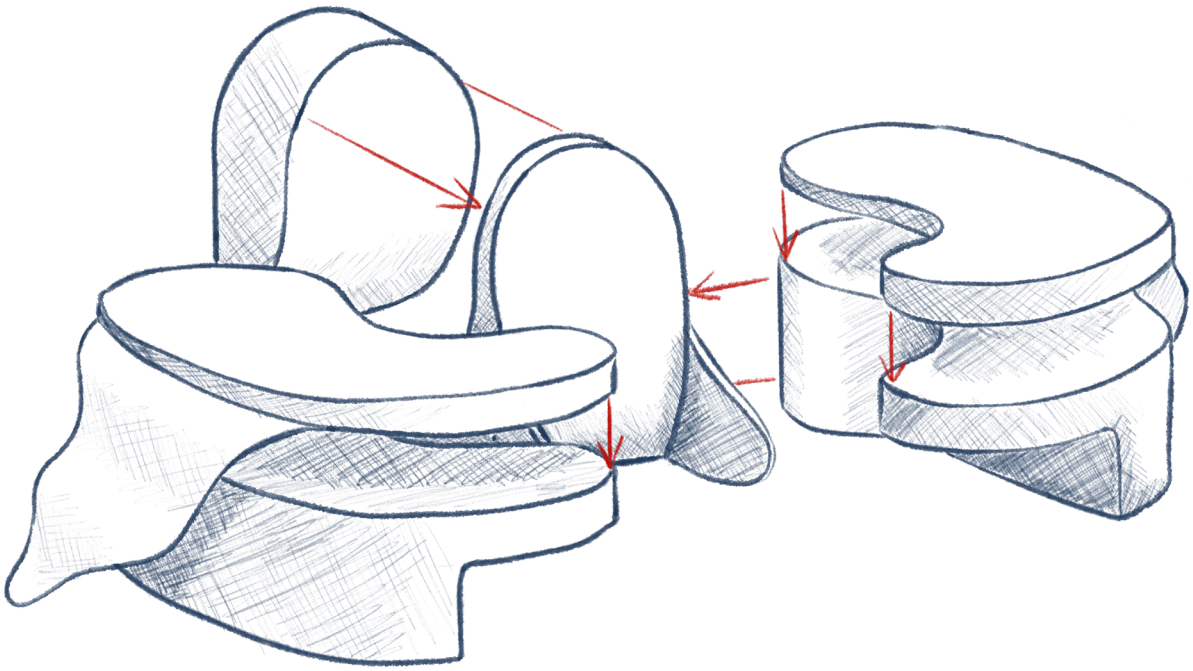


Ill. 117 Longivity of EVA foam

Ease of customization

Ill. 118 Ease of customization and replacement

This approach of aiming for a circular economy not only extends the product's lifespan but also supports a culture of reuse and customization.



Ill. 119 Modularity easing repairability

5.3 Business plan

A business plan has been established by using the Business model canvas, if one were to make a start-up selling the product. It has been made for the current state of the product, where the business relies on the nurse´s recommending the nursing solution to twin mothers by providing neonatal- and maternity wards with a number of products. In addition the word has to be spread through Facebook groups dedicated to twin mothers. (Appendix 57)

Customer Segments
- Primary customers: Mothers who have given birth to twins.
- Secondary customers: Hospitals.

Value Propositions
- Allows mothers to start and finish breastfeeding independently.
- Increased safety during breastfeeding.
- Flexibility for use in both deep and low sofas and beds.
- Adjustability for optimal comfort for mother and children.

Channels
- Social media, especially Facebook groups.
- Free distribution of products to hospitals to introduce the product to mothers.
- Future creation of a website for wider reach and convenience.

Customer Relationships
- Interaction and support through hospitals and social media.
- Providing quality customer service and quick problem resolution.
- Building a healthy culture where mothers resell the product, and the company sells covers and additional parts to renew the product.

Revenue Streams
- Direct sales to mothers.
- Sales of extra covers and accessories.
- Potential partnership with hospitals for larger purchases.

Key Activities
- Production and quality control.
- Product development and innovation.
- Branding and marketing.
- Customer service and support.

Key Partners
- AB Vandskæring cutting the components
- A sewing factory in Lithuania
- Hospitals as distribution and influence partners.

Key Resources and activities
- Developers that can estimate and detail new products and variants at a low cost
- Sparring and testing with users

Cost Structure
- Costs of giving away products to hospitals.
- Production costs including sewing and water cutting.
- Marketing and distribution.

5.4 Implementation

The implementation plan is based on a startup that is about to launch a new and innovative product into the market. The plan outlines how the startup utilizes its resources best and focuses its energy over the next five years to ensure a successful introduction and growth. (Appendix 57)

Year 1

Prototypes and Design

Prototypes are developed and tested to identify and resolve design flaws. The design is finalized for production after refining it based on test results.

Design for manufacturing integrates manufacturing considerations into the design phase to optimize production efficiency.

Proof of Concept

100 units are created and 10 are distributed to hospitals and maternity clinics for feedback and awareness and recommendations.

The remaining units are sold through contacts, fairs or facebook groups.

Business plan

The business plan and business structure for how the business will operate are completed.

Invest in 200 new units

At this stage, additional products need to be purchased.

Year 2

Get funding

Once there is proof that the product sells and the business plan is clear, the company seeks for funding through investors.

Website

A website will enhance the accessibility of the product, especially when investing in enhancing marketing strategies.

Marketing Campaign

A launch of a comprehensive marketing campaign including social media and influencer collaborations will spread awareness about the product.

Website

At this stage, additional products are purchased.

Year 3

User Feedback and Product Improvement

Detailed feedback is collected from users and necessary improvements are made.
Accessories to the products or extensions are developed, based on customer requests.

New products to the product family

To grow the business, investment is needed in developing additional products to expand the range beyond a single item.

Year 4

Launch

Introduce the new product(s) to the market.

1,000 Units

The increased turnover makes it possible to purchase a large number of breastfeeding solutions.

Saturation

The Danish Market is saturated and the company needs to assess whether the Danish market is about to be filled with the product.

Year 5

Expansion to Other Countries

A market analysis is conducted to identify the most promising international markets.

The product and marketing strategies are adapted to the new markets.

Partnerships with international distributors and retailers are established.

5.5 Budget

To realize the product, a rough estimate of the budget has been developed based on the implementation plan of the product. In the first year of launching the company, the focus will be on completing the product and developing a product that strategically accounts for manufacturing that optimizes the design. Once the product is completed, it will be crucial to establish proof of concept to verify its potential on the market. This will be achieved through the first investment, as depicted in table 3. (Appendix 59)

The initial investment amounts to 134.310 DKK, enabling a production of 100 units. Few products are sold initially since it requires testing and prototypes to start up the production however the total balance will be positive at Year 2 with a profit of approximately 120.000 DKK. If the business plan is successful, the product will break-even when reaching a total sales of 50 units and loans and investments can be paid back. After the second year of launching, the profit could be used to improve production methods or development which could be necessary when entering other markets.

To ensure that the five-year plan is feasible, an spreadsheet was created. This spreadsheet contains estimations of the company's cash flow.

The retail price is set to be 2.999 DKK as the production cost per unit is 1.138 DKK because the sales prices i expected to be approximately double the production cost excluding VAT. This retail price is compeeting with the prices of a nursing chair rather than a nursing pillow making it a competitive product. (See section 1.4)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Units sold	*0*	*60*	*180*	*300*	*480*	*1200*
Sales price	*2.999 DKK*	*2.999 DKK*	*2.999 DKK*	*2.999 DKK*	*2.999 DKK*	*2.999 DKK*
Turnover	*-DKK*	*179.940 DKK*	*539.820 DKK*	*899.700 DKK*	*1.439.520 DKK*	*3.598.800 DKK*
Production cost per unit	*-1.138 DKK*	*-1.138 DKK*	*-1.138 DKK*	*-1.138 DKK*	*-1.138 DKK*	*-1.138 DKK*
Total production	*- DKK*	*- 68.280 DKK*	*-187.770 DKK*	*-341.400 DKK*	*-546.240 DKK*	*-1.365.600 DKK*
VAT	*- DKK*	*- 35.988 DKK*	*- 107.964 DKK*	*- 179.940 DKK*	*- 287.904 DKK*	*- 719.760 DKK*
Development	*-12.375 DKK*	*-DKK*	*-DKK*	*-DKK*	*-DKK*	*-DKK*
Total balance	*-12.375 DKK*	*75.672 DKK*	*244.086 DKK*	*378.360 DKK*	*605.376 DKK*	*1.513.440 DKK*
NPV						*2.804.559 DKK*

Table 3 Budget of Sprout

#06

EPILOGUE

6.1 Conclusion

The thesis has focused on designing a product dedicated to twin mothers, making it possible for them to tandem breastfeed without assistance since 9/10 women cease to tandem breastfeed once discharged from the hospital because it is too hard to do so without help, thereby jeopardizing a healthy breastfeeding pattern for their babies.

Fitting two contexts

The result is Sprout, a nursing solution promoting independence when tandem breastfeeding at home as well as at the hospital, saving valuable time and easing the stressful mind of a newly hatched twin mother along with easing the workload of the nurses at the neonatal- and maternity wards. The product is designed with the soft environment of breastfeeding in mind, bringing a homelike feeling to the hospital ward along with comfort and support when tandem breastfeeding at home, once discharged.

Allowing for independence, adjustability and safety

Sprout´s most important task, when offering independence to the mother, is to keep the babies safe and secure, using the attached swaddle by placing the babies prior to the mother seating herself. Tandem breastfeeding without assistance requires the mother to have both hands free and to change the current flow of preparing for breastfeeding independently. Additionally, a comfortable and relaxed position when tandem breastfeeding, is crucial for the lactation and milkflow. Sprout is offering the mother to sit in the optimal twin position, using the wedges to elevate the babies towards her along with ensuring support of the mothers´ back and arms for the duration of the breastfeeding session. The product's adjustability accounts for it to fit different sizes of women, by altering the position of the backrest and securing the buckled-belt. In addition the size of a growing baby is considered by adjusting the swaddle and a changing context is accounted for by adjusting the backpiece of the product. However it could be favorable to examine if the product should be made in different versions intended for one specific size, for a more customized fitting of Sprout.

A product with potential

Sprout is intended to compeed with the nursing chairs available on the market by filling a market gap, being a product to use in collaboration with existing furniture at the hospital ward or at home. Sprout has a great market potential, since the current solutions are often very expensive and take up much space, however the cheaper twin nursing pillows available might jeopardize the sales of Sprout and a targeted marketing strategy has to emphasize the differences of the product categories within twin nursing solutions, nursing chairs, nursing semi-furniture, nursing pillows.
Furthermore, the longevity of the product has been a priority, since baby equipment in general has a short lifespan and reselling is quite common. Therefore the materials and construction of the product is accounting for Sprout to be customized between each use-period of 6 months.

6.2 Reflection

Product

Prototyping

The primary design approach of the process has been prototyping through building mockups which has been valuable as it aligned the ideas and thoughts of all group members. However a somewhat functional prototype was constructed late in the process and has mostly been tested regarding adjustability, by singleton mothers or users who have not experienced breastfeeding or having children, since it has been hard to physically get in touch with twin mothers resulting in only one twin mother testing the product rather late in the process. Preferably, more twin mothers should test the functions of the product and a prototype using the correct structural materials (EVA foam and linen fabric), will account for defaults occuring when using a different material than intended. It was attempted to make a "one size fits all" product, however many more problems to account for, emerged along the way and a new prototype utilizing the modular design should be tested, where e.g. the backrest is a standard component that can be paired with side pieces intended for either a small, medium or large mother, to make variations that affects the production less than if every part should be customized. In addition the different contexts should be explored further since the nursing solution was only tested in a handful of couches and others might be softer resulting in the user to sink down further than expected which has to be accounted for, perhaps in another way than decided on for the product proposal.

Responsible design

The product proposal is approaching sustainability from a circular economy perspective as the product is intended to last through multiple uses by different mothers. By reselling the product and customizing it with different upholsteries an extension the product´s lifetime is possible, in a product category of otherwise short-time usage. However, EVA foam is difficult to recycle and therefore it has to be investigated if the product could be reused or redistributed in other ways at the end of its lifecycle or possibly shared through marketing the nursing solution as a rental option in comparison to companies like Swapfiets, as the duration of Sprout is intended to be six month a subscription solution for these months could be beneficial for both users and the environment. Another idea could be to redesign the product proposal for it to be used as motor skill toys, like the bObles toys investigated, in order to prolong its lifespan even further. In addition it would be preferred if all materials could be sourced locally, since a member of the company could supervise if problems were to occur. Therefore alternative materials or the possibility of starting up a production within Europe, should be explored along with investigating the quantity of the waste material of the production and how to possibly minimize or utilize it.

Business

As the product proposal is investigating a market gap and inventing a new product category within twin nursing solutions, a semi-furniture for tandem breastfeeding, it could be speculated if the product is understood. The product proposal might be unidentifiable, in contrast to a chair, and seeing it within a context where the usage and advantages are explained, is possibly necessary. Marketing strategies should therefore help explain the product and its benefits. With the current strategy of accommodating circular economy by promoting the product to be resold, it will be interesting if a market potential will remain, before expanding the product outside Denmark and before the company can develop new variants and products.

Process

A wicked problem

The process has been far more complex than first anticipated, realizing that the problem worked with, has been wicked rather than the expected tame problem of improving the nurses´ working position. The development of the product proposal resulted in countless iterations and concepts, going back and forth between problem and solution space as the initial problem was ill-defined and therefore several pivots were made in terms of where to place the focus and the final foundation of the design proposal was determined rather late in the process. This has resulted in a very fuzzy process, with different takes on solving the problem which can cause confusion as to whether the product has ended up on the right path or if the right questions have been asked and investigated.

User involvement

The process has benefited from a lot of knowledgeable experts and relied on their theoretical expertise and experience with the problem of tandem breastfeeding. On the other hand it has been hard to get in contact with the primary user group of twin mothers, other than through facebook groups. The process has therefore lacked in terms of physically testing the product on twin mothers and babies and in witnessing the process of breastfeeding, presumingly because this will provide additional pressure on the families and in addition is a very private matter. Even though the group members have had access to singleton mothers it is not the same having them testing the product, since the two experiences with breastfeeding can not be compared.

Product management

The process could have been orchestrated differently, and presumingly, better if more energy had been focused on structuring the project management of the process to gain an overview and be one step ahead, thereby accounting for the occuring pivots by e.g. assigning each group member areas to be in charge of beforehand instead of along the way. When problem-slicing the different aspects of the problem space, one solution space was always prioritized and unnecessary time was spent on developing concepts that could have been avoided, when remembering to work on the different problems simultaneously.

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Illustration list

1. Own illustration
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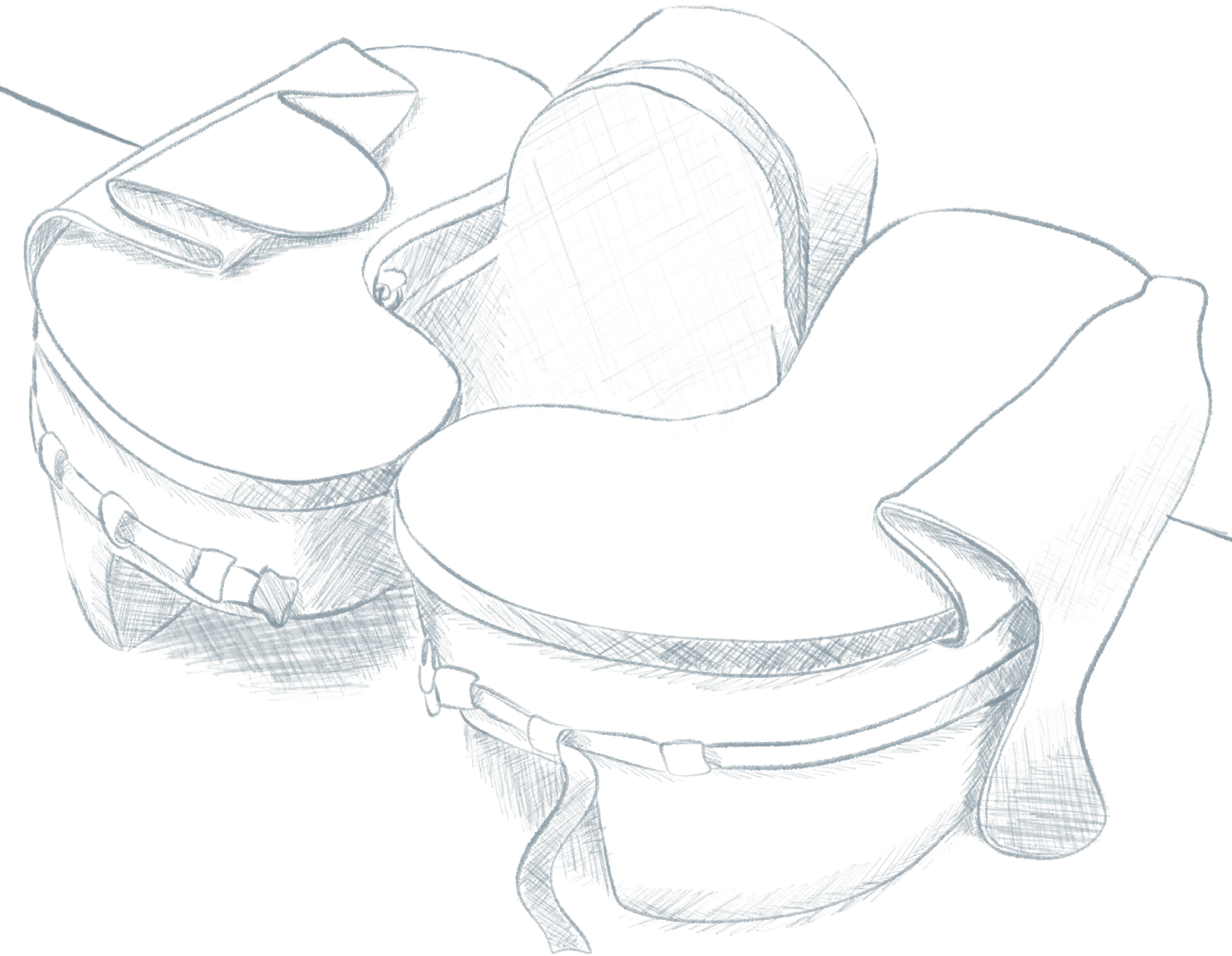
AALBORG
UNIVERSITET

SPROUT

TECHNICAL DRAWINGS

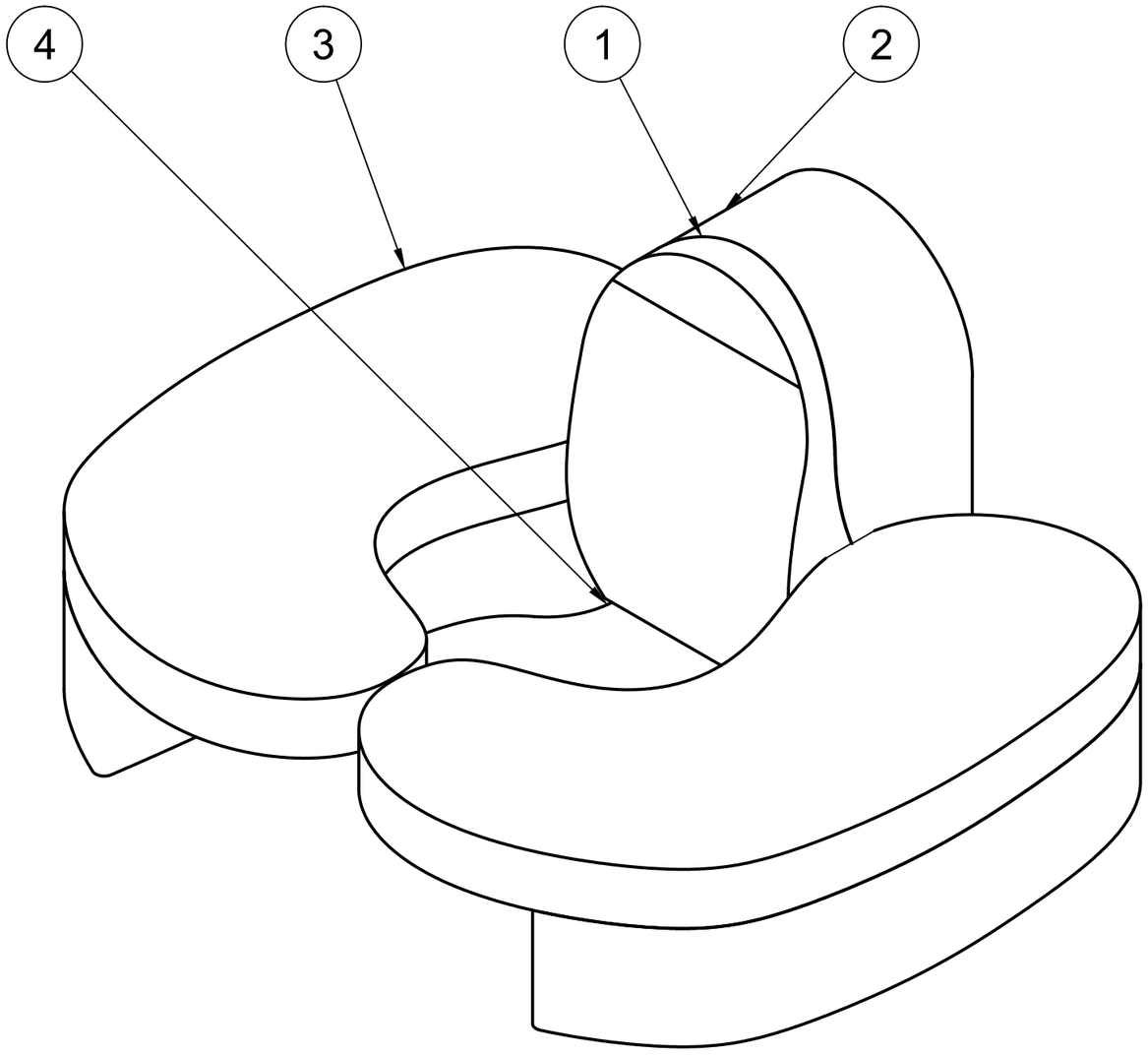


Bolette Henneberg
Isabell Desirée Andersen
Kasper Reinholdt Berg Kristiansen

Aalborg University - 2024
Industrial design
MSc04 ID4

Parts List

Item	Qty	Part Number	Material
1	1	Back Rest	EVA FOAM
2	1	Back Piece	EVA FOAM
3	2	Side Piece Top	EVA FOAM
4	2	Side Piece Bottom	EVA FOAM



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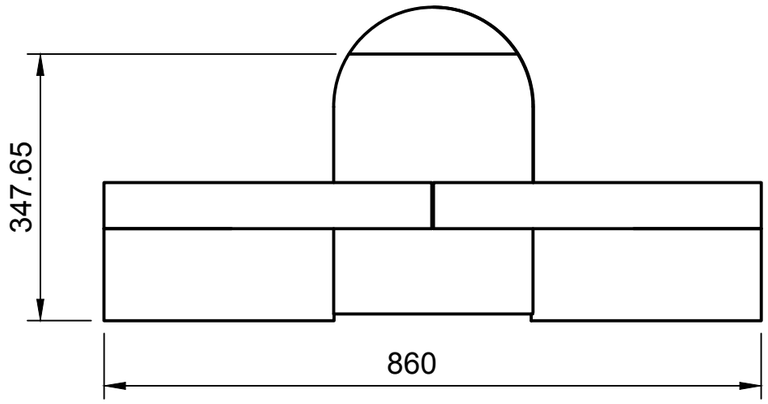

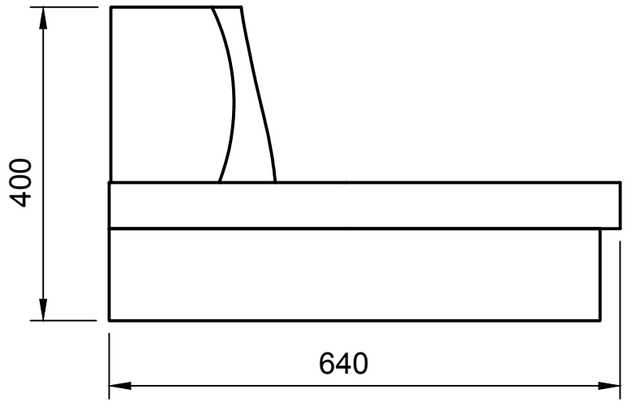

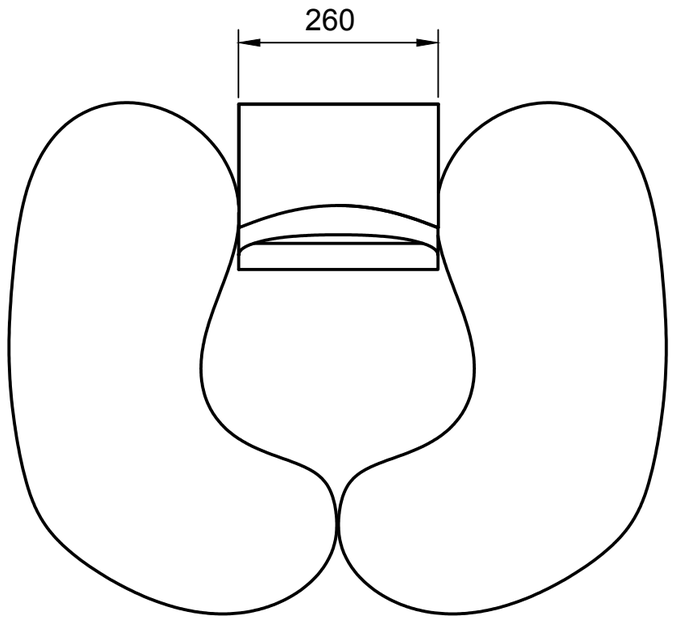

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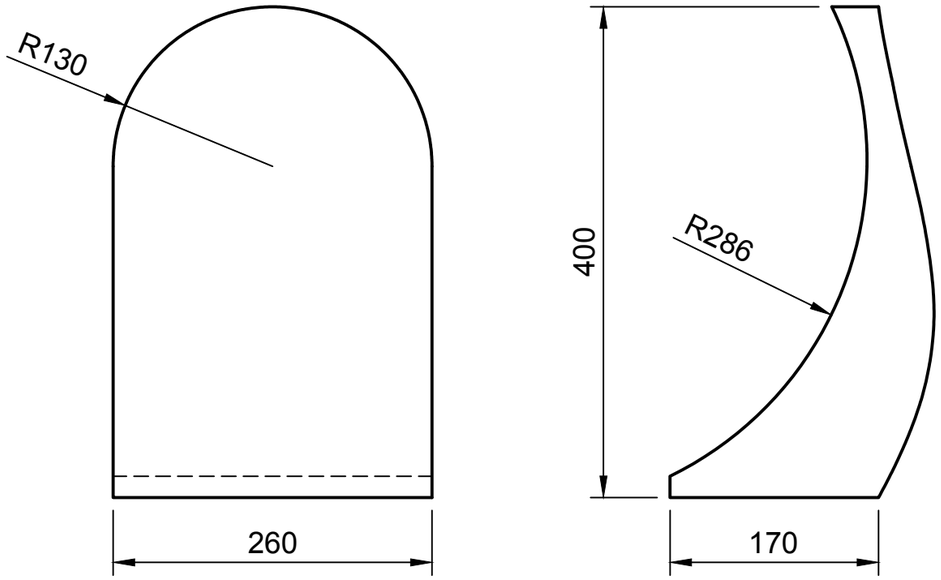

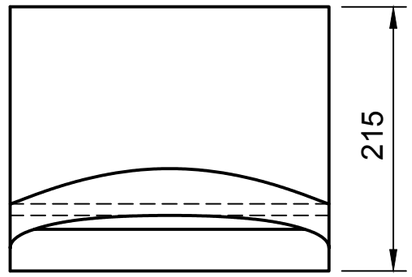

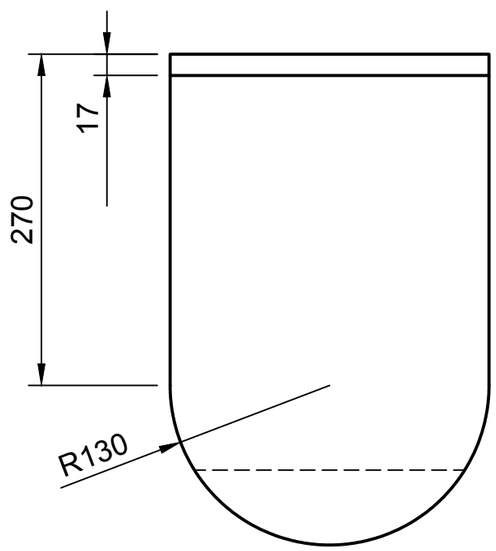

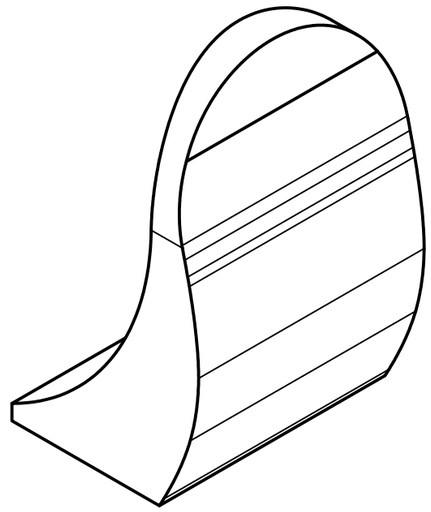

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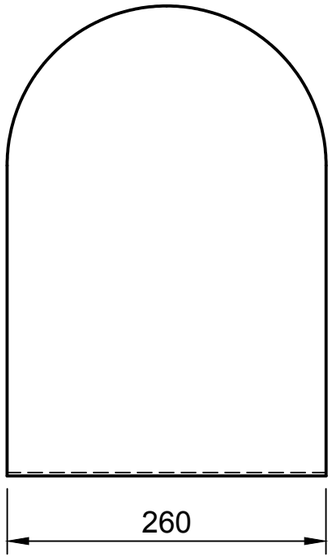
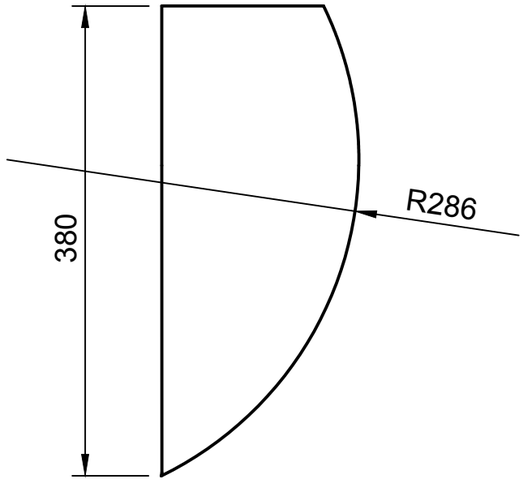
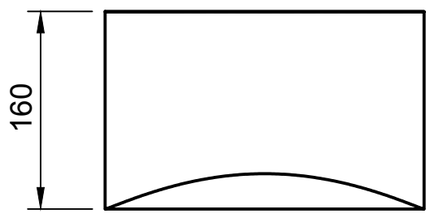
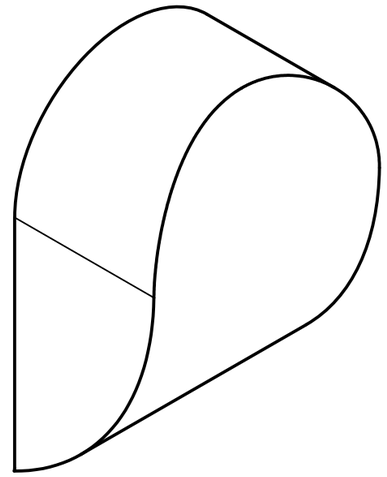
			QTY 1 / SCALE: 1/5 / Sheet 3/26

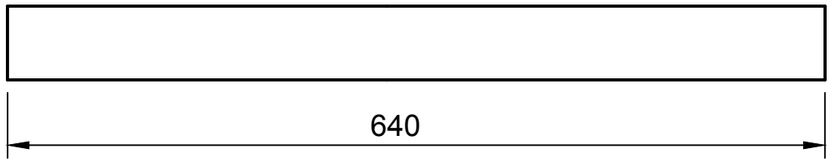


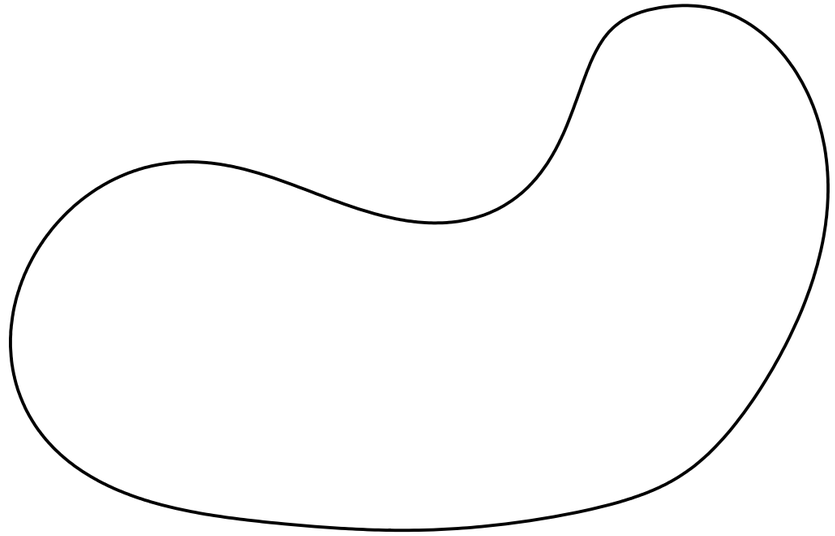


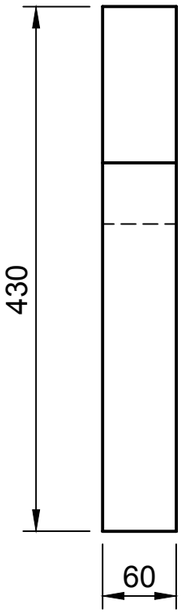


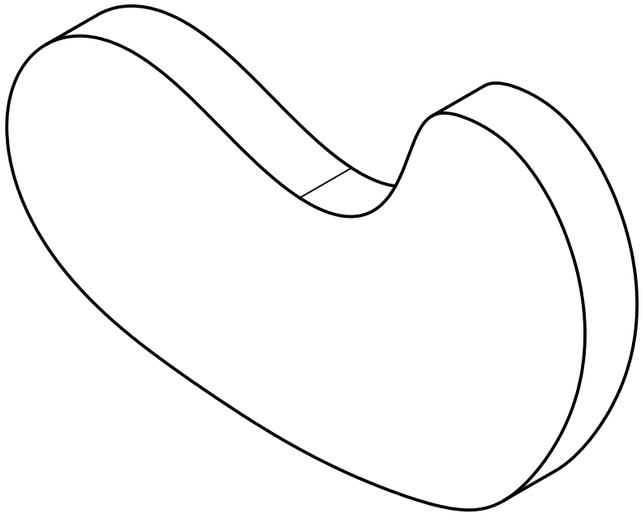


MATERIAL: EVA Foam	PRODUCTION: Water cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Back Piece	ITEM NO. 2
			QTY 1 / SCALE: 1/5 / Sheet 4/26

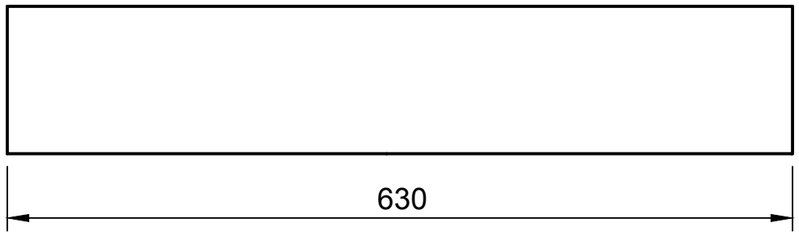


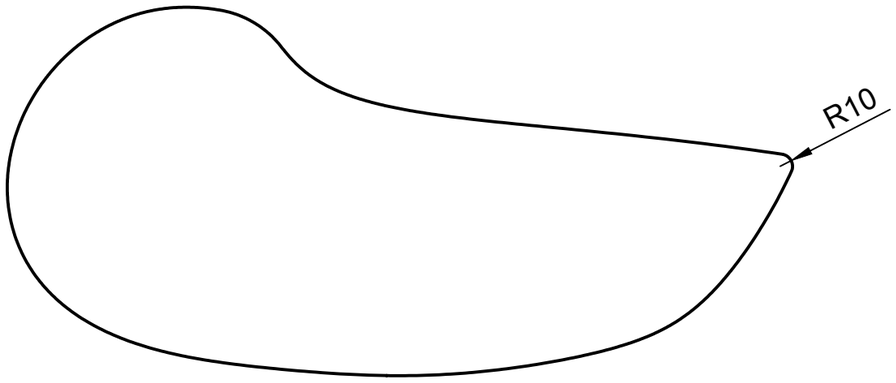


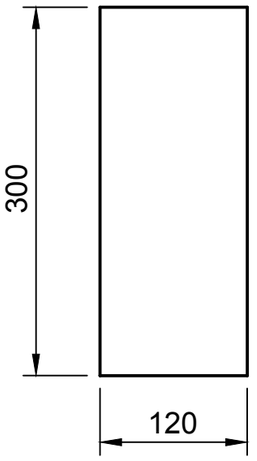


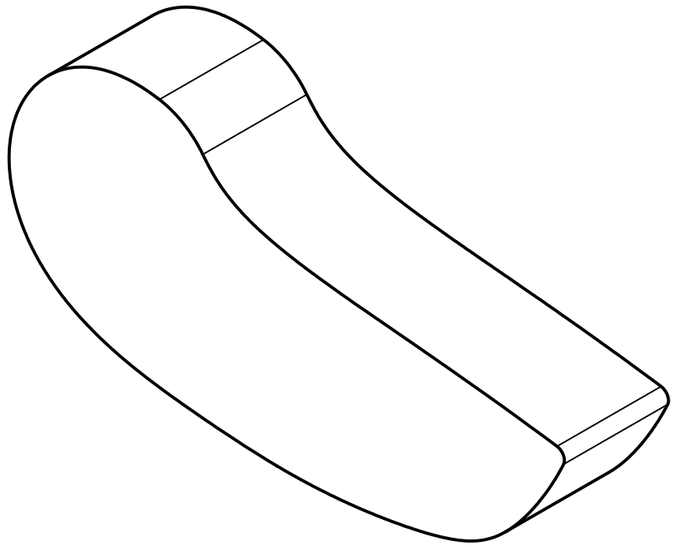


MATERIAL: EVA Foam	PRODUCTION: Water cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout	PART NAME: Side Piece Top
			ITEM NO. 3
			QTY 2 / SCALE: 1/5 / Sheet 5/26

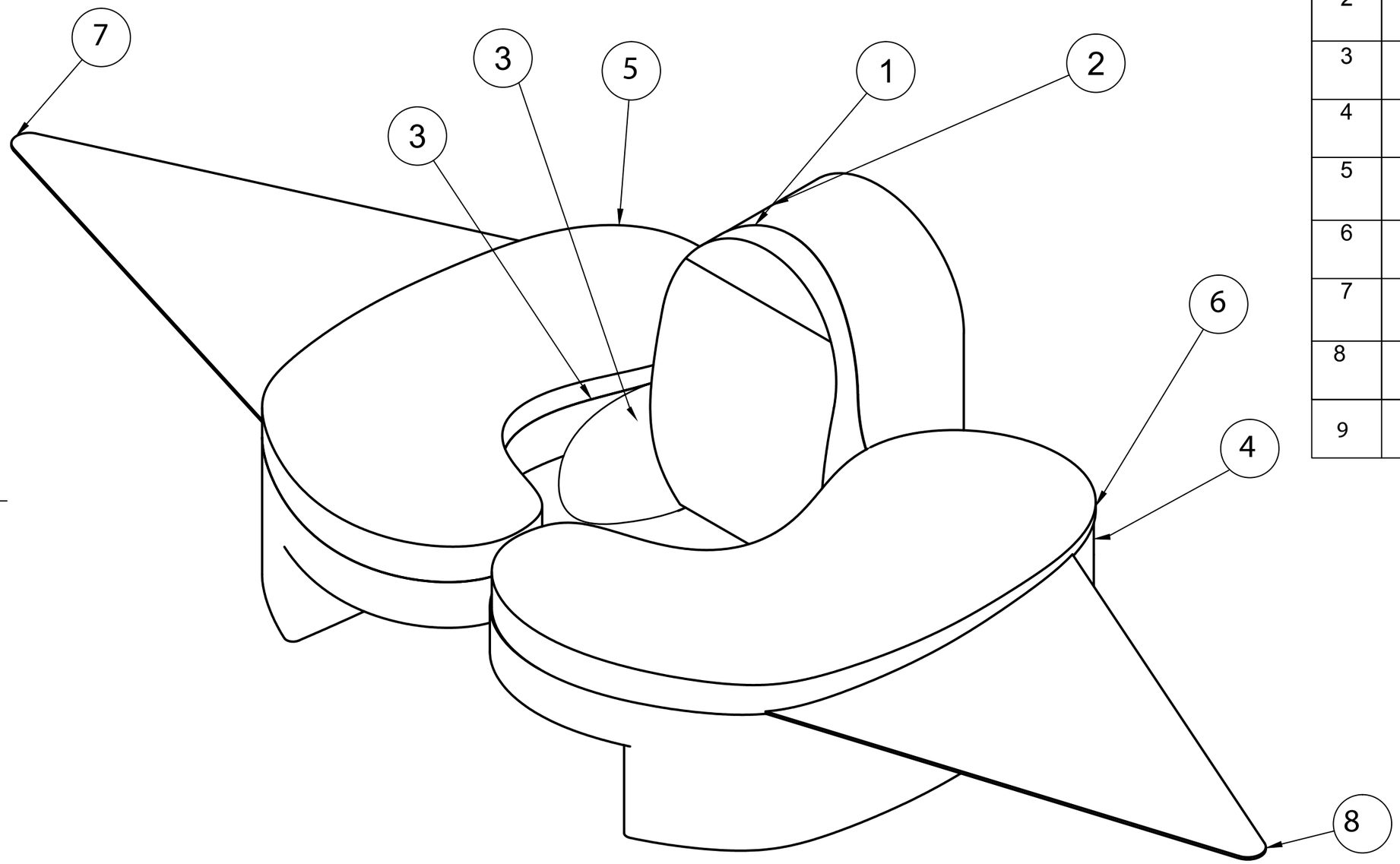








MATERIAL: EVA Foam	PRODUCTION: Water cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Side Piece Bottom	ITEM NO. 4
			QTY 2 / SCALE: 1/5 / Sheet 6/26



Parts List			
Item	Qty	Part Number	Material
1	1	Cover for Back Rest	Linen
2	1	Cover for Back Piece	Linen
3	1	Cover for Right Side Piece	Linen
4	1	Cover for Left Side Piece	Linen
5	1	Inner Cover for Right Side wedge	Cotton
6	1	Inner Cover for Left Side wedge	Cotton
7	1	Cover for Right Side Wedge/Swaddle	Cotton
8	1	Cover for Left Side Wedge/Swaddle	Cotton
9	1	Inner Cover for Wing	Cotton

MATERIAL: Linen - Cotton

PRODUCTION:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS

Created by MSc04 ID4 27/05/2024

Document type: PDF A3

Title

PART NAME:

Sprout

Educational institution: Aalborg University

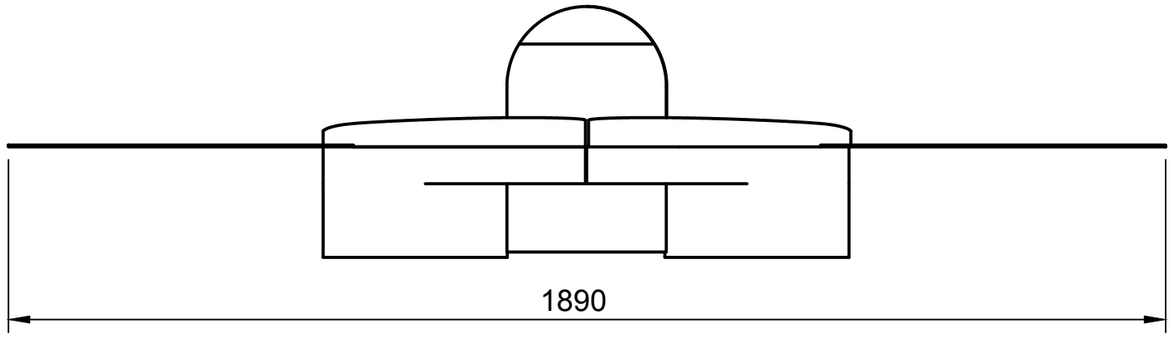
Education: Industrial Design, MSc04

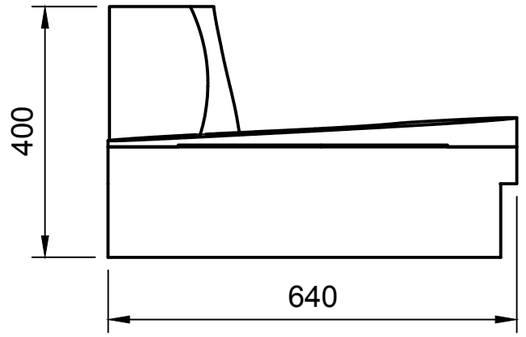
ITEM NO.

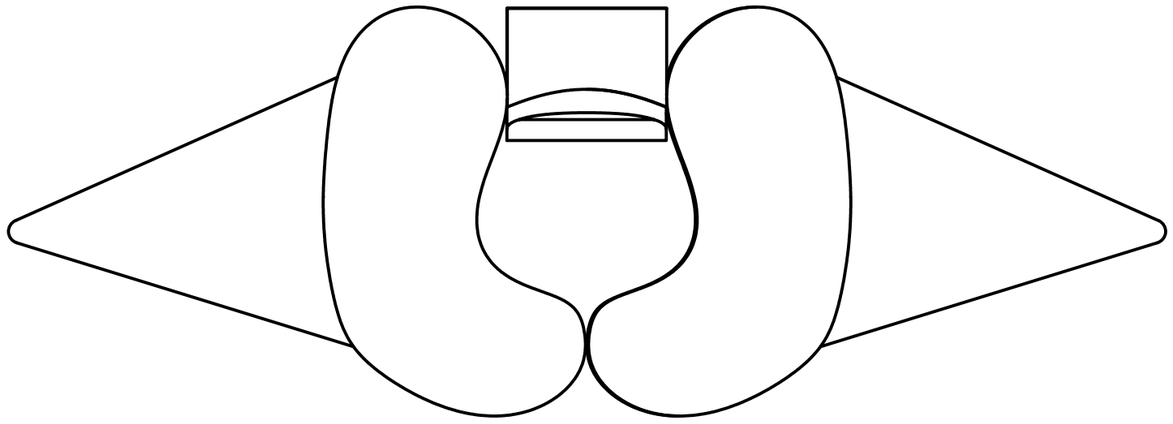
QTY

SCALE: 1/5

Sheet 7/26







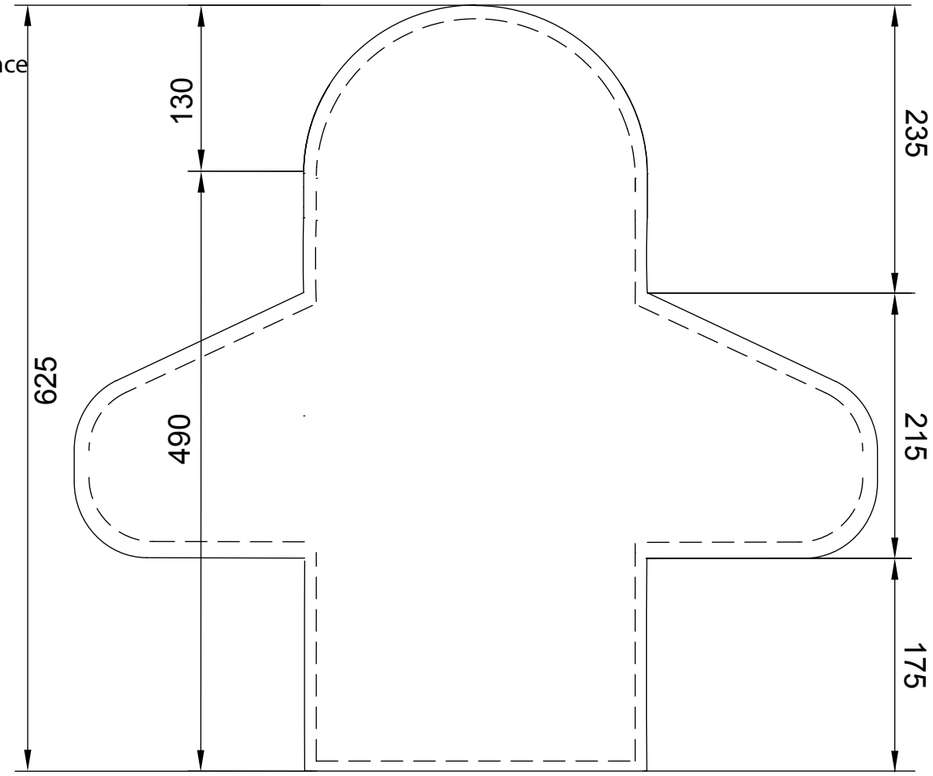
MATERIAL: Linen - Cotton	PRODUCTION:	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title PART NAME: Sprout	ITEM NO.
			QTY / SCALE: 1/10 / Sheet 8/26

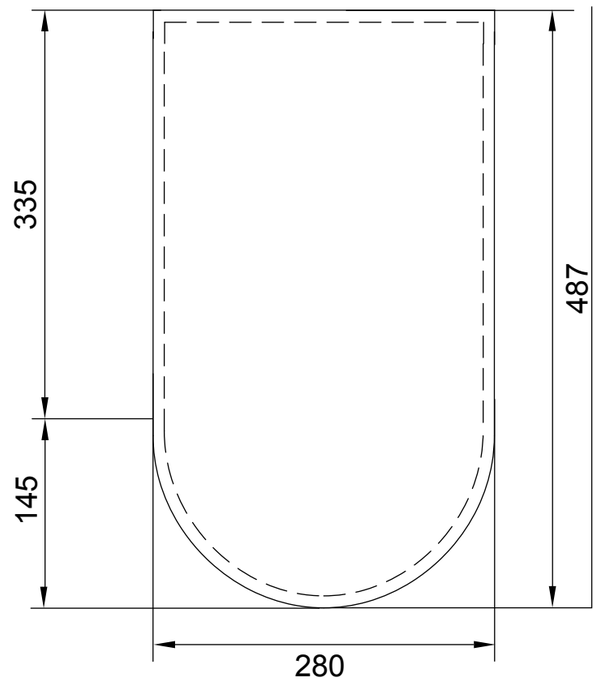
Cutting patterns, Cover for Back Rest

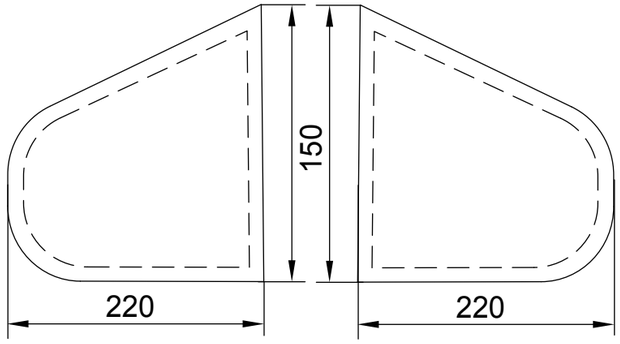
With 10 mm seam allowance

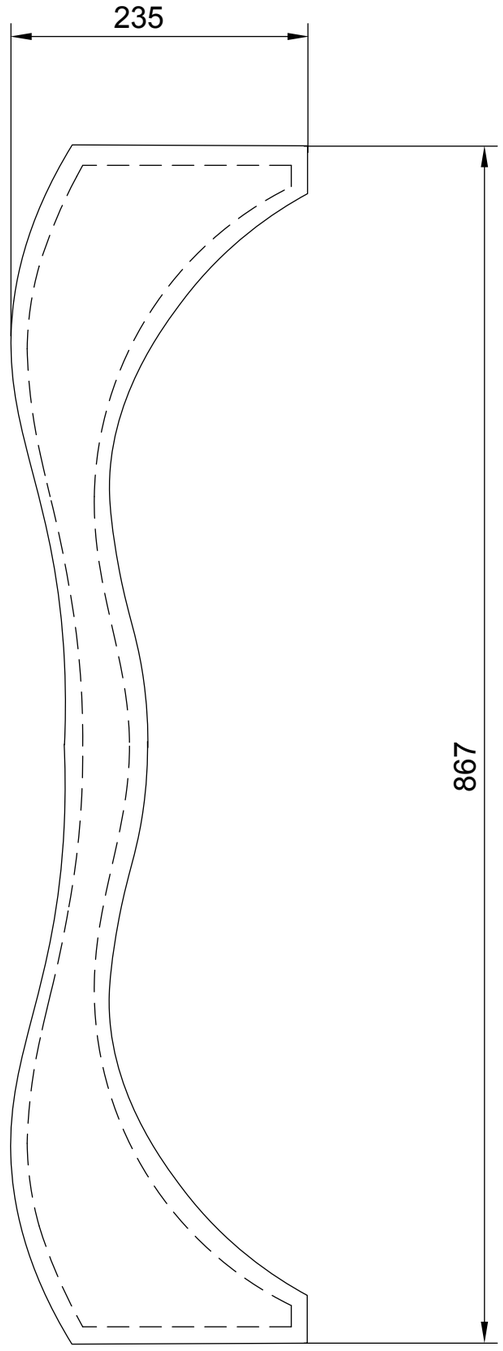
Cut line

Seam allowance









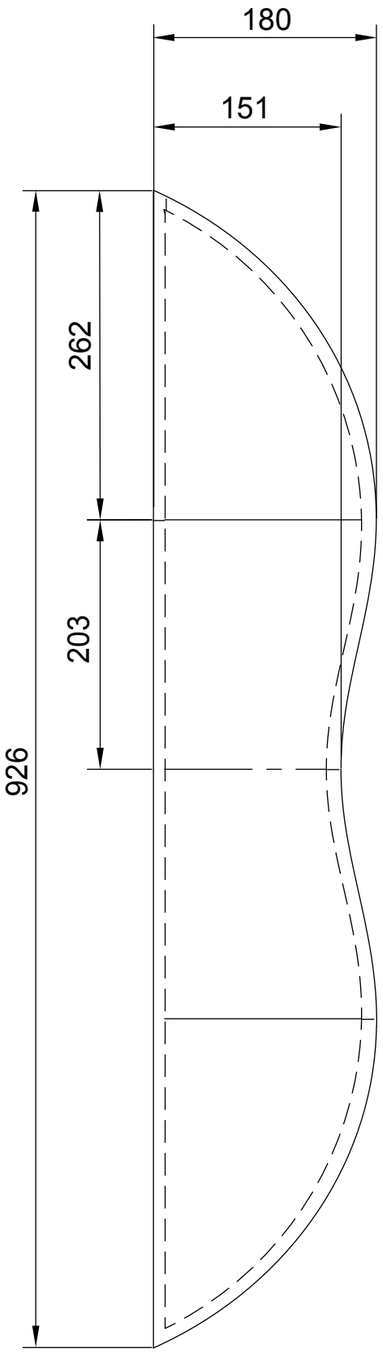
MATERIAL: Linen	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Cover for Back Rest	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 9/26

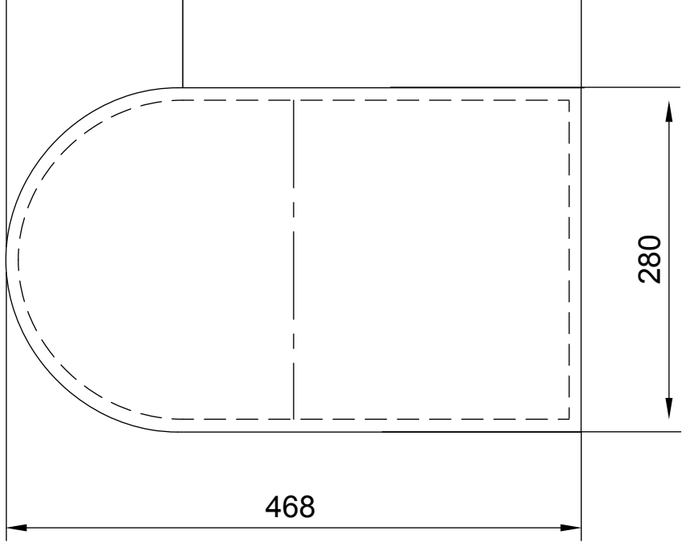
Cutting patterns, Cover for Back Piece

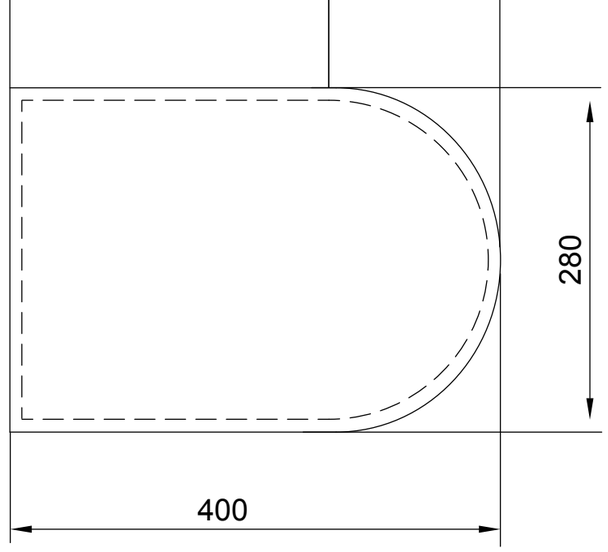
With 10 mm seam allowance

Cut line

Seam allowance







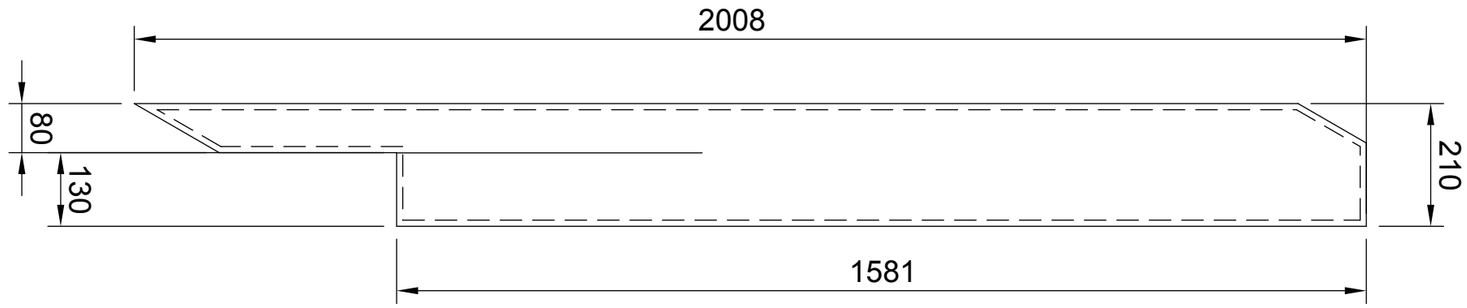
MATERIAL: Linen	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Cover for Back Piece	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 10/26

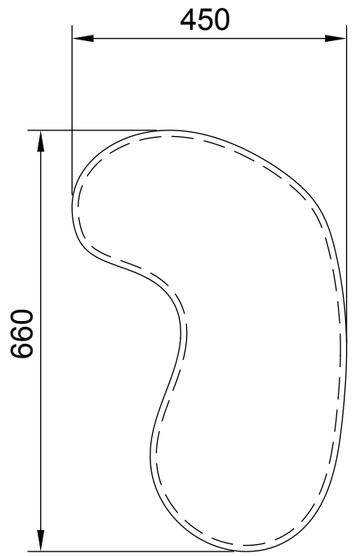
Cutting patterns, Cover for Right Side Piece

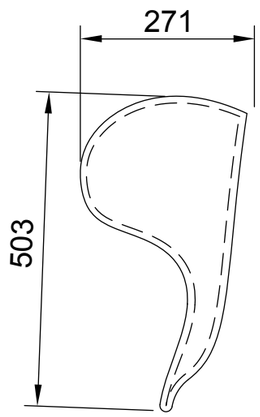
With 10 mm seam allowance

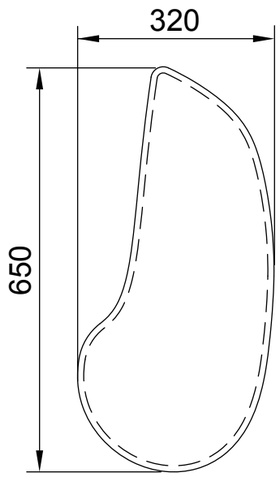
Cut line

Seam allowance









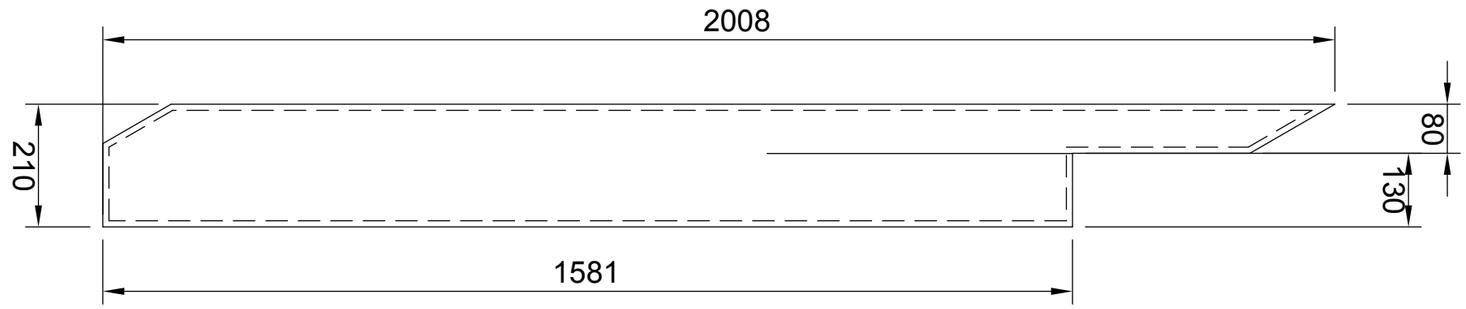
MATERIAL: Linen	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout	PART NAME: Cover for Right Side Piece
			ITEM NO.
			QTY 1 / SCALE: 1/10 / Sheet 11/26

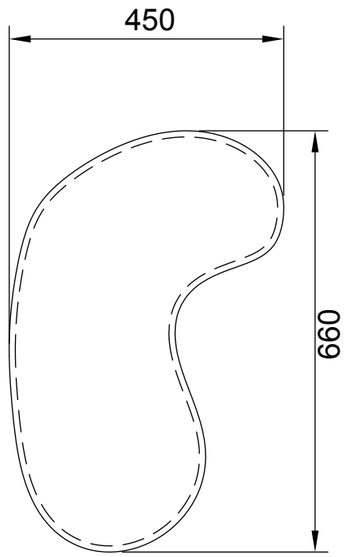
Cutting patterns, Cover for Left Side Piece

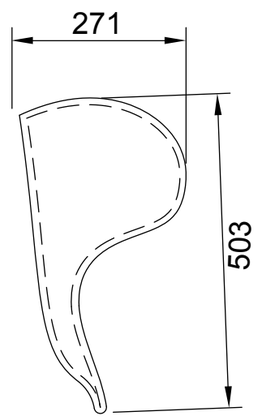
With 10 mm seam allowance

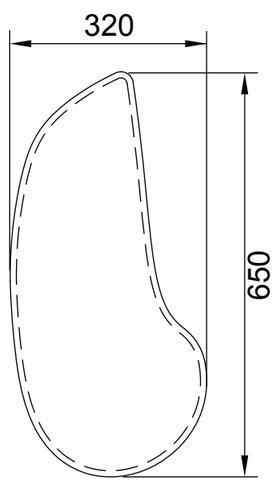
Cut line

Seam allowance









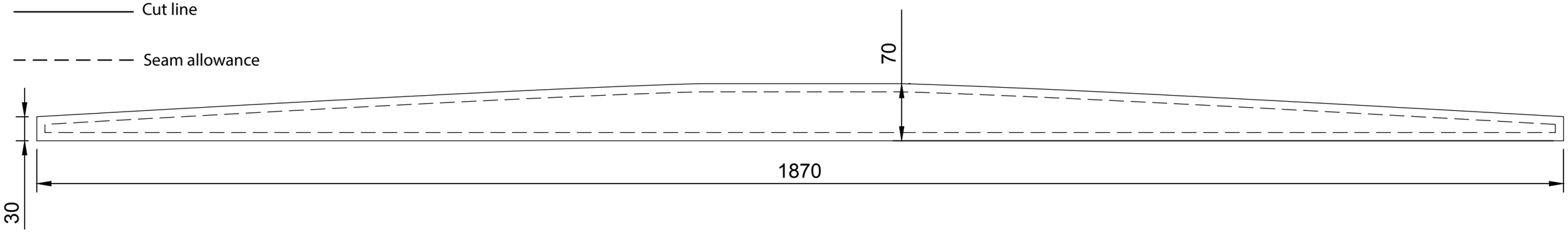
MATERIAL: Linen	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Cover for Left Side Piece	ITEM NO.
			QTY 1 / SCALE: 1/10 / Sheet 12/26

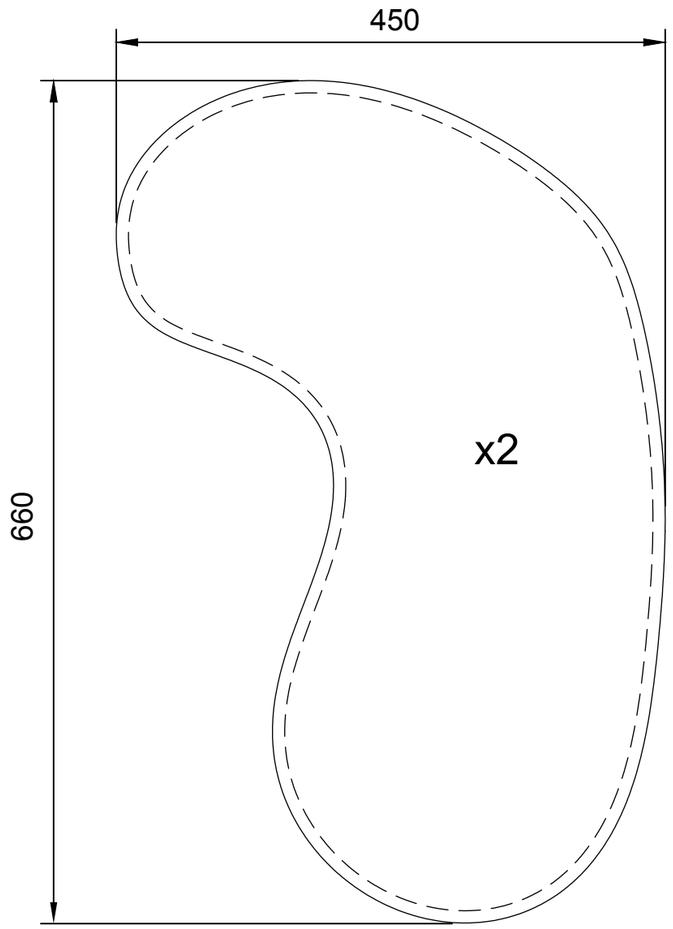
Cutting patterns, InnerCover for Right Wedge

With 10 mm seam allowance

Cut line

Seam allowance





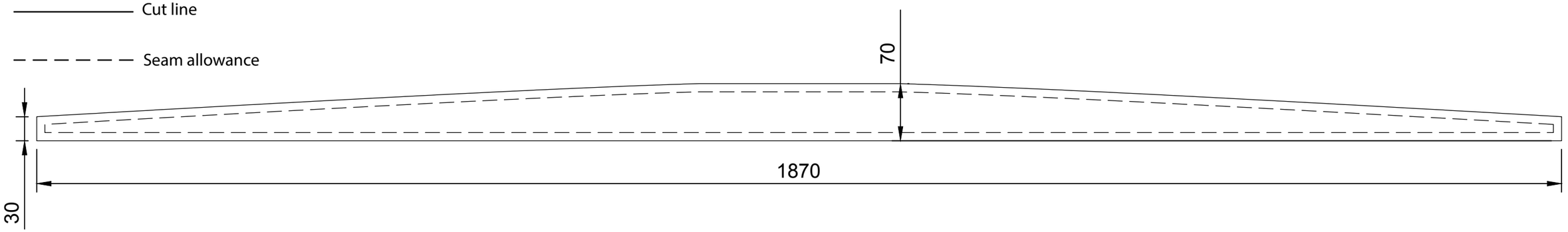
MATERIAL: Cotton	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout PART NAME: Inner Cover for Left Side wedge	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 13/26

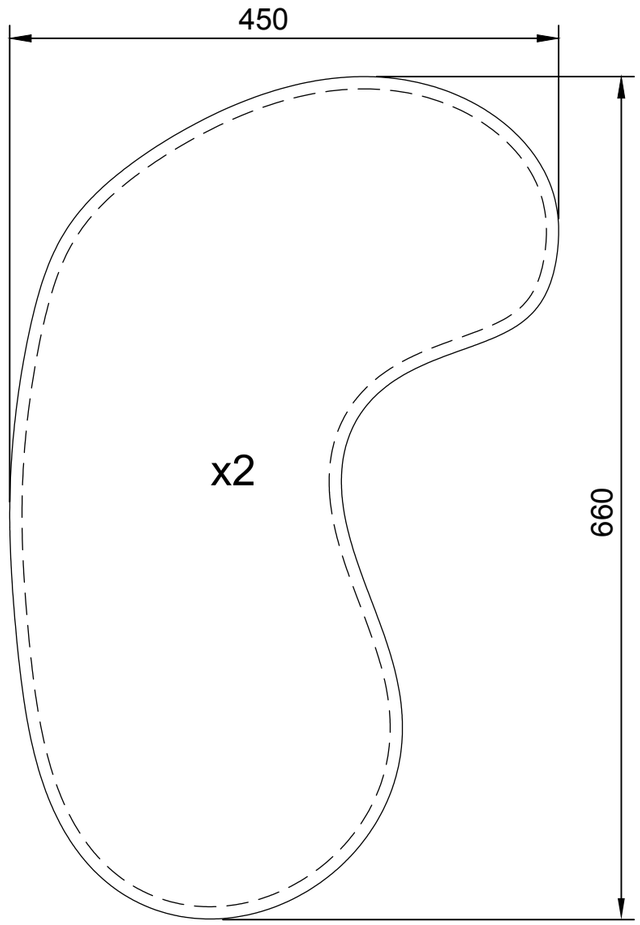
Cutting patterns, IInnerCover for Left Wedge

With 10 mm seam allowance

Cut line

Seam allowance





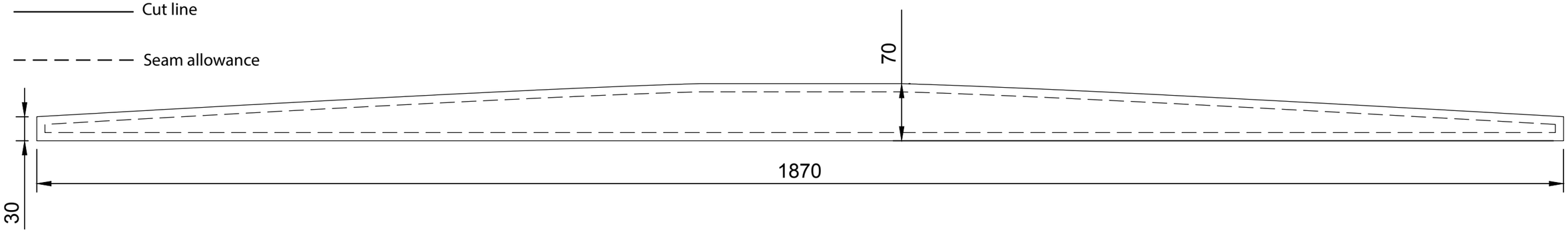
MATERIAL: Cotton	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Inner Cover for Left Side wedge	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 14/26

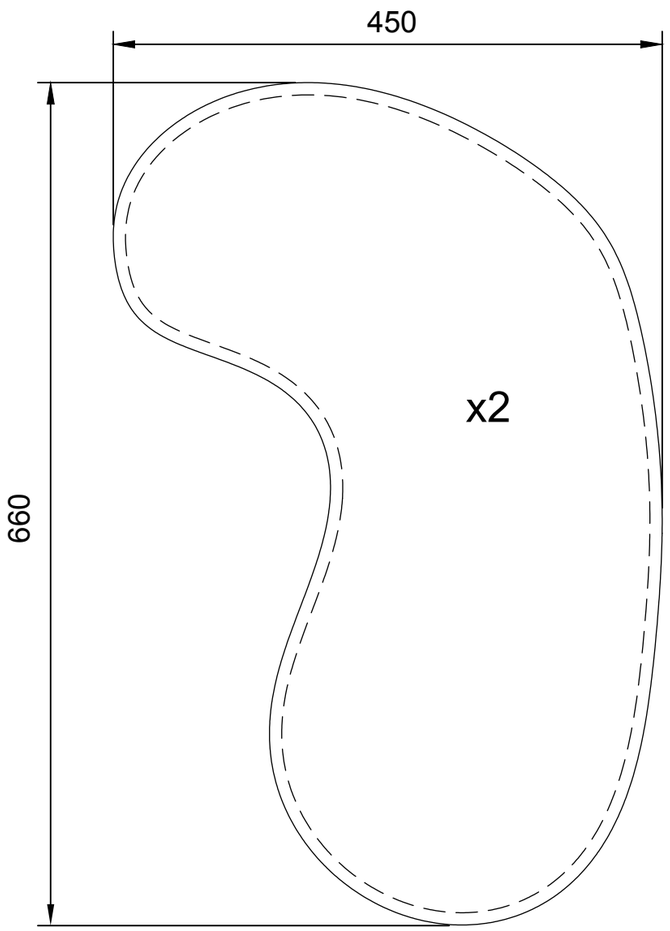
Cutting patterns, Cover for Right Wedge and Swottel

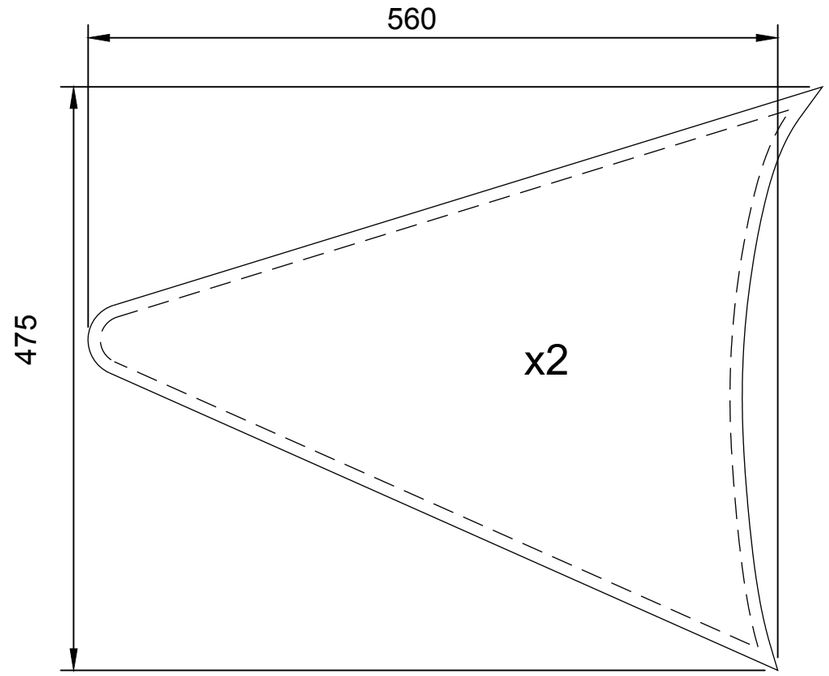
With 10 mm seam allowance

Cut line

Seam allowance







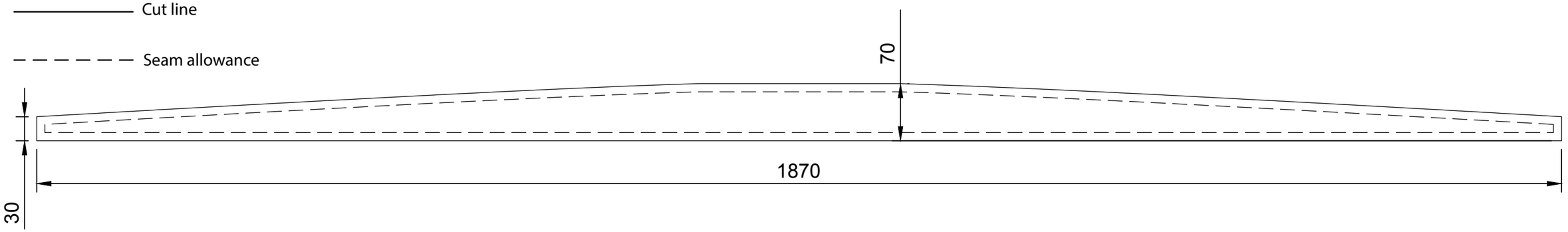
MATERIAL: Cotton	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Right Wedge and Swottel	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 15/26

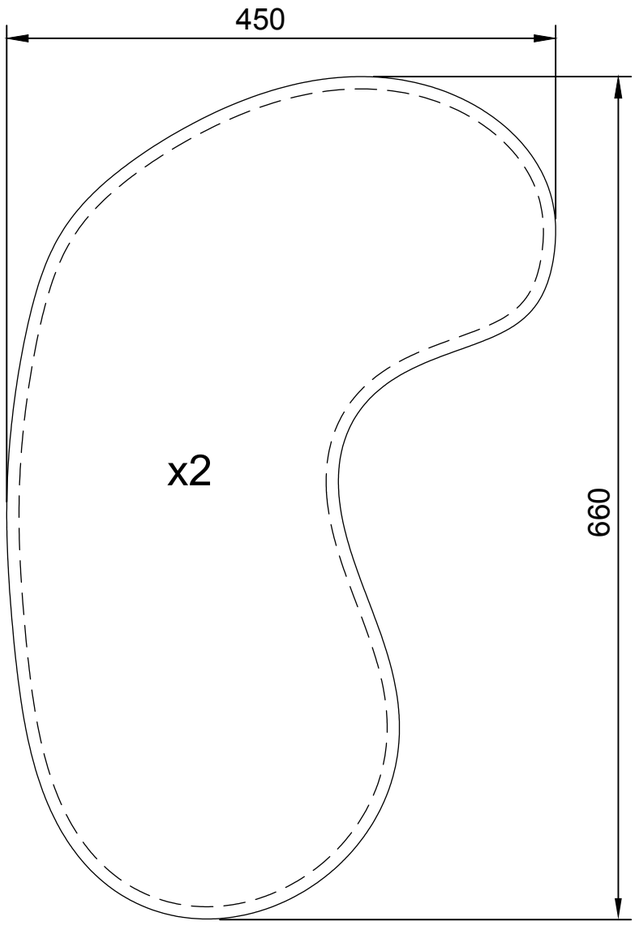
Cutting patterns, Cover for Right Wedge and Swottel

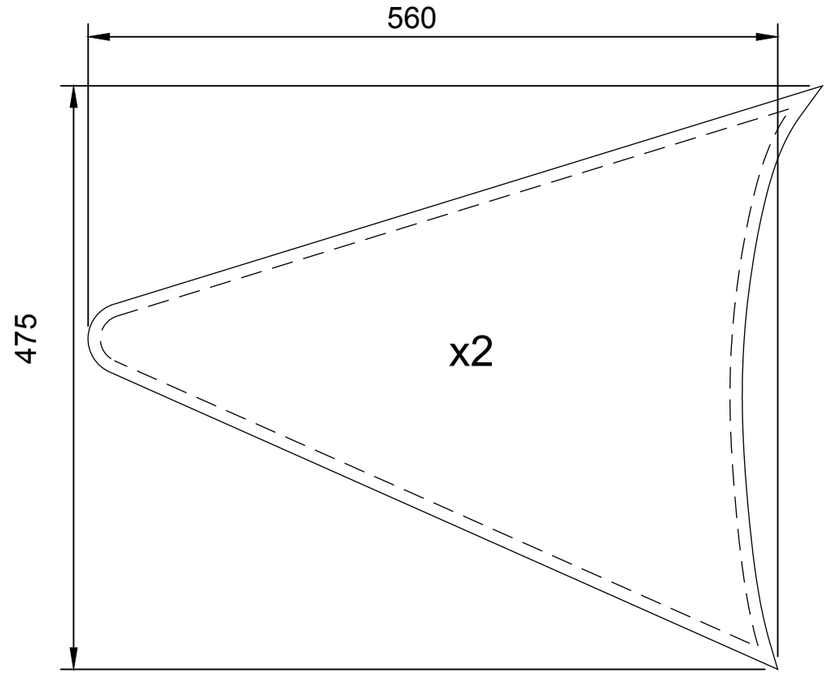
With 10 mm seam allowance

Cut line

Seam allowance







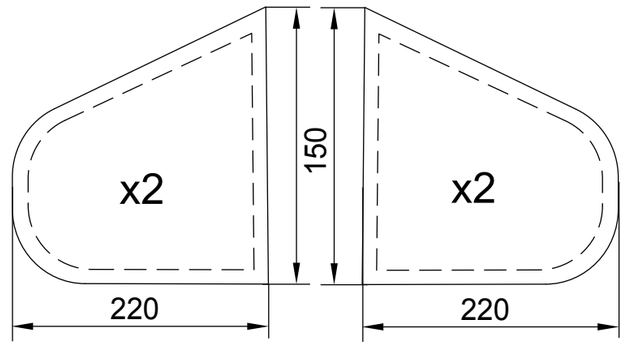
MATERIAL: Cotton	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Right Wedge and Swottel	ITEM NO.
			QTY 1 — SCALE: 1/5 — Sheet 16/26

Cutting patterns, Inner Cover for Wings

With 10 mm seam allowance

Cut line

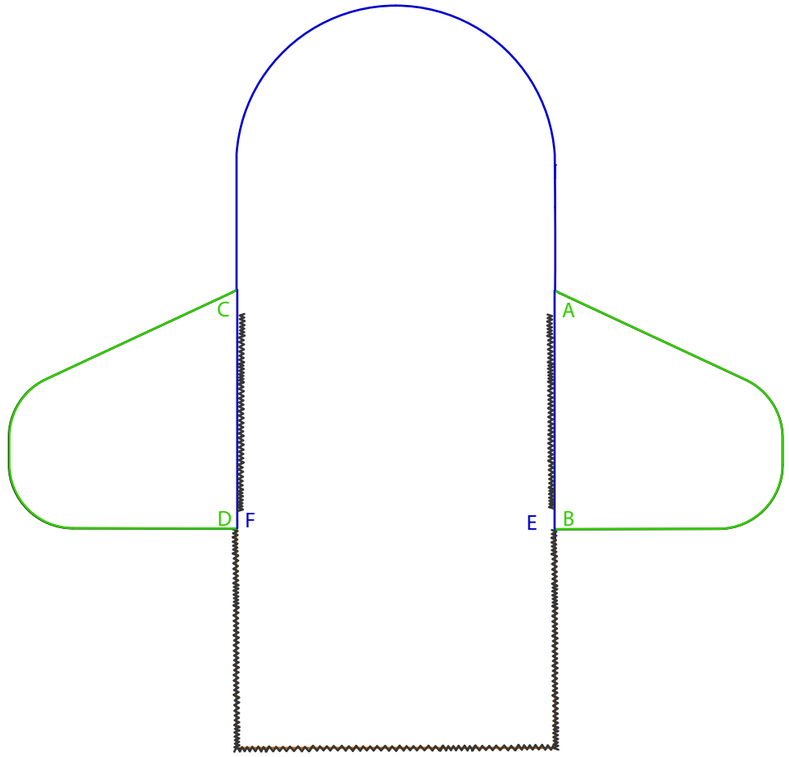
Seam allowance

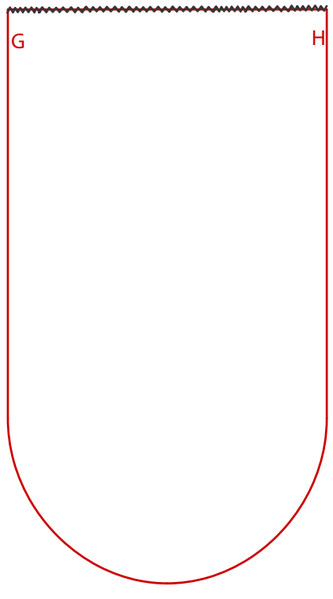


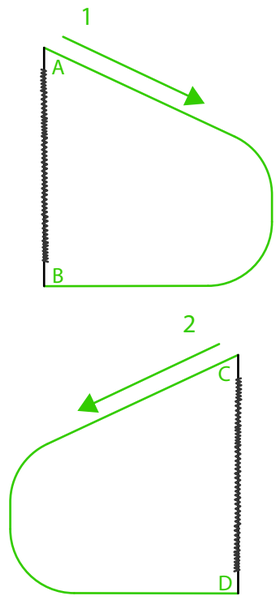
MATERIAL: Linen	PRODUCTION: Cutting	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Cover for Back Rest	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 17/26

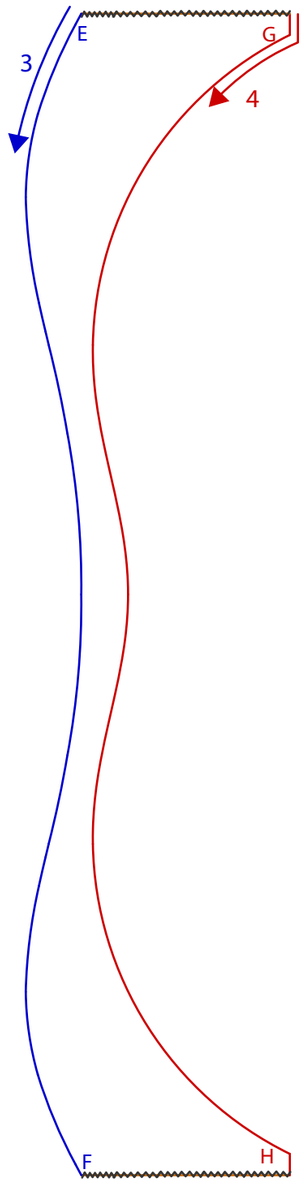
The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper





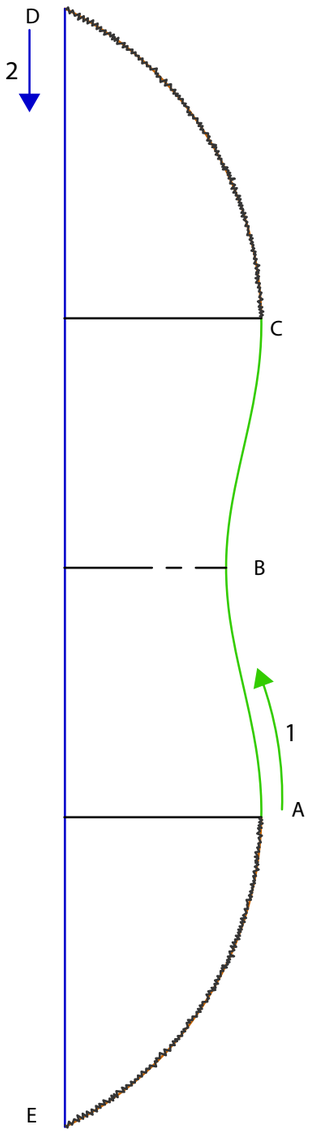


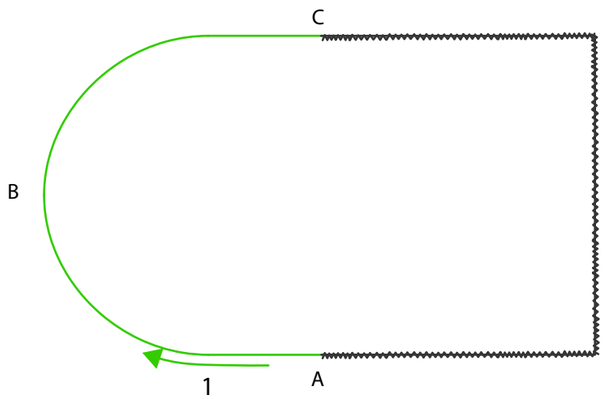


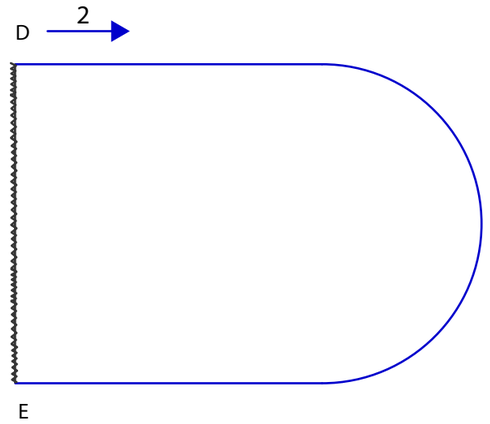
MATERIAL: Linen	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Cover for Back Rest	ITEM NO.
			QTY 1 — SCALE: 1/5 — Sheet 18/26

The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper



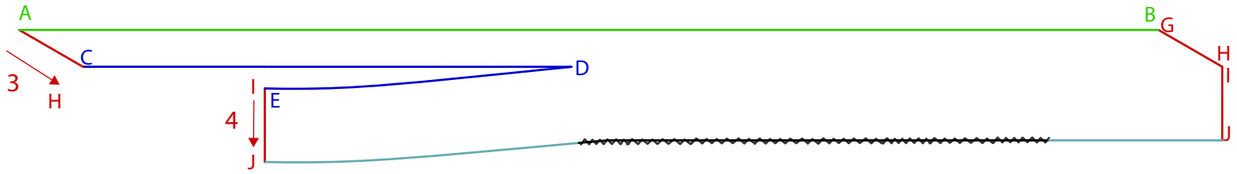


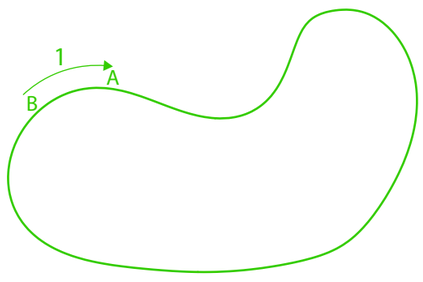


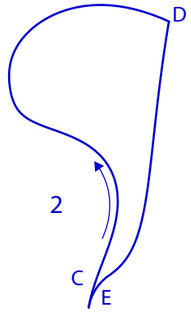
MATERIAL: Linen	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Cover for Back Piece	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 19/26

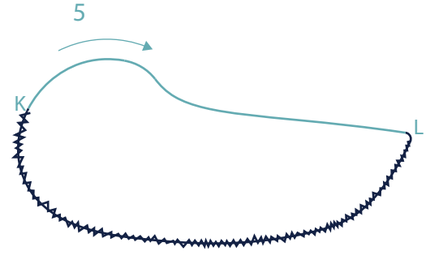
The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper





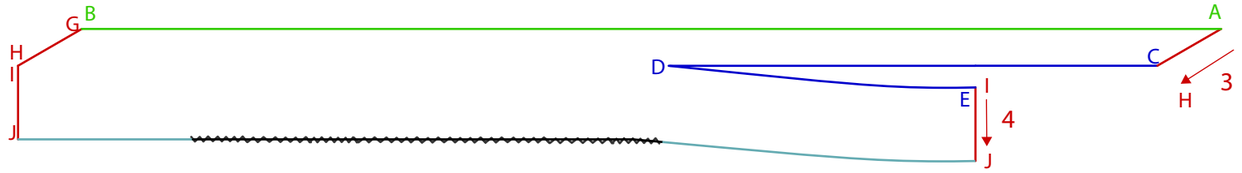


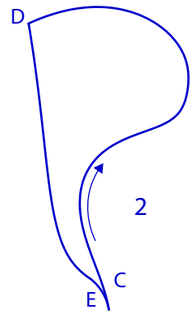


MATERIAL: Linen	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Cover for Right Side Piece	ITEM NO.
			QTY 1 / SCALE: 1/10 / Sheet 20/26

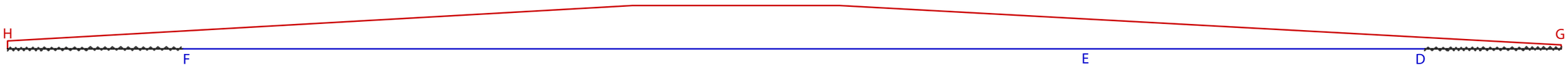
The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper



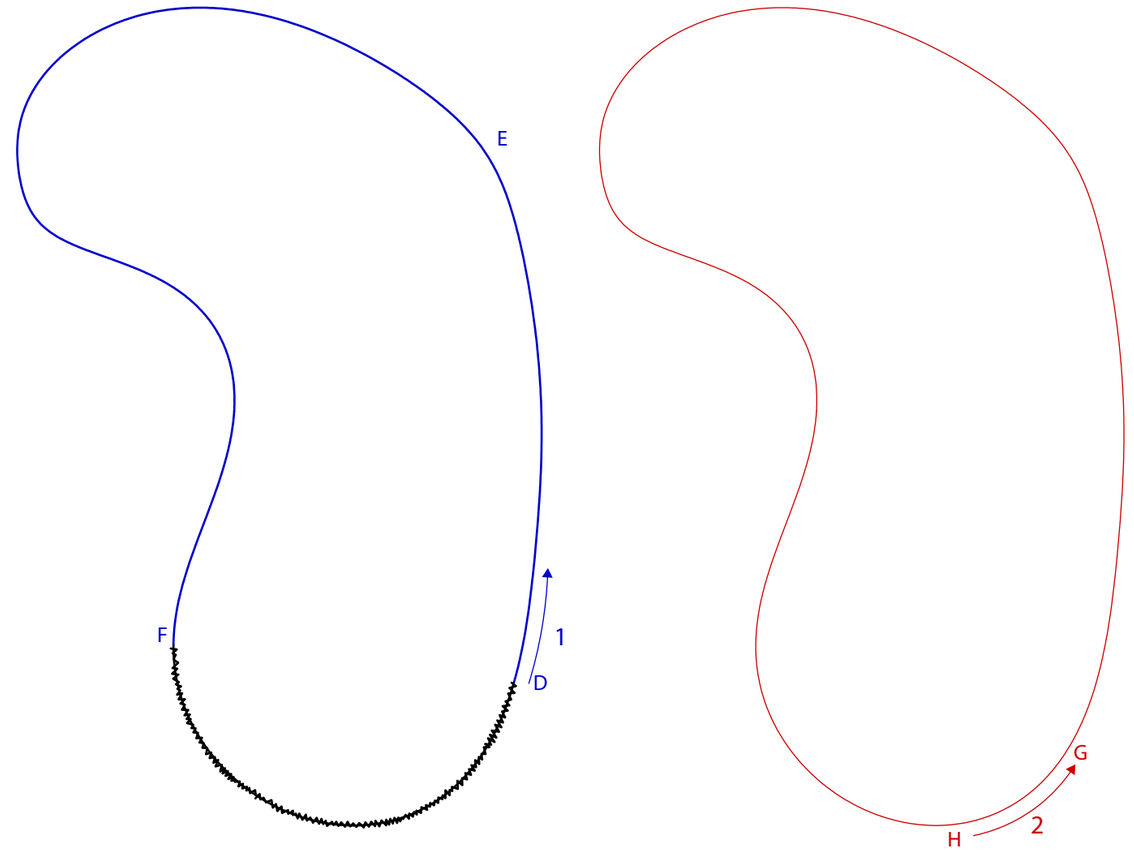


MATERIAL: Linen	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg Universityorg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Cover forLeft Side Piece	ITEM NO.
			QTY 1 / SCALE: 1/10 / Sheet 21/26



The order of opperation. Seam connection along with corner allignment points (the letters)

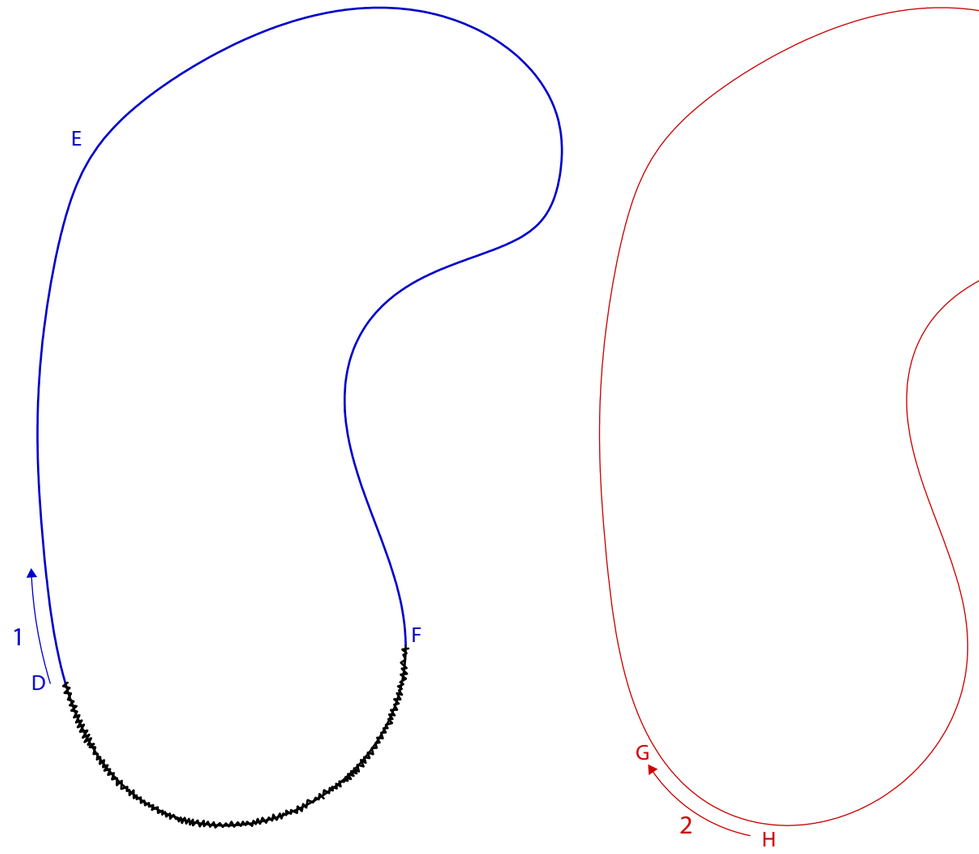
Zipper



MATERIAL: Cotton	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg Universityorg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Inner Cover for Left Side wedge	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 22/26

The order of opperation. Seam connection along with corner allignment points (the letters)

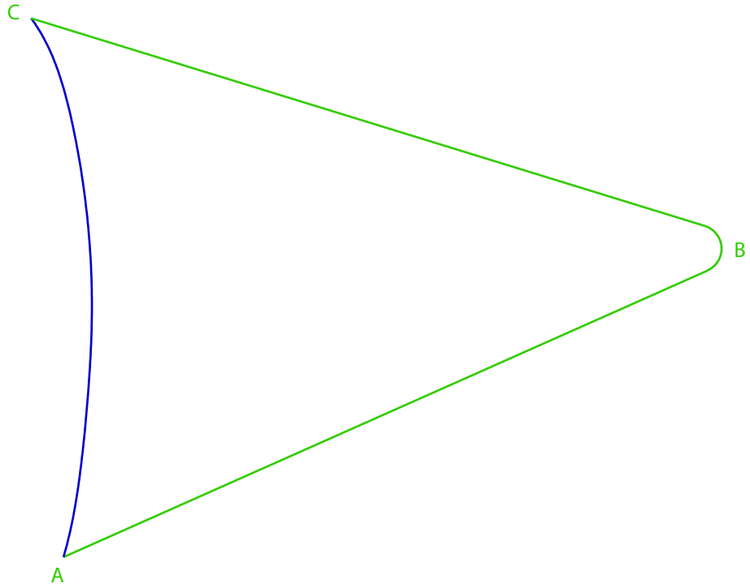
Zipper

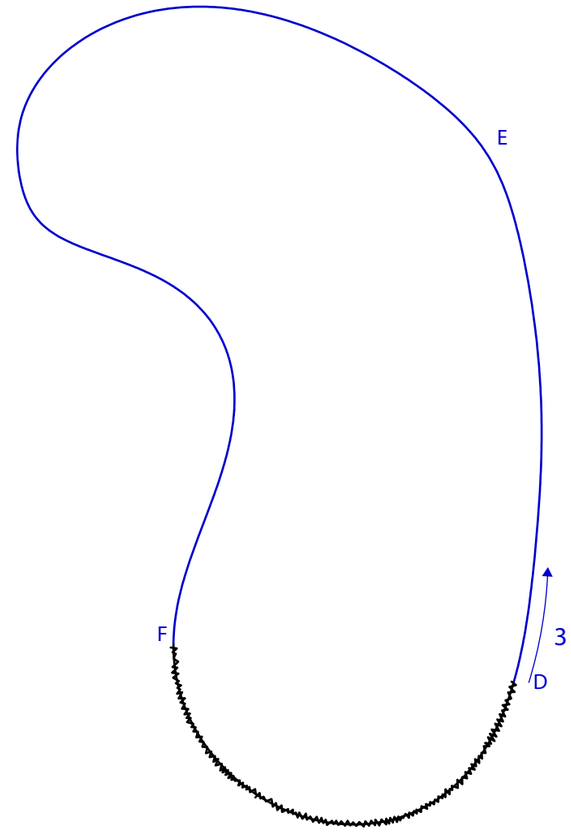


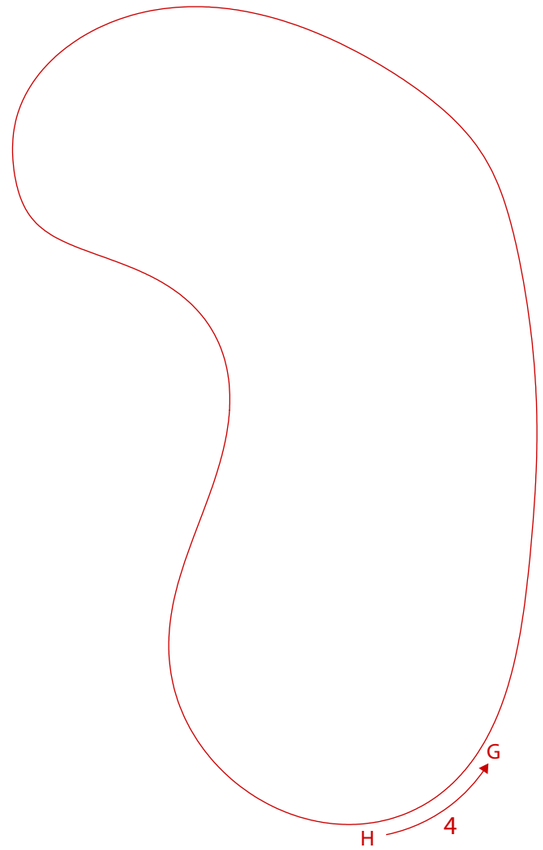
MATERIAL: Cotton	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg Universityorg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout PART NAME: Inner Cover for Right Side wedge	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 23/26

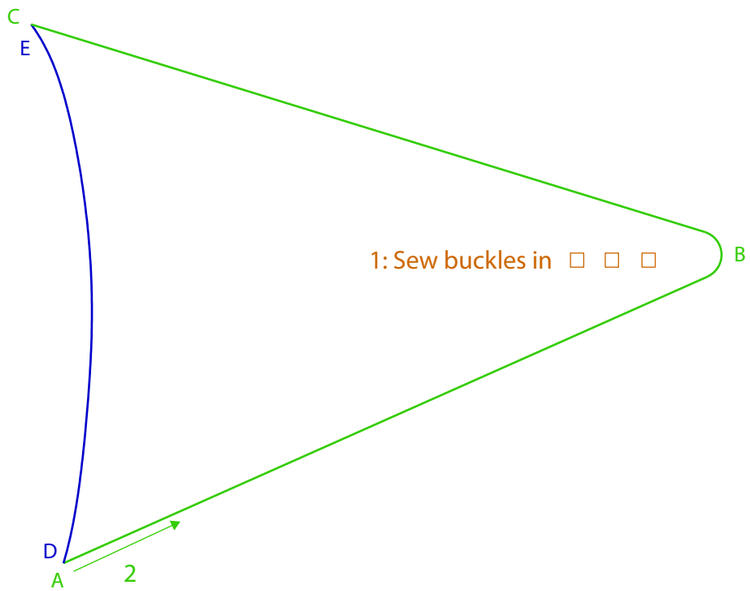
The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper





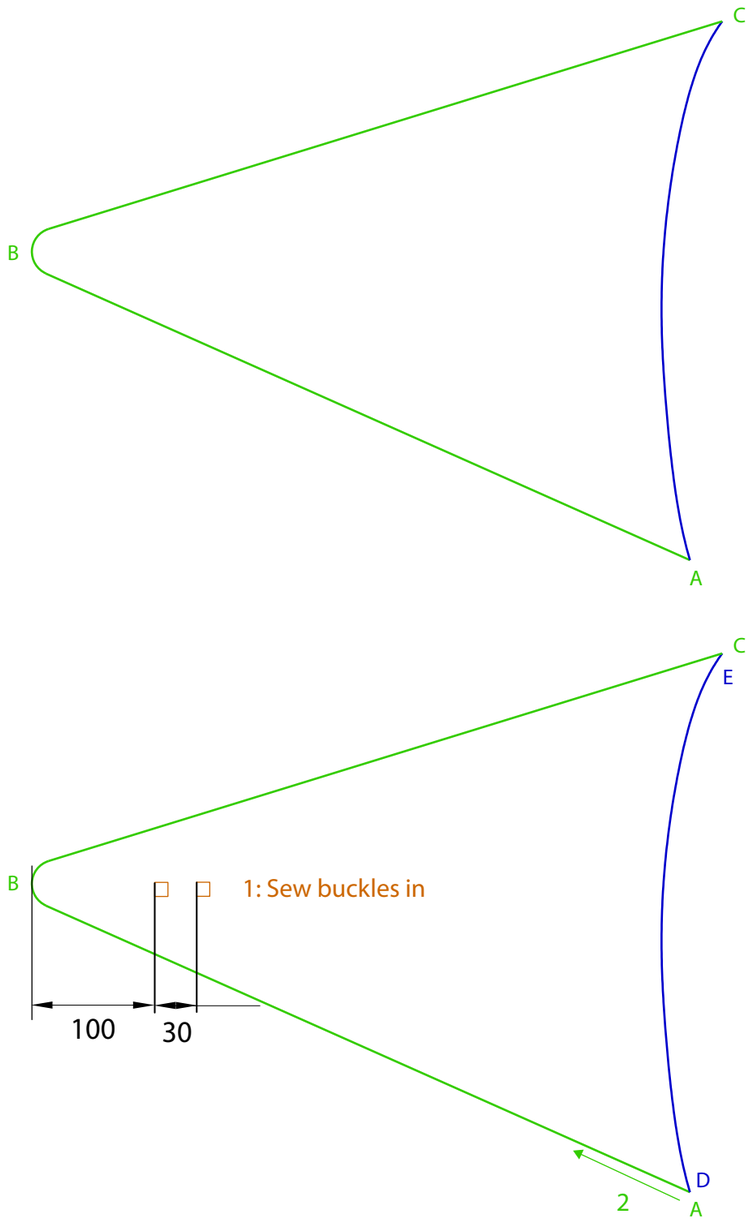


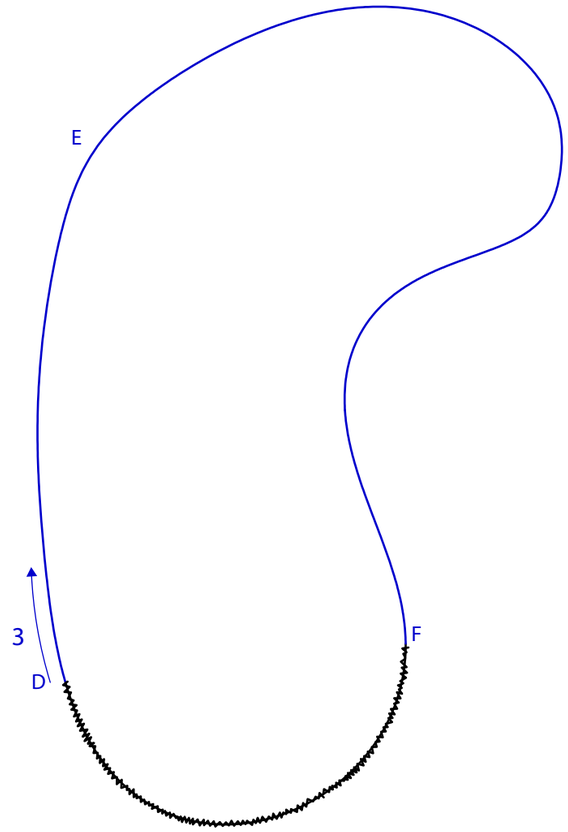


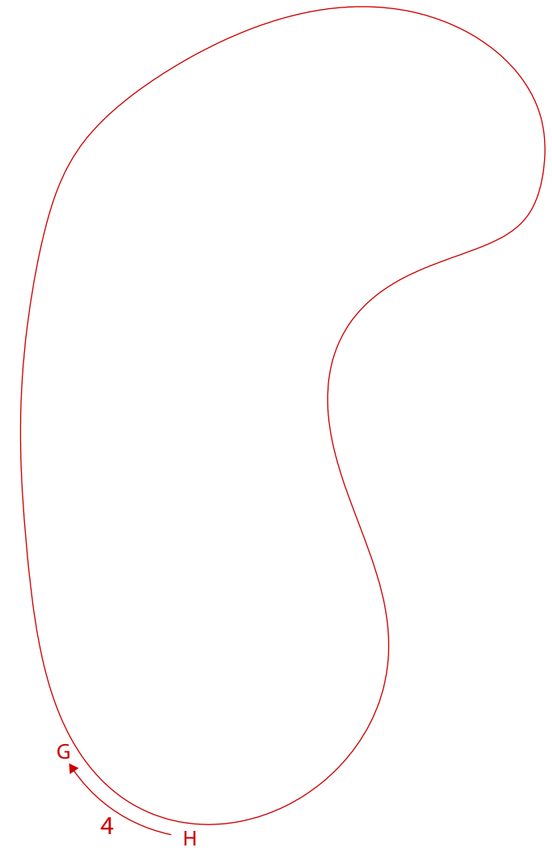
MATERIAL: Cotton	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg Universityorg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout	PART NAME: Cover forRight Side/Wedge Swottel
			ITEM NO.
		QTY 1	SCALE: 1/5
			Sheet 24/26

The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper



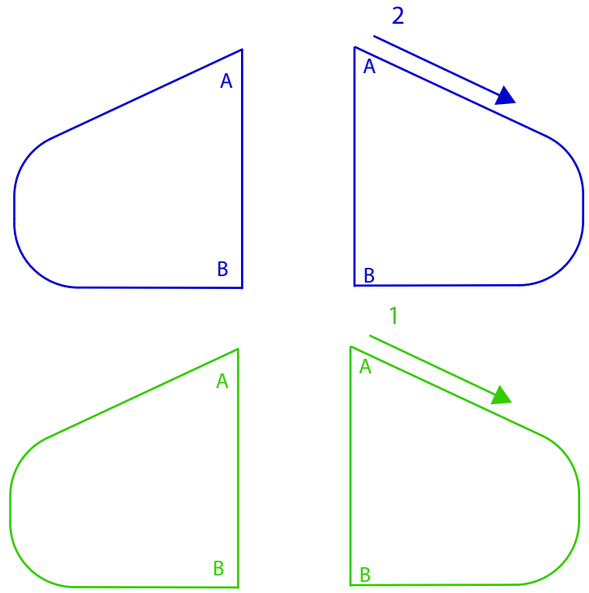




MATERIAL: Cotton	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg Universityorg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title: Sprout — PART NAME: Cover for Left Side / Wedge Swottel	ITEM NO.
			QTY 1 · SCALE: 1/5 · Sheet 25/26

The order of opperation. Seam connection along with corner allignment points (the letters)

Zipper



MATERIAL: Linen	PRODUCTION: Sewing	Created by MSc04 ID4 27/05/2024	Educational institution: Aalborg University
		Document type: PDF A3	Education: Industrial Design, MSc04
		Title Sprout / PART NAME: Inner Cover for Wings	ITEM NO.
			QTY 1 / SCALE: 1/5 / Sheet 26/26