CHALMERS
UNIVERSITY OF TECHNOLOGY

Britax GO Unlimited

DESIGN AND STRATEGIC DEVELOPMENT OF A BRITAX PRODUCT SERVICE SYSTEM

Master's thesis in Industrial Design Engineering

FILIP N. TRAUNG

Department of Product and Production Development
Division Design and Human Factors
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2017

Britax GO Unlimited

Design and Strategic development of a Britax product service system

FILIP N. TRAUNG

Department of Product and Production Development
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2017

Britax GO Unlimited
Design and Strategic development of a Britax product service system
FILIP N. TRAUNG

Department of Product and Production Development
Division Design & Human Factors
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone +46 (0)31-772 1000

Cover:
[A collage of the Britax GO Unlimited product-service system]

Printed by Chalmers Reproservice
Gothenburg, Sweden 2017

Preface

This masters thesis, spanning 30 credits, was achieved at Chalmers University of Technology as part of the Industrial Design Engineering Masters Programme during the spring of 2017.

The undertaking was initially conceived by me, Filip Traung, as an appropriate project for my then upcoming master thesis as I was also awaiting my first child and was going to be taking long walks with a stroller in my spare time. The following issue were then to find a case- organisation that were willing to lend their brand and name for associating with this project and which was ultimately found in the form of Britax Ltd, the Britax Römer brand and Britax Nordiska Barn.

Following, I would like to send my gratitude to those who have helped me in this project; First and foremost, I would like to thank my contact at Britax Nordiska Barn, Carolina Olsson, for giving me the opportunity to have them as the case- organisation and thereby making the project possible. Further, I would like to thank my Academic Supervisor and Examiner at Chalmers, MariAnne Karlsson, as well as my two opponents, Petronella Johansson and Sara Westerlund, for lending their knowledge on report writing and helping me perfect this report. Lastly, I would like to give a special thanks to my external supervisors at Yovinn Consultancy Agency for lending me a place to work, lots of free coffee and superior expertise in the area of Industrial Design and Product Development.

Abstract

Reporting on the design and strategic development of a Britax product service system, called *Britax GO Unlimited*, as performed by Industrial Design Engineering master´s student *Filip Traung* and part of the department of Product and Production Development, division Design & Human Factors at Chalmers University of Technology.

An investigation to follow as a reaction to the straggly and stagnant market of baby carriages, in terms of product integration and inventiveness; a superior design concept was sought with the user as the primary stakeholder. To solve this, an iterative, top-down approach to design including a strategic overview of the Britax Römer Brand and the companies operations, was investigated and conceived.

This meant a project consisting of three phases: the investigation-, intention- and creation- phase. A large part of the project surrounded the work around the ultimate vision of what the product could be. This guided the process towards a focus on green branding, circular economy and the urban user whom relies on public transportation. Three forward looking visions for what the baby carriage could be was conceived and after iterations towards engineering, or reality, the final result was found.

The project resulted in a subscription service called Britax GO Unlimited that helps parents when taking care of their child when away from home. The Britax GO Unlimited service includes three services- GO Anywhere, a rental and extension service focusing on travel locations such as airports and train stations, GO P-repaired, a repair service, and GO Back, a take-back programme making the Britax GO Unlimited based on circular economy. This service is embodied in the Britax Booth, a store-in-store experience and the Britax B-Urban, a travel system for the urban user whom relies on public transportation.

Key-words

Product Design
Design thinking
Strategic Design
Industrial Design
Concept Design
Design Engineering
Baby carriage
Travel system
Perambulator
Stroller

FILIP TRAUNG
INDUSTRIAL DESIGN ENGINEERING
MASTERS STUDENT

Table of contents

1. Introduction **7**

1.1. Background 8

1.2. Purpose 8

1.3. Objectives 8

1.5. Delimitations 8

1.6. Disposition 8

2. Method **9**

2.1. Overall method 10

Approach 10

Process 11

Evaluation 12

2.2. Investigation phase 13

Starting point, defining the product 13

Branding and Market today 13

Core problem definition 13

Investigate core emotions 13

2.3. Intention phase 14

Emotive Vision 14

Functional Vision 14

Operational Vision 14

Concluded intent 14

2.3. Creation phase 15

ideation 15

Concept generation / Synthesis 15

Concept refinement 15

3. Results from the investigation phase **16**

3.1. Starting point, defining the product 17

Literature study, literary definitions 17

Physical Definition 18

Symbolic definition 18

Historical definition 19

Relative definition 20

Use definition 21

Future definition 22

3.2. Branding and market Today 23

The Britax Product portfolio 23

The Britax Visual Brand 24

The Britax Römer Brand practices 25

The Current market brands 27

Current market solutions 27

Current market and market positions 28

The second hand market 28

Market User Value 29

History of britax Römer 29

Environmental impact 30

Business intelligence 31

3.3. Core problem definition 32

Core problem definition 32

Core problem complements 33

Concerned by the Core problem 34

Culture around the core problem 35

The context of the core problem 36

The core problem over time 36

The core problem hierarchy 37

Core problem framing 37

3.4. Investigate Core Emotions 38

Meaning and emotion 38

Emotive attachment 39

Emotional fulfilment 40

absolute emotional need 40

41 4. Results from the intention phase
42 4.1. Emotive Vision
42 *Vision of emotive needs*
43 *Vision of emotive expression*
43 *Vision of design entirety*
43 *Emotional Vision*
44 4.2. Functional Vision
44 *Core problem discussion*
45 *Vision of ultimate functionality*
46 *Use cases*
46 *Key characteristics*
46 *Functional Guidelines*
46 *Functional Vision*
47 4.3. Operational Vision
47 *Brand Vision adherence*
48 *Market opportunities and market choice*
48 *Operational strategy*
48 *Operational Vision*
49 4.4 Concluded intent
49 *The guidelines*
49 *The Vision*

50 5. Results from the creation phase
51 5.1. Ideation
51 *Vision based ideation*
52 *First Vision- Creation iteration*
53 *Ultimate Vision: the magical cradle*
54 *Second Vision- Creation iteration*
55 *Vision 2050: the Cradler*
56 *Third Vision- Creation iteration*
57 *Vision 2030: the Strafer*
58 *Fourth Vision- Creation iteration*
59 5.2. Concept generation / Synthesis
59 *Testing combinations*
60 *Concept: the lever*
61 *Concept: the leaner*
62 *Modelling, concept evaluation and concept choice*
63 5.3. Concept Refinement
63 *Concept choice*
63 *Seeking the essence*
64 *Testing and detailing*
65 *Visual brand detailing, marketing and message*
66 *The Golden Ratio*
67 *Surface Design, Digital Visualisation*

68 6. Final result
68 *Britax GO Unlimited: A Britax Product- Service System*
69 *Britax Go unlimited*
70 *Britax Booth*
71 *Britax Bassinet*
71 *Britax B-Urban*
75 *Product Roadmap*
76 *Requirements list*

77 7. Discussion
77 Method Discussion
78 Result Discussion

79 9. Conclusion

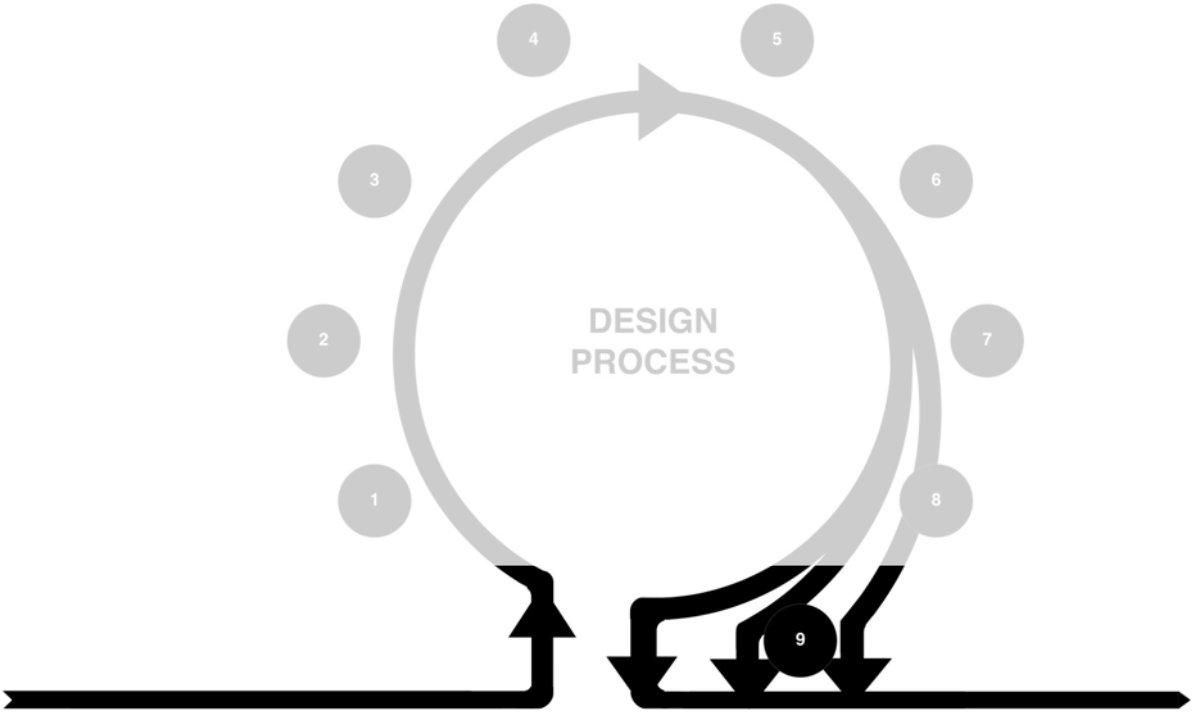
80 Sources

83 Appendices

1

Introduction

Chapter 1: introduction compiles what where going in to the project and what where meant to be coming out.



1.1 Background

On behalf of Britax Nordiska Barn AB, a design investigation was meant to be carried out to assess the potential for a new and better baby transportation system that would improve on the baby carriages of today. The investigation would partly consist of a user study; where the core problem or need, today solved by the baby stroller, were defined; and partially of an exploration into design solutions, in order to ultimately result in a better product or product-service system.

Britax Childcare Holdings Ltd is currently designing and manufacturing solutions which ”help families move around safely, smoothly as well as with full confidence” and is the parent company to the subsidiary of Britax Nordiska Barn AB. In Sweden, the stroller market is a field of high competition between many different brands manufacturing traditional- as well as futuristic designs. However; the stroller of today is a product with inherent development potential both in construction and level of integration. Thus, this investigation were of interest to Britax for several reasons, part from the aspiration of leadership- and ideas for potential future product development in this field, the potential of a more integrated, usable and essential solution were sought after.

1.2 Purpose

The purpose of the project was to, partly, assure a product able to be capitalised upon by Britax Childcare Holdings Ltd, but most importantly, to create a solution that can improve the quality of life of those concerned by the core problem. In the process of determining how this purpose was to be fulfilled, the overall *goal* of the project was set to be the following: *To design a product or product-service system that better suits the core- problem, or need, that child strollers are meant to fulfil today.* Further, the goal was complemented with an *aim* of assessing the potential and possibilities of a more integrated, usable and pure solution to the core problem and thereby be able to fulfil the aspiration for both leadership and ideas for potential future product development within the field.

1.3 Objectives

In order to achieve the overall goal of the project, three objectives were formulated; firstly, to investigate the core-problem solved and emotional need fulfilled by today's baby carriages, the Britax Childcare brand as well as market opportunities, secondly, to form an intent concerning the market opportunities, emotional aspiration as well as core problem and finally, to craft around the intention to form a better product or product-service system for baby transportation.

1.4 Delimitations

The limitations set at the beginning of the project were kept to a bare minimum in order for the project to be open for as many different solutions as possible. However, for the project to stay on course, a delimitation regarding the investigative part of the project was to not follow up on any sidetracks that are discovered if they are not expected to, in the end, help in solving the overall goal. Further, monetary- , manufacturing- and environmental aspects of the final concept was only be investigated in an overarching manner. Furthermore, the process was mainly focused on the early stages of product design and, thereby, requirements engineering as well as implementation and development were only to be performed to a small extent.

1.5 Disposition

The overall disposition of this report is based on the IMRAD report structure; i.e. divided into Introduction, Method, Result, Analysis and Discussion. The result and analysis parts do however, as this is a design report, go very much hand in hand, woven into three resulting chapters based on the three phases of the project; *Investigation, Intention* and *Creation*. This is followed by a Discussion chapter, that discusses how well the final result matched the commitments described under heading 1.2 and 1.3. and the methodology that was used, as well as a Conclusion chapter, to sum up just how well the project performed overall.

1.6 Evaluation

In industry, there has to be some certainty for that a new design will pay off. Traditionally, for most companies, the advantages need to be measurable, explainable and derivable from something more than just a hunch or gut feeling. Further, the project, from an academic and scientific point of view and as part of an engineering education, needed to follow a rational line of argument and the final result to be based on objective and measurable data. As the results, ideas and concepts of the project needed to be derived and measured in some way; 9 evaluation criteria, based mainly upon the work of successful industrial designers, were thus attempted and are listed in table 1.1.

Table 1.1. The evaluation criteria around which the design work is both derived and evaluated

Figure 1.1. 2017 Emmaljunga Super Viking

Figure 1.2. 2017 Britax GO Big

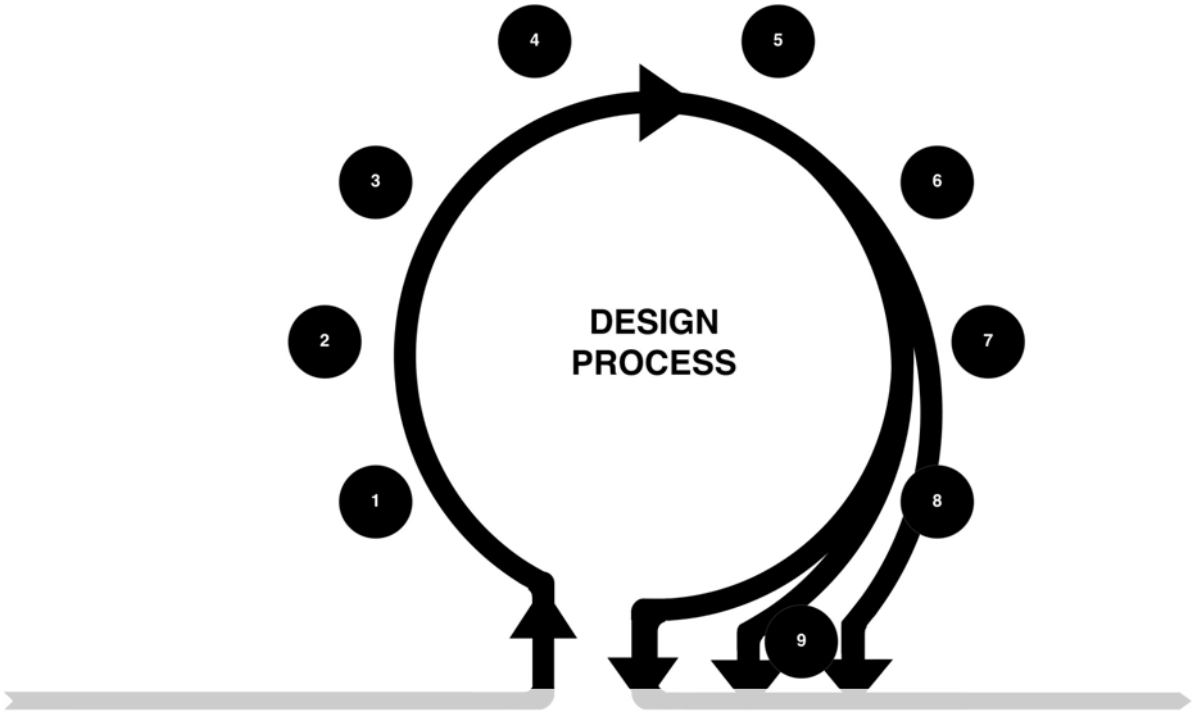
Emotional	How well the solution or product-service system adheres to the emotional values seemingly intended to be fulfilled and to what extent these values are suitable for the use case.
Direct	How direct the solution solves the core problem, i.e. how closely the solutions are to the problem. This usually means problem prevention instead of problem minimisation and results in less steps required in the customer journey.
Essential	With what level of minimalism, or efficiency in engineering terms, the design solves the core problem regarding all of its included aspects. Not minimalism in terms of an aesthetic style, where the level of physical elements or visual stimuli are a predetermined amount, but rather exactly the level that is needed to fulfil what is intended.
Honest	The design has to be honest in all aspects, usually embodied in exposed materials etc. as could be displayed in Frank Gehry's architectural design of the Usonian houses (Mars, 2017) and also an aspect argued for by Dieter Rams in his 10 principles of good design ("Good design | About Vitsœ | Vitsœ", 2017).
Usable	Functional requirements has to, in some way, be fulfilled through the level of usability and intuitiveness in the final design as also argued for by Dieter Rams in his 10 principles of good design ("Good design | About Vitsœ | Vitsœ", 2017). However, this should always be related to the value of keeping the design simple as argued by Hartmut Esslinger (Esslinger, 2014).
Self-aware	The final design had to express *product self-awareness*, much related to the theory of extrapolating the essence of a concept and purifying it as Apple chief designer, Jony Ive, argues (Rose, 2013), which makes the result clear, focused and on- point.
Holistic	The final concept were to be based on singular solutions which together create a confined whole and be designed with a systems perspective in mind. In doing so, the product would be more *holistic*.
Innovative	The final concept had to be not innovative for innovations sake, but had to be new and original as otherwise it is just copying, and in design; copying is deemed a crime, as also argued for by Jony Ive (Gibbs, 2014) and Dieter Rams ("Good design | About Vitsœ | Vitsœ", 2017).
Environmentally friendly	The environmental friendliness of the solution is foremost evaluated as in level of usability related to how well the product stands the test of time, as argued to be the anthesis of disposability by Marc Newson (Rose, 2013). The importance of long-lasting products are also argued for by Dieter Rams in his 10 principles of good design ("Good design | About Vitsœ | Vitsœ", 2017).

However, the undertaken problem were deemed to be that of a wicked problem meaning to which no ”true” solution will ever exist (Rittel and Webber, 1973). Thereby, design thinking, rather than so called requirements engineering, where the appropriate mind set for this project as fulfilled requirements can rarely be seen as absolute solutions to a problem that involves the humanities and where the overall solution cannot be measured by true or false but rather as better or worse. Further; design thinking often deals with these humanitarian aspects of a product that is not yet explained in natural science. The actual experience of a product does rarely coincide with what is conveyed through numbers or statistics. This comes in contrast to requirements engineering where measurability is the A and O in order to support the decisions to be made. Thereby, although the effort to make these emotive qualities measurable, in the end, the goal must always ultimately be to make an as *good* as possible product and thereby the best solution must always win; i.e. if a solution *feels* better, regardless of a measurable disadvantage, there is probably something better about it that is not yet explained in natural science. Furthermore, during the investigative phase, the definitions, benchmarking and functions analysis were based on two reference products that represented the top of the line on the Swedish market. These products were the 2017 Emmaljunga Super Viking, as owned and supplied by the project performer and seen in figure 2.3., and the 2017 Britax Go Big, as supplied by Britax Childcare Holdings Ltd and seen in figure 2.4.

2

Method

Chapter 2: Method describes the overall methodology and the approach, process and evaluation criteria that it involves.



2.1 Overall methodology

APPROACH

The project was based on the premise that *form follows emotion*, in contrast to the more traditional *form follows function,* as a superior way to create great products. The approach was introduced by *Hartmut Esslinger* as a slogan for his design consultancy; *Frog Design*, back then called *Esslinger Design.* One of his creations that follows this sentiment can be seen in figure 2.1 (Sweet, 1999). Basing the design on this premise, however, did not mean that the final design was to be based on arbitrary shapes that just *felt* good but rather be form with a *higher purpose*. This means that the choice of included functions were based on how well they fulfilled the intended emotional purposes and, in continuation, the form of the final design were be based on those functions, i.e. since *form follows function*, and *function follows emotion*; *form follows emotion*.

Figure 2.1. Hartmut Esslinger´s Yamaha; as designed on the premise that *form follows emotion.*

The imminent problem was deemed to be a, so called, wicked problem; anything that solves a problem related to a human need or is to result in a consumer product falls under this categorisation due to the human species' complex and emotional nature as well as unclear purpose on planet earth (Rittel & Webber, 1973). As the product design perspective advocates the user as the primary stakeholder of the final product; the *top down* design process will be utilised as seen in figure 2.2. This means an iterative design approach where the solution would solve the user's needs as the main focus; starting in these needs to then elicit the best ideas and solutions of how to fulfil them from there (Mccoy, 2016).

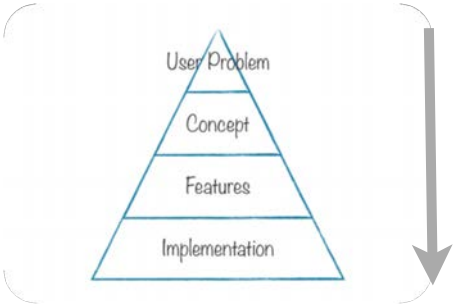


Figure 2.2. The Top Down approach; as starting in the problem of the user to then elicit the needed implementation.

This type of product design process means that the typical Industrial Design process is to come first, in order to investigate and conceptualise the problem and thereby the *wickedness* can be *tamed*. The development process, of the resulted concept, to follow can then be divided into several smaller-, tame-, problem solving processes and requirements engineering can thereby follow, in order to finish and refine the solution. This means a vision based approach routed in the VIP, *Vision in Product Design*, methodology as described by Hekkert, P., & van Dijk, M. (2011) and can be seen in figure 2.3.

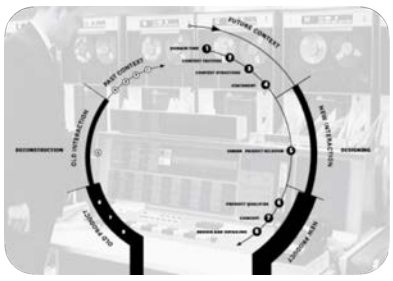


Figure 2.3. The VIP methodology; meaning backtracking where and why a product is the way it is to then find out a vision for what it ought to be on the most fundamental level.

1. Starting point, defining

2. Branding and market position

3. Investigate core problem

4. Investigate core emotions

5. Emotive Vision

6. Functional Vision

7. Operational Vision

8. Concept generation

9. Concept choice and refinement

The project started by formulating a new and tailor made process. Although it was to be based in several existing methodologies, there were not any of them that was deemed to be all-encompassing nor sufficiently connected the starting point with the desired outcome, so this process had to be derived and composed.

As most projects do not start from the description of the ultimate need of the user but rather of how the present solution is inadequate and needs improvement, the project needs to be filtered in order to fit this process in an initial, investigative phase. This phase means reverse engineering the project, taking it from the product level, through how it fits into the bigger picture of the brand, finding out what core problem is solved by this undertaking and finally eliciting what emotional need is fulfilled by solving this problem. A version of this backtracking process is also argued by Hekkert, P., and van Dijk, M. (2011) in their VIP methodology.

Before determining the primary approach of how to solve the user's need, a phase outlining the overall intention with the design was achieved. This is an inherently logical step as a common translation of the latin word *Design* is *Intention* ("Design, n.", 2017). This phase meant the start of the top down approach which, firstly, defined the emotional purpose of the design, secondly, what core problem to be solved by the design and, finally, what overall activity should be associated with the brand. These three stages will make up the primary approach going into the last phase.

A creation phase was what elicited the ideas and solutions required to fulfil the users need in a better way than today. Depending on the the possibilities that were found when defining the approach, as well as in the early ideation stage, the following process was either about designing an evolution of todays product or creating something completely new. This in turn determined wether the continued process was supposed to focus more on further evaluating the existing products and focus on incremental improvements or wether to look at other product categories or technical principles that are more similar to the new, more revolutionising solution.

This process; how the project initially will be filtered by the top down perspective to then go through the intention and creation phase; is illustrated in figure 2.4. These three phases are divided into 10 smaller stages to be performed in chronological order and are listed to the right.

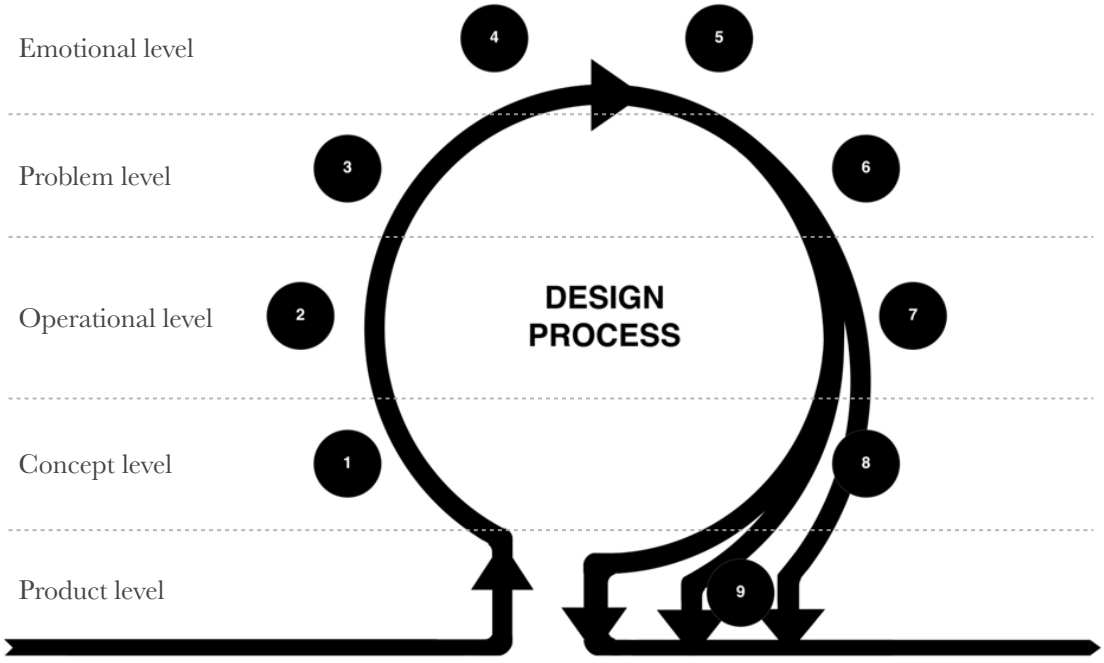


Figure 2.4. Visual representation of the entire project process from input to final result

2.2 Investigation phase

1. STARTING POINT, DEFINING THE PRODUCT

The starting point of the project was a literature study covering the product area in an overarching manner. This intended to result in literary definitions, benchmarking as well as a customer journey map, all of which were meant to be a reference of which the solution, in the end, must be better than.

Literature study, literary definition
The literature study was meant give an overview of the baby carriage industry as well as to define all related aspects from a academic point of view. A more thorough literature study of the product area was achieved later on in the project as the concepts tended to look somewhat alike existing solutions, this in order to be as time efficient as possible.

Benchmarking, relative definition
A relative definition of how well the strollers of Britax and the product segment in general perform towards their purpose, each other and complementary products were made. This was achieved through a SWOT analysis, where the strengths and weaknesses of each category was outlined, and Pugh matrices, where positives and negatives of each category was highlighted and weighted. The relative definitions were mainly based on the opinions of the interviews.

Customer Journey mapping, definition of the experience
In order to define what the stroller category is to the user from an experience point of view; customer journey mapping were utilised to investigate each activity performed during use. The strollers performance during each activity were also evaluated and the related emotions were mapped. The resulting experiences were based on the long walks achieved together with the child of the designer as well as the interviewees opinions.

2. BRANDING AND MARKET TODAY

The second part of the investigation was a mapping of the current state of the Britax brand as well as a market analysis in order to learn about existing solutions, rivals and current trends.

The Britax Brand
The Britax brand was mapped through the leading star method; an efficient way to making sure in having investigated every part of the brand (Löfgren, 2016). The investigation also further expanded on the systems perspective by detailing the vision of the company. Further, the performance of how well the company executed on the vision, trust and green status of the brand was investigated.

Current market and market position
The current market position of the brand was investigated by applying the value curve diagram and the SWOT analysis. The findings were related to Britax' current position on the Swedish market as well as the position they aspire to be in, the value of which is argued as Brand Self-awareness by Hestad et al. (2014).

Business intelligence
The situational analysis, or business intelligence analysis, was performed by mapping the Pestel factors as well as performing a trend analysis of the current stroller market as well as substitute products that also solve the identified core problem.

3. CORE PROBLEM DEFINITION

As the product segment was defined, an investigation into the core problem that this product segment aims to solve, whom it concerns as well as how it fits into the user's daily life from a systems perspective, was accomplished.

Define the core problem
The definition of the core problem or need was narrowed down in order to be as open and unbiased as possible during ideation. The core problem was also meant to help focus on what, in the end, must be solved.

Hierarchical task analysis
To put the core problem into a systems perspective and map how it fits into a bigger picture; an HTA, or hierarchical task analysis, was carried out. This detailed how the overall system, as well as several subsystems, related hierarchically.

Problem framing
To follow this systems perspective, the framework, and what lies in the periphery, of the core problem were outlined in order to map what affects the problem, both directly and indirectly.

User profile and Stakeholders
User profiling was performed in a strictly rational way based only upon objective and empirical data about the users of the system in order to evaluate anthropometric- and cognitive limitations. Also, a stakeholder list was put together and the primary user was defined in order to simplify when a compromise between conflicting demands needed to be made.

4. INVESTIGATE CORE EMOTIONS

In order to know the ultimate purpose of the stroller, the underlying emotional reason for why the core problem is solved was investigated through what emotional purpose is being fulfilled by the current solutions.

Meaning and emotion
The product area of strollers was investigated in terms of what meaning and emotion are contributed to the category and what purchase decisions was made that lead to the particular choice of stroller.

Emotive attachment
The reference products was evaluated through Semantic differential scales and SAM, Self Assessment Manikin, in order to chart the emotions and motivation that are being elicited. The SAM evaluations were part of the interviews with 10 users.

Emotional fulfilment
All previous findings of the investigation phase were related to Maslow's hierarchy of need to map emotional fulfilment.

Absolute emotional need
Finally, all emotive aspects found were related to Plutchik´s model of basic emotions in order to map the absolute emotional need.

2.3. Intention phase

5. EMOTIVE VISION

To start with the most fundamental aspects of the design, the emotions and emotional needs that the product or product-service system will elicit and fulfil when used were visualised and formed the starting point for the creative phase.

Vision of emotive needs
What the user was meant to ultimately feel when using the product or product- service system were mapped by using mood boards and the wanted outcome of a later evaluation of the final concept, of SAM as well as the Semantic differential scale were outlined. The emotions the new system should elicit were related to what emotions the system raise today.

Vision of emotive expression
In relation to the two reference products, the desired emotive expression regarding the personality of the final design were outlined as well as superimposed over the product personality scale and was to act as a guideline for further design work.

Vision of Design entirety
As superimposed over the value curve diagram from the investigation phase, the design focus could be pinpointed and visualised.

6. FUNCTIONAL VISION

A discussion regarding how the core problem should be approached was initiated. Based on this, as well as the key characteristics found in the investigation phase, a series of guidelines were formulated.

Core problem discussion
In order to solve the core problem as direct as possible, explained and argued for as advantageous in chapter one, an investigation around how to prevent the problem all together was accomplished.

Vision of ultimate functionality
Before ideating around the functionalities of the intended product, easily taking for granted what it can and can not do, the questions were posed both what it intuitively could and should be.

Use Cases
Based on the users living situations outlined in chapter two, a 3x3 matrix with the transportation habits on the y-axis and the type of built environment on the x-axis was put together; hereby different users categories could be identified.

Key characteristics
By outlining the key characteristics of the area of baby strollers, the effort of eliciting and formulating guidelines, for what to consider during the crafting phase, was made more clear.

Functional guidelines
The guidelines are then meant to form a direction for the forthcoming concept development process without limiting the project too much. In order to achieve this, the guidelines were formulated as sentences without any strict measurable parameters.

7. OPERATIONAL VISION

The first stage of the intention phase was about formulating the opportunities that exist based upon the previously investigated branding and market position. These were related to the position that the Britax brand should and aspire to have.

Brand vision adherence
Firstly, the decision wether to question the branding strategy, or bigger picture of the Britax Römer brand, needed to be made. The systems perspective was utilised again in order to determine whether the design was to adhere to the overall vision and idea that the entire organisation strives for or whether to question it.

Market opportunities and Market Choice
At this stage, the vision were related to what markets and businesses are ripe for change and where a, so far, poor user experience is defining the category. This needed to be related to the current brand and market position in order to evaluate the potential impact of an expected solution.

Operational Strategy
Finally, as argued by Beverland et.al. (2010), whether to try to *evolutionise* or *revolutionise* the core problem is much based on market position. The availability to innovate in this field therefore needed to be related back to this earlier investigation which was also done at this stage.

8. CONCLUDED INTENT

To conclude the intention phase, the overall intent was summarised in an early list of requirements and in a unified vision.

The product should...
All product requirements were formulated as open sentences and acted as a halfway point in terms of *taming* the *wicked* problem, and were meant to tell of what the product should be and thereby be the start of a final requirements list.

The vision:
The unified vision was formulated as a summarising sentence by combining the emotive intent, or emotive vision, the functional intent, or functional vision, as well as the brand- and market intent, or operational vision.

2.4 Creation phase

7. IDEATION

An iterative idea development process, vision based and taking all the previously gathered information and insights in mind, were undertaken as a start of the creation phase.

Vision based ideation
Vision based ideation, meaning continuously formulating what the ultimate product would be, mainly from the main stakeholders point of view but also from some of the others, and then try to come up with how to solve it on a technical level, was achieved.

Testing and modelling
Testing was primarily carried out through sketch modelling and hands-on evaluation. At this stage, *outer functions,* or customer use were tested in the intended full scale by means of fast modelling materials. Technical principles were however tested in smaller technical models.

Idea evaluation
During this process, based on their potential to be realised, some ideas were abandoned and others chosen to be researched further. This was based on the evaluation criteria that are mentioned in Chapter one, the input from modelling, as well as the supervisors' and examiners' opinions. The ideas were also related to the current customer journey and how they alter the overall experience.

8. CONCEPT GENERATION / SYNTHESIS

The concept development process was based on the information and insights gathered through the literature and user studies. With this information in mind, an iterative ideation and evaluation phase could begin.

Secondary investigation
Based upon the direction of the ideas and concepts that was deemed fitting, both in terms of being a significant improvement as well as realisable, a secondary investigation was accomplished which focused on the strollers of today. This meant a function analysis was completed in order to learn more about all the necessary parts and relate them to their positions on the Kano model.

Vision based iteration
The concepts were generated with the help of morphological matrices. Further, a vision based iteration follows in the same way as the vision based ideation where each concepts position in the point of time is related to what the ultimate use would be. New ideas for how to solve it on a technical level were generated and put into the matrices.

Modelling, concept evaluation and concept choice
The concepts were primarily evaluated through *quick-and-dirty* model making together with utilising Pugh matrices to compile as well as clarify the results. The concepts were related to the customer journey map in order to evaluate the number of steps needed as well as what emotions are elicited while doing so. A final concept choice was made and a combination of several concepts was deemed to fulfil the evaluation criteria the best.

9. CONCEPT REFINEMENT

The final stage of the project consisted of an extensive concept refinement attempt that involved seeking out the essence of what the concept was before performing more testing and detailing of the final design. This detailing affected the functions as well as the visual branding. The marketing and message were developed in concert with the development of the product and the final touches were achieved through surface design and digital visualisation.

Seeking the essence
As the final concept were chosen, it was very important to find the essence of the that concept in order to achieve a type of *product self-awareness.* By doing so, a certain level of clarity to the design was enabled as exactly what the concept should and should not be about could be derived from this. The continued detailing process referred back to the resulting essence at several instances and was also interpreted through the filter of the Britax Römer brand values and beliefs.

Testing and detailing
The final design was defined through an iterative process, primarily consisting of model making in full scale in order to evaluate the actual performance and emotional output. Further, Siemens Jack was used to give an ergonomic input on the final design as the final concept involved the user having to interact with a physical object.

Visual brand Detailing, marketing and message
As the final design was meant to adhere to the overall branding of Britax, the design format analysis method was performed of other Britax products in order to ensure a connection to the brand heritage and brand recognition. Further, details of the product or product-service system were derived from the heritage or typical visual identity features of the brand and integrated into the new concept in a way where they did not compromise on the concept essence.

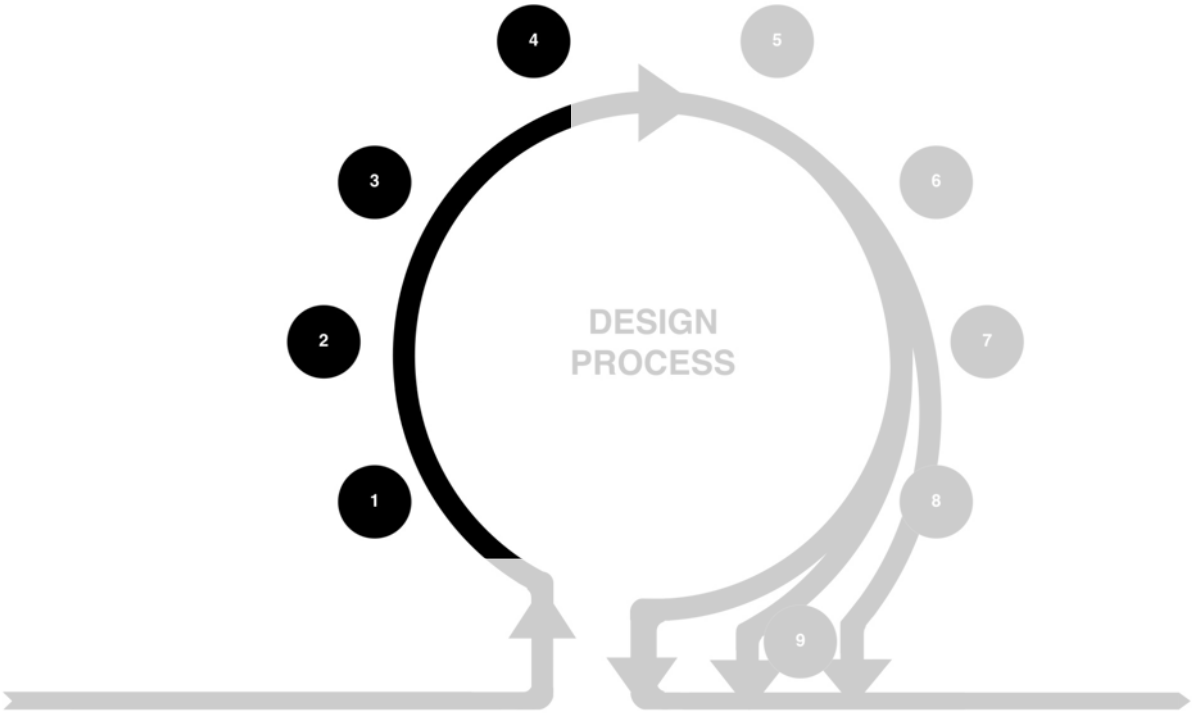
The Proportions
The proportions of the final design were investigated by utilisation of the golden ratio as well as a functional and intuitive design reasoning.

Surface design, Digital visualisation
During and after the final functions of the concept had been set, surface design was achieved to determine the exact shapes, lines and enclosing surfaces of the final concept. This was achieved through both solid- and surface modelling made primarily in Fusion 360. Further, the visualisation of the final concept was made with Autodesk Showcase and fusion 360 's built in software.

3

Results from the investigation phase

Chapter 3: Results from the investigation phase compiles, cross-references and discusses the result of the investigation phase.



3.1. Starting point, defining the product

The starting point of the project was a literature study covering the product area in an overarching manner. This intended to result in literary definitions, benchmarking as well as a customer journey map, all of which were meant to be a reference of which the solution, in the end, must be better than.

LITERATURE STUDY, LITERARY DEFINITIONS

To give an overview of the subject as well as to define all related aspects from an academic point of view; in figure 3.2, these definitions were compiled. The following definitions were sourced from the Oxford English dictionary which is, according to itself, the definitive record of the English language ("Home : Oxford English Dictionary", 2017).

Figure 3.2. A Visual compilation of the baby carriage definitions together with example images.

Starting with *Perambulator / Baby carriage;* the definition of a perambulator reads as follows: *A carriage for a baby or young child, which may be pushed along by a person on foot. Now usually shortened to pram.* The definition extends to the following: *Originally resembling a chair mounted on two or (esp.) three wheels. In later use usually resembling a cradle mounted on four wheels, with a handle for pushing and often a folding hood* ("Oxford English Dictionary - perambulator, n.", 2017). The suited age span of the infant is, for most perambulators, between being new born to 8 months of age. A significant difference between the perambulator and the other definitions is how perambulators are all about the care of new born babies and thereby focuses on a lying position.

As to *Stroller / Push chair;* the definition is: *A child's push-chair, esp. a collapsible buggy* ("Oxford English Dictionary - stroller, n.", 2017). This definition mainly spans infants from 8 months old, i.e when the perambulator is no longer the recommended tool to use, to the age of three years or approximately 17 kg in weight. The stroller or push chair is thereby all about sitting up and is designed for both toddlers and small children. The word *stroller* is the official term in North American English whilst *push chair* is the official term in British English. Further, there is also so-called *active strollers*, i.e. a stroller where the parent is enabled to perform activities such as running or power-walking.
There is also the term *Buggy* and its' definition is: *baby buggy n. orig U.S. a pram; (later) a pushchair, a stroller; cf.* and extends to various other vehicles: *(a) a perambulator); (b) = caboose; (c) an automobile* ("Oxford english dictionary - baby, n. and adj.", 2017)

In modern times, so-called *travel systems* has taken over the market: the travel system is a platform; consisting of wheels, frame and handle on which a detachable bassinet, chair or carry-cot can be attached and thereby be turned into either a pram or stroller. The travel system is meant to be a type of *all-in-one* solution and thereby supports an age span of the child from being new born up to three years of age (or approximately 17 kg in weight). *Travel systems* usually also refers to when an in-car carry cot is part of the system.

Lastly, there is the *multi-child* versions of strollers, prams and travel systems. A *multi-child* version of either a stroller, perambulator or travel system is an attempt to support more than one, usually two, children at the same time. These solutions are usually wider,than the ordinary version in order to accommodate more than one child.

PHYSICAL DEFINITION

Following the definitions of the product on an academical level, each physical essence was compiled through narrowing down what basic principle the concept was based upon and by defining the physical elements from which it is built.

The physical essence of a *Pram* was deemed to be: *A cradle connected, through a frame, to wheels*. The main parts are the frame, seen in figure 3.3, and the *Bassinet* (cradle), seen in figure 3.4.

Following, the physical essence of a *Stroller* was considered to be: *A seat connected, through a frame, to wheels*, The main parts of a stroller are the frame, seen in figure 3.3, and the *Child seat*, a small chair, seen in figure 3.5.

Lastly, the physical essence of a *Travel system* was regarded as: *A platform consisting of frame and wheels with detachable cradle and seat.* The main parts of such a travel system where, following the same logic, a frame made up of wheels, a handle and luggage compartment, seen in figure 3.3, as well as the bassinet of figure 3.4 and the seat of figure 3.5.

Additionally, there is a large flora of more or less essential accessorises related to baby carriages such as *the Diaper bag:* a bag to store diapers and other articles, usually hung on the handle of the pram; the *Side bag*, an extra luggage space when traveling; the *Cup holder,* an external holder for a mug; the *Rain cover,* an additional cover to put over the travel system covering mainly the bassinet or child seat; the *Sunshade*, a parasol to be attached to the travel system in order to shade the infant from direct sunlight; the *Toddler roller*, an additional platform attached to wheels in order for a sibling or other small child to ride along with the baby carriage, the *Foot muff,* a sleeping bag put in either the bassinet or child seat providing an extra isolating layer; and the *Travel adapter,* an adapter for the docking ports that allow for the attachment of an in-car carry-cot.

Figure 3.3. frame made up of wheels, a handle and luggage compartment.

Figure 3.4. the *Bassinet* (cradle) for a pram or travel system.

Figure 3.5. the *Child seat*; a small chair for a stroller or travel system.

SYMBOLIC DEFINITION

In order to narrow down the common mental image and symbolical reference of baby carriages, the symbolics of perambulators as well as strollers were cross referenced and the following results were compiled from the elements they had in common:

Regarding the symbolics of the perambulator, there were a lot of results as well as several different types; although with a lot of similarities. The symbols all included two dots for wheels, a rounded square as the bassinet, a quarter circle as the hood and a line for the handle. The ultimate result of the symbolic compilation can be seen in figure 3.6.

When it comes to the stroller, a moderate number of symbols were found. These versions could be divided into two different varieties: either where you could see the entire child or only the legs and head sticking out. They both consisted of two dots for wheels and an outline of a chair. In some of the symbols, the parent pushing the chair was also represented. The ultimate result of the symbolic compilation can be seen in figure 3.7.

Regarding travel systems, no specific symbols were found for this specific configuration as the symbols of a perambulator and stroller covers the two main modes of a travel system. The ultimate result was rather created through cross referencing the earlier results and the resulting symbolic compilation can be seen in figure 3.8.

The complete compilation of symbolics can be seen in Appendix I: Symbolic definition.

Figure 3.6. The result from compiling the different symbols of perambulators.

Figure 3.7. The result from compiling the different symbols of strollers.

Figure 3.8. The result from compiling the symbols of both strollers and perambulators.

HISTORICAL DEFINITION

As seen in figure 3.9: historical sources were cross referenced and related to the definitions of the perambulator and stroller as follows.

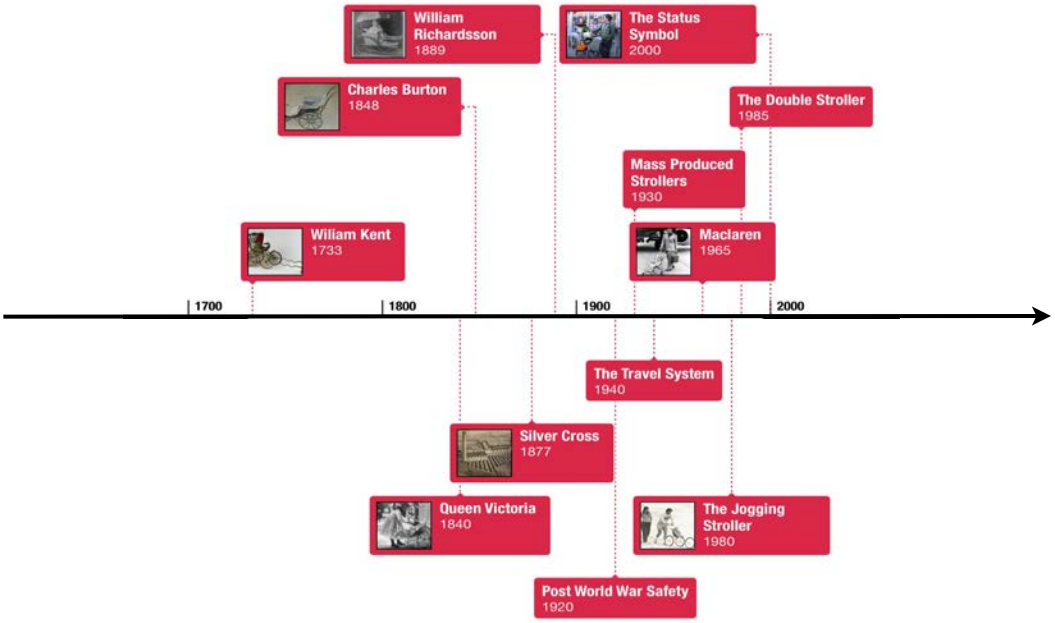


Figure 3.9. Visual representation of the baby carriage´s historical timeline.

The first baby carriages
In 1733, William Kent designed and constructed the first baby carriage for the the 3rd Duke of Devonshire, William Cavendish, and his family. The result, seen in figure 3.9., was a smaller version of the typical horse drawn carriage and was meant to be drawn by a dog or shetland pony (Amato, 2004). In the early 19th century, the baby carriage became more popular and the dependency on animals were questioned. The baby carriage then turned into a cart pulled by the parent, as seen in figure 3.9., i.e. replacing *animal* with *human* power. By the mid 19th century, the terms stroller and pram had not been established to the extent that they are today and the baby carriages then usually covered parts of both definitions. It was the American inventor, Charles Burton, who designed the first solution to allow the parent to push their infant ahead of themselves and, in doing so, coined the term perambulator (Van Dulken, 2001). Burton´s design can be seen in figure 3.9.

Following the industrial revolution
By the mid 19th century, the baby carriages became more industrialised as Burton moved to Great Britain and started manufacturing his baby carriage design as a response to low demand in the United States. Notable is also the establishment of the firm Silver Cross in 1877 as seen in figure 3.9., one of the oldest manufacturers of perambulators and long considered to be manufacturing the *Rolls Royce* of baby carriages (Harrods, 2017). In 1889, William H Richardson designed and constructed the first perambulator where the bassinet could be turned around in relation to the wheel base, as seen in figure 3.9., making it possible to see the child as the parent was pushing the pram (Holmes, 2008). By the turn of the century, steel constructions rather than wicker and wood became the preferred materials and at the end of the first world war, safety became a high priority which lead to baby carriages being constructed lower than before as seen in figure 3.9.

Modern inventions
The umbrella stroller, seen in figure 3.9. is an invention by Oven Finlay MacLaren in 1965 as an answer to the complaints voiced by his daughter as she traveled with her child. The invention was a lightweight and ultra portable stroller; foldable to the same extent as an umbrella (Roy, 2004). In the 1980´s, several versions of both stroller and perambulator were conceived, the most common are the activity- as well as the double- strollers, both seen in figure 3.9, which in turn laid the groundwork for the twin versions of most strollers and perambulators. A high level of foldability became an expected part of most products.

Current time
Since the 1990ties, so called travel systems had started to take over the market where the consumer gets both a pram and stroller in the same product, as seen in figure 3.9. Traditional strollers were only sold with specific segments in focus, such as the activity- or foldability needs. The British royal court was an early adopter of the perambulator as Queen Victoria purchased three versions in as early as the1940´s from the Hitchings baby store (Van Dulken, 2001), and in later times been showing of their perambulators in public as seen in figure 3.9. This has to do with, in part, the role of the pram and strollers slowly turning into a status symbol, emphasised later as more outlandish, futuristic and even retro designs have entered the market at the higher price points, notable of which is the Bugaboo Chameleon and Stokke Xplory.

RELATIVE DEFINITION

A relative definition was achieved by benchmarking the two reference products against each other through extensive testing, the opinions voiced during the interviews and online reviews. This was also cross referenced towards the performance of the product segment in general. In table 3.1. the results from this investigation, of relative definitions, were compiled. The entire list of questions posed to the interviewees can be seen in more detail in appendix II: Questionnaire.

Table 3.1. Benchmark of the two reference products and the product segment in general.

Pros	Perambulator mode	Stroller mode	Cons
	2017 Emmaljunga Super Viking		
Rolls easily High Quality materials Prototypical Honest materials Big storage space Two-way seating Well balanced			Risk of pinching Not very foldable Messy in construction Complicated docking mechanism Adapter needed for carry-cot
	2017 Britax Go Big		
Rolls easily Big storage space Simple docking mechanism Support for carry-cot			Not very foldable Flimsy when driving
	General product segment		
Agility Comfortable for infant Prototypical Big storage space			Not very foldable Messy Large footprint Based on castor wheels Bad ergonomics Badly utilized storage space Low integration

The Emmaljunga Super Viking travel system has a lot of positive aspects to its' design but just as many negative; the most prominent of the positive ones are the high quality materials that the product is based upon and thereby scores high on the evaluation criteria of *Honest* and *Holistic,* as they make up the product without a large amount of parting lines or covered pieces. Negative, however, is how the detail-construction is based upon over complicated and messy folding as well as docking mechanisms and thereby scores low on the *essential* and *usable* evaluation criteria.

The Britax Go Big, however, performs more on average but the significant advantages over the Emmaljunga travel system are the low weight of the construction and very simple docking as well as folding mechanisms. Thereby the baby carriage is performing well regarding the *Essential* and *Usable* evaluation criteria. Negative aspects are however how the travel system tends to travel in a wobbly and bouncy fashion and is made from more flaccid or covered materials with a lot of parting lines, compared to the Emmaljunga travel system, and thereby scores lower on the *honesty* and *holistic* criteria.

Finally, the overall product segment were deemed to perform very well regarding the comfortable situation for the infant/child, and does so whilst being fairly agile and with a large storage space. Further, the product category has a strong *prototypicallity* in both the lying and seated position. This translates to the pram and stroller product segment scoring well on the evaluation criteria of *Usability* and *Self Awareness.*

Where the overall concept lacks are mainly in ergonomics, large footprint and low integration. This means that the evaluation criteria of *Direct, Usability* and *Holistic* are where the concept underperforms.

USE DEFINITION

In order to define what the baby carriage means to the user from an experience point of view; customer journey mapping was utilised to investigate each activity performed during use. The strollers performance during each activity were be evaluated and the related emotions were mapped for both the infant, seen in figure 3.10, and the driver, seen in figure 3.11. The use definitions were based on both the experiences of the designer, the child of the designer and the 10 interviewees.

Figure 3.10. Customer Journey map of the babies / child's experience.

The Infants perspective

Positive Experiences — The infant seemed to remain positive when getting picked up as well as getting put into the pram. Then, all types of movement, especially on uneven surfaces and when passing obstacles, a positive experience could be noticed for the infant as this seemed to delude the infant from distractions. Further, both bus- and car trips seemed to bring a positive impact to the infant in terms of a calming effect

Bland Experiences — Some experiences did not seem to have an effect on the mood of the infant, during the trips, as neither positive nor negative. Such were the infant's perception of body temperature, soiling the diaper, stopping for short durations, getting woken up as well as contact with- or absence of contact with the parent.

Negative Experiences — Clearly noticeable negative experiences were as the infant was getting dressed and undressed before, during and after the trip. Long durations when the pram stood still clearly lead to a negative experience on several instances as well as when the diaper had not been changed or the infant had not been fed for a significant amount of time.

Figure 3.11. Customer Journey map of the parent's / driver's experience.

Driver's perspective

Positive Experiences — The positive experiences from a driver's point of view where mainly related to the potential possibilities of being able to go out together with the infant and achieve a presumed goal. Also, the overall performance of the travel system, to accomplish transportation of the infant in open areas, was deemed a positive experience. Other positive experiences were mainly related to the interaction with the infant as well as achieving smaller goals in taking care of him/her.

Bland Experiences — Many of the smaller steps in the journey of dealing with a travel system were deemed as mainly moderate experiences that could be both somewhat positive and negative. The preparations before and after the trip, navigating tight spaces as well as the overall ergonomic interactions with the travel system were examples of this.

Negative Experiences — The negative experiences were mainly those related to the infant's health and mood; for example when the infant was crying due to having to stop and wait for something or when in a large crowd and worrying about there risk of the infant contracting disease. Further, notable is the poor utilisation and poor ergonomics of the luggage compartment, the occasional absence of changing tables at the current location and finally the performance when passing through doors.

The customer journey maps of both the babies-/child's- and the parent's/driver's experience can be seen in more detail in appendix III: Use Definition.

FUTURE DEFINITION

In order to investigate the ideas and future prospects of the product concept, a future definition was compiled in a KJ-analysis as seen in figure 3.12. This was achieved in order to investigate where the future might be headed and to scope out ideas for the project's eventual upcoming concepts. This resulted in the following.

Figure 3.12. KJ analysis of Design Concepts.

Ultra Foldable — Many concepts pointed towards ultra foldability for an easier traveling lifestyle, expanding on the ideas of *Maclaren* and his umbrella stroller, as can be seen in figure 3.12, or even trying to get large perambulators and travel systems to fold up into a small package.

Design for all — Several concepts looked towards fulfilling unfulfilled needs that were related to impairments and a handicap in society, usually related to transportation. The concepts spanned both wheel chair users and parents with rheumatism.

Ultra Thin — Further, ultra thin designs were common in both strollers and perambulators where the functions were to have the smallest possible impact on the world around to be both agile, cartable and foldable at the same time.

Ironic — A few concepts investigated and questioned normal stroller and perambulator norms and in doing so displayed ironic qualities, mainly related to high danger. The concepts were integrating both weapons and spikes into the baby carriage, as can be seen in figure 3.12., as well as performing high speeds and having excessive proportions.

Movability — Some concepts expanded on the mobility of the strollers and perambulators through both the possibility of being self-going as well as being very agile, fast and dynamic. Some investigated the current trends of smart and connected objects geared with motors and gyroscopes.

Transforming — Many concepts investigated transforming capabilities in order to support the wide spread of needs, especially contradicting needs such as walking and running, as well as changing needs, mainly the child growing, moving from a lying to a seated position as seen in figure 3.12.

Caring cradle — As travel systems are at least as much about the child as it is about the parents, some concepts focused on investigating the caring part of the solutions. This meant air ventilation systems for the child, to be safe from disease as seen in figure 3.12., as well as baby bottle warmers and an overall enclosed, protecting shape.

3.2. Branding and the market today

This second part of the investigation phase is a mapping of the current state of the Britax brand as well as a market analysis to learn about existing solutions, rivals and the current trends.

HISTORY OF BRITAX RÖMER

As seen in figure 3.13., the Britax Römer brand was once split between two separate companies: Britax and Römer. Today, the brand is strong after a 40 year long history of the companies being merged.

Römer Wingard

The German manufacturer started in the 1870s in Ulm by manufacturing safety helmets. The company initially manufactured helmets for both the military, fire-departments and bike riders. It was not until 100 years later, in 1978, as the company started manufacturing gear for baby safety instead of helmets, that the company was quickly purchased by Britax ltd (Britax Childcare, 2013).

Britax Ltd.

Established in1938, Britax started designing and manufacturing adult safety belts in Hampshire, Great Britain. It was in 1966 that the focus changed towards child safety in cars as the first in-car travel systems were introduced. In 1978, the company became Römer Britax autogurte GmbH as the German counterpart to Britax; Römer Wingard, was annexed (Britax Childcare, 2013).

Britax Römer

Together, the Britax Römer Brand has supported the development of child safety during travel for almost 40 years. During the 1980s and 1990s, the company expanded its operations to the US, Australia and New Zealand, as well as to the countries in Scandinavia and Asia. The Baby Carriage side of thing were expanded in 2011 with the purchase of BOB and further with the purchase the Brio- Go production and brand in 2013 (Britax Childcare, 2013).

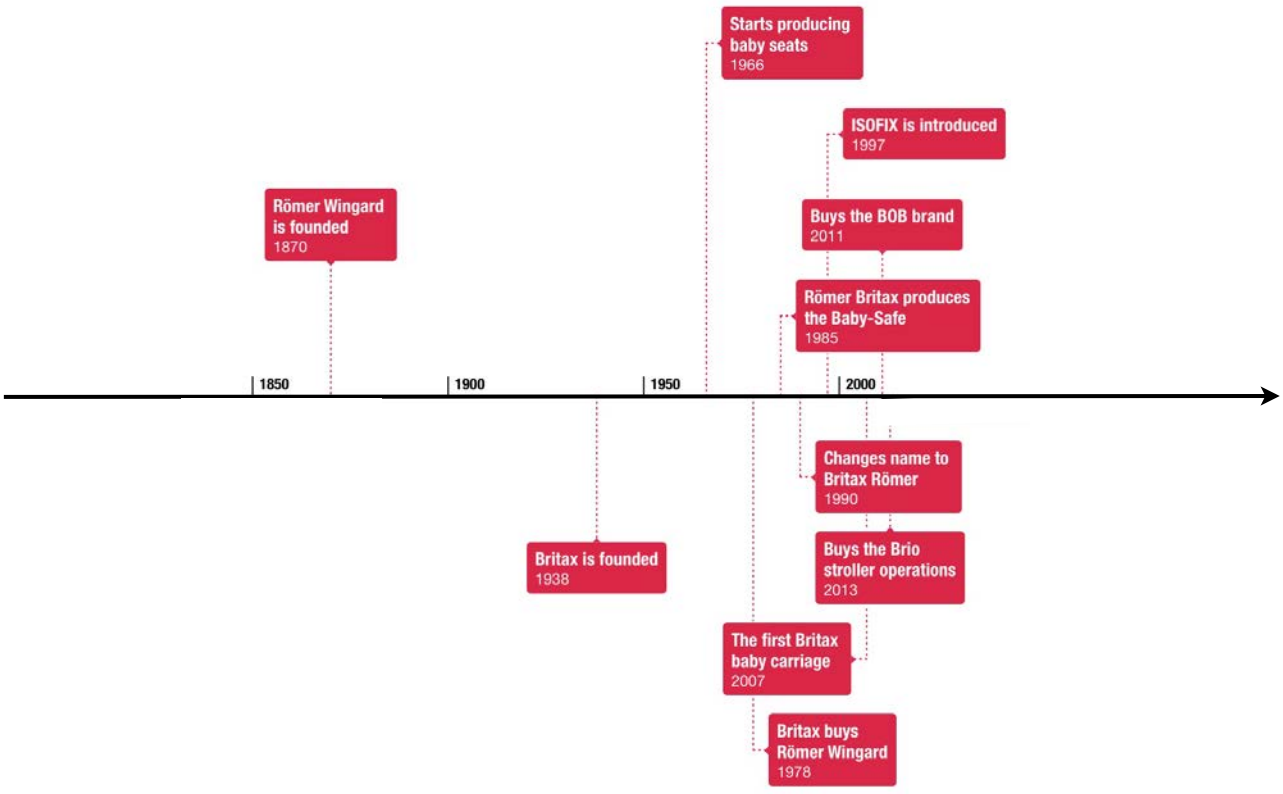


Figure 3.13. Visual presentation of Britax Römer´s history as a timeline.

THE PRODUCT PORTFOLIO OF BRITAX RÖMER

The Product Portfolio of Britax Römer (figure 3.13.) was mapped based on the Swedish range, both due to the location of where the project was performed but also as this is one of the most comprehensive for the company. The portfolio constitutes:

Figure 3.13. Visual Compilation of Britax Römer´s Swedish product portfolio.

The Go- Series

This series includes the Brtiax Go, Go next and Go Big travel systems and originally spring from the Brio product portfolio that Britax ltd acquired in 2013 (SvD, 2013). This means the series differ somewhat in their design and naming convention to the rest of the Britax product portfolio. The three models convey three different sizes and price ranges of a do-it-all approach where the Britax Go Big is the latest addition and also one of the two reference products of the project (as can be seen in chapter 1).

The B- series

The B series is the one most in line with the Britax brand and includes the B-motion, B-agile and B-ready strollers. It is Britax´s original series with each type of stroller more focused on a particular need whichis conveyed in the naming convention. The B is an acronym for Britax and short for *being* at the same time and followed by the version specific focus: -motion, -agile and -ready.

The Revolution series

The Revolution Pro and Revolution Pro Duallie are Britax´s active stroller line up focusing on parent's wanting to go running with their child or going on hiking trips. These come in both a one child version (in the *Pro*) as well as a Multi-child version (in the *Pro Duallie*).

The Smile- series

The Britax Smile is an agile type of product with a small chassis but still a relatively spacious luggage compartment. The Britax Smile- series used to belong to Brio before the acquisition by Britax Römer ltd.

THE VISUAL BRAND OF BRITAX

The Britax product portfolio is the main conveyor of the Britax Römer visual brand which is compiled in a Brand Board as seen in figure 3.14. From this, the following visual brand ingredients could be extrapolated.

Figure 3.14. Brand Board describing Britax Römer´s visual brand.

First is the prominent use of the colour red, much related to the colour of safety. This can be seen in the logotype, marketing materials, safety features and fabric choices for the strollers. The chosen fabric colour is always contrasted by shades of black whilst grey tones are common throughout the design language. The stark contrasts continue throughout the visual brand as logos, details and parting lines can be high-lighted by brighter colours or come in bright versions. The colour choices on the company websites are also conveyed with this contrasting cut between the choice of accent colour and the black, or sometimes white, base colour.

Regarding the physical, or mechanical, design of the Britax Visual Brand, the products tend to lack integration in their construction in order to accommodate folding mechanisms etc. In common for most products are quite organic shapes. Whilst the original Britax product portfolio, primarily the B- series, is based on a tubular construction, the later acquired Go-series is based upon wider aluminium profiles. In both cases, text are superimposed on the sides in order to convey the brand and product version.

Further, reoccurring details in the Britax Römer visual brand are patterns of flower petals as well as nature scenes throughout the websites and marketing materials. This is mainly manifested in the promotional content through images of families being together, having a good time in nature.

THE BRITAX RÖMER BRAND PRACTICES

The Britax brand was mapped through the leading star method, as seen in figure 3.15; an efficient way to make sure having investigated every part of the branding (Löfgren, 2016) and resulted in the following:

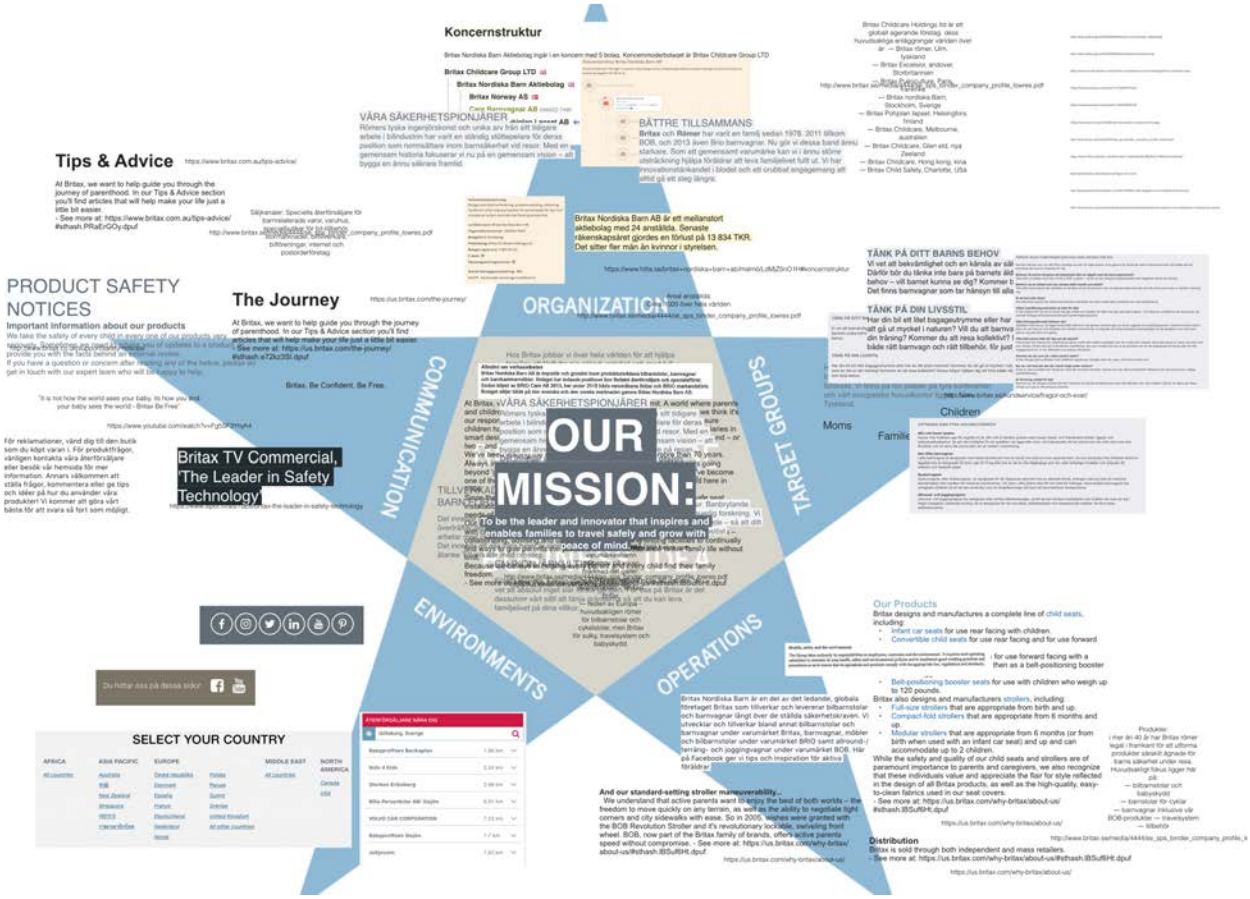


Figure 3.15. KJ analysis of the Britax Römer brand practices compiled to the background of the Leading Star Methodology.

Vision

The vision of the Britax Brand is to enable families to be free by trying to separate being able to move about in the world from the feeling of danger and insecurity. This can be seen in the following brand vision statements: *We believe in helping every parent and every child find their family freedom*, *continue to be the number one brand in safety technology* and *to build a more safe tomorrow.* Further; *family life without limit*, *family life on their own terms*, *enable the family to live without limit* and *family life to the fullest* are some reoccurring statements that reinforces this sentiment ("About Britax", 2017).

Brand Promise

The Britax brand promises to: *enable families to move safely, smoothly and with full confidence.* This promise is also reinforced by claiming that you are: *never better protected through the use of safety standards* and that: *life flows smoother through smart design.* The brand encourages the trip without directing the family and finally, in doing so, enable the family to: *Be Free* ("About Britax", 2017).

Core Values

At the very core of the Britax Römer operations lies values such as: *At Britax, we believe family life should be lived without limit* ("About Britax", 2017) and they also strive for: *A world where parents and children are free to make the most of every moment together*. ("About Britax", 2017). Finally, they claim that: *it's our responsibility to make this happen.* ("About Britax", 2017)

Business idea

The Business idea, referred to as the mission by Britax, is the following: *To be the leader and innovator that inspires and enables families to travel safely and grow with peace of mind.* ("Britax - The #1 Brand in Safety Technology.", 2017) Further, they intend to achieve this through: *A first-time culture working towards a limitless family life.*

Organisation

Britax Nordiska Barn is the Nordic part of the parent company Britax Childcare holdings Ltd, descended from and registered in Great Britain. In turn there are three companies under the umbrella of Britax Nordiska Barn: Britax Norway AS, the Norweigan branch; Care Barnvagnar AB, the Swedish branch; and OY Britax-Pohjolan Lapset Ab, the Finnish branch (Allabolag, 2017). In Sweden, US and the UK, the brand is mainly known as Britax but in the bigger part of Europe as Römer for child seats and Britax for baby carriages. The combined brand Britax Römer followed a merger that was made in 1978. In 2011, the American brand BOB was included and Brio Barnvagnar, the previous stroller business of Brio AB, was included in 2013. Britax Nordiska Barn is a medium sized company with 24 employees (Britax Nordiska Barn, 2016).

Target Groups

The target groups of Britax are primarily families of all forms although the communication efforts are mainly directed towards mothers whilst children are also commonly highlighted throughout the marketing material. Men are generally not highlighted. Further, the needs of families, living in urban and countryside environments, are fulfilled both in terms of strolling or exercising as well as the possession of a car or traveling by public transportation is taken into consideration. Finally, multiple children and different ages are taken into consideration ("Frågor och svar | Kundservice | Britax Childcare", 2017). Britax targets only the consumer markets.

Operations

The operations of Britax vary a lot from country to country as displayed in the differentiating product portfolios and in the differences between the Britax brand and and Römer brand. Britax Römer is today, however, a global producer of: child seats, infant car seats, convertible child seats, full size strollers, compact fold strollers, modular strollers, bicycle child seats, overall travel systems and related accessorise. ("About Britax", 2017) Regarding distribution, Britax´s products are sold through both independent and mass retailers. ("About Britax", 2017)

Environments

Britax has its largest presence in Europe where they operate in several countries but also in North America and Asia Pacific whereas they have only a small presence in Africa and the Middle East. Regarding social networks, in Europe; Britax has its presence mainly on Facebook and Youtube. In the US; Facebook, Instagram, Twitter, Linked-in, Youtube and Pinterest are the channels on which Brtiax operates. Regarding distribution; Britax is sold through both independent and mass retailers throughout the world but does not operate any brand stores at this time.

Communication

Britax communicates their brand values and promises through tag-lines such as: *Britax. Be Confident. Be Free*; "*It is not how the world sees your baby, its how you and your baby sees the world - Britax Be Free*" and *The leader in safety technology*. These tag-lines are highlighted in several commercials. Further, the brand is reinstated for the customers through product safety notices on the website where important information about the products and recalls in progress are conveyed. Regarding Green Branding, searching for the words *Miljö* (Environment) and *Hållbarhet* (Sustainability) on the Swedish website as well as for *environment* on the international websites, leads to only one environment related search result: about what you can do together with your child on Earth-Day, as can be seen in figure 3.16.

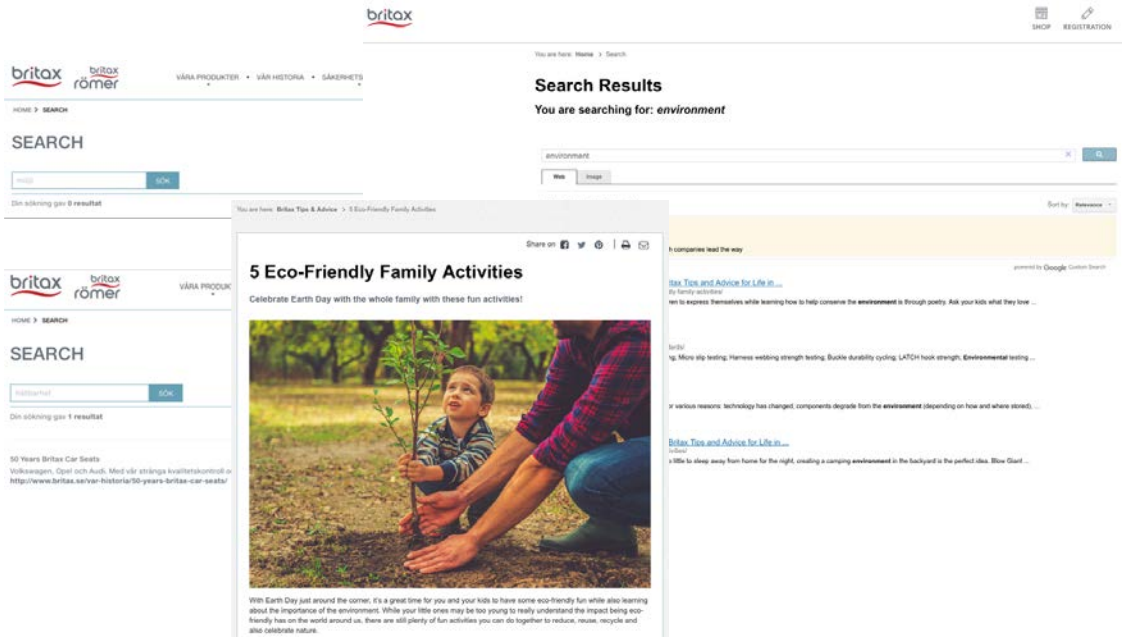


Figure 3.16. Searching for environment-related topics garnered only one relevant result.

COMPETING BRANDS

The most prominent market brands were compiled by their presence or absence on the Swedish market in figure 3.17. Regarding the primary operators on the Swedish market, many are Swedish companies but only one still manufactures its products in Sweden. Common is also that many of the manufacturers produce bicycles: *Kronan*, a Swedish manufacturer of travel systems and bicycles; *Bugaboo*, an international manufacturer of mid and large sized travel systems; *Thule*, a Swedish manufacturer of goods for an active lifestyle among active strollers; *Crescent*, A Swedish manufacturer of travel systems and bicycles; *Baby jogger,* an international manufacturer focused on activity strollers; *Stokke*, International manufacturer of agile and mid sized travel systems; *Babyzen*, International manufacturer of highly foldable strollers; *Emmaljunga,* the only manufacturer still manufacturing in Sweden, focused on travel systems; and finally *Joolz,* an international manufacturer of travel systems.

On the international market, there are a large floora of brands, most prominent of which are: *GB, Voyage, Infanti, MyBabiie, ABC Design, Mother´s choice, Hd, Quinny, Bao Bao Hao, Shenma, Combi, Peg-Perego, Evenflo, Chicco, Urbini, Seebaby, Silver Cross, Maxi- Cosi, Uppababy, Geobaby, Hauck and Bebeconfort.*

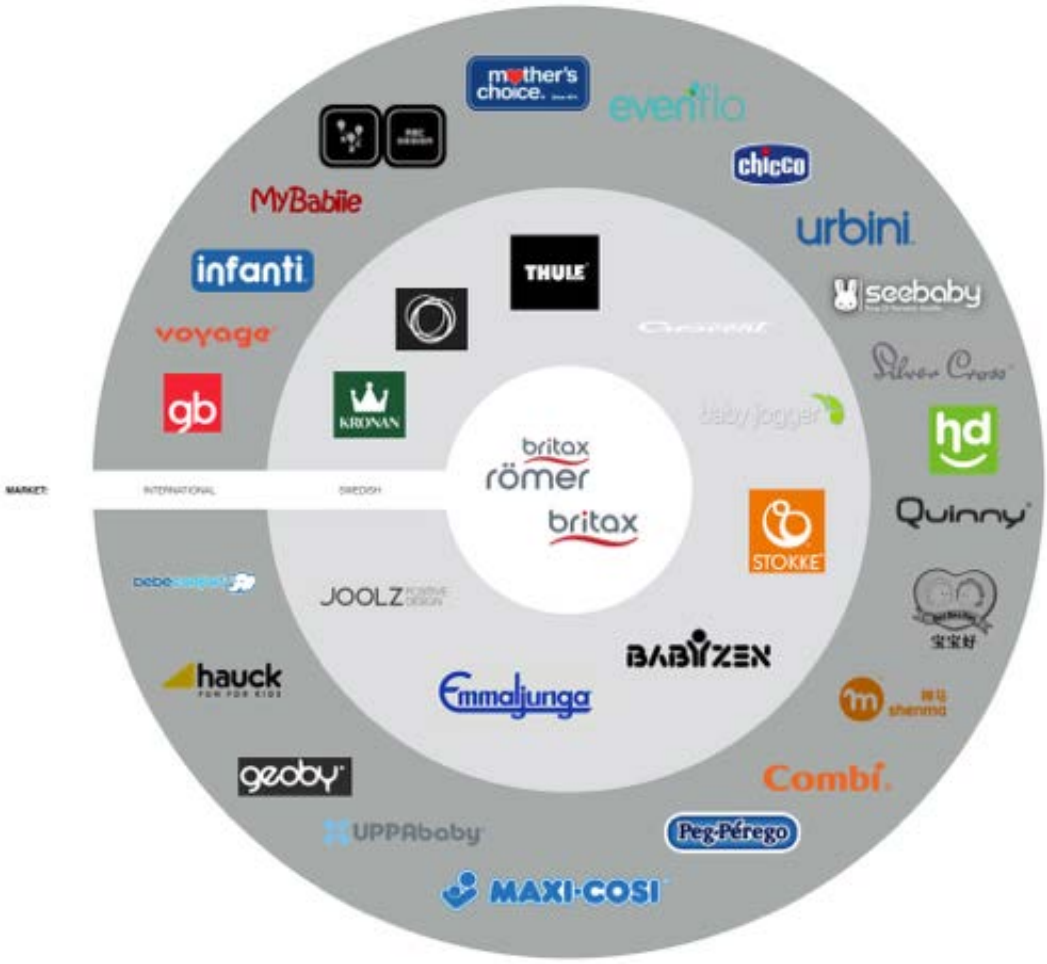


Figure 3.17. Visual compilation of the brands on the Swedish and international markets.

COMPETING SOLUTIONS

In the same way as the current market brands; the current market solutions were related to their presence or absence on the Swedish market. They belong to the same prominent brands and, as can be seen in figure 3.18, constitutes the following:

Do-it all solutions	Common, and part of the travel system trend, are expensive do-it- all systems that are able to transform depending on the need for multi-child, active or off-road functionality.
Ultra foldable	The opposite to the do-it all systems are the ultra foldable solutions for traveling and when the child can mostly walk by him- or herself.
Banal and cheap	A large part of the market is competing on price and therefore the lower boundaries regarding quality and functionality are pushed by many manufacturers.
Focused on agility	Some solutions are primarily focused on the need of an agile solution for traveling on narrow city streets among a large number of other pedestrians.
Focused on activity	Another focus is on activity or off-road needs where the driver can go running together with the child or traverse other types of environments.
Classic style	A small part of the market differentiates by staying true to an older and more classical style and usually sells to a higher cost.

Figure 3.18. Visual compilation of the solutions on the Swedish and international markets.

CURRENT MARKET AND MARKET POSITIONS

The current market position of the Britax Römer brand on the Swedish market as well as the position they aspire to be in were investigated. Further, the international allocation of solution types sold were mapped. As seen in figure 3.19. so called travel systems rule the market, here referred to both as *standard* (this encompasses an exchangeable bassinet and child seat) and *multi optional systems (*referring to solutions were also a in-car seat can be attached). Both fall under the definition of *Travel Systems* and thereby make up 59 percent of the market. Lightweight solutions also make up a big part of the market (33 %) whilst 3-wheeled, usually more agile solutions, make up only 8 %. Currently, *Emmaljunga Barnvagnar* is the leader on the Swedish market with *Britax Ltd* in second place (Pricerunner, 2012).

Further, as seen in figure 3.20., a large majority of all solutions sold (53 %) are intended to carry a child 1-2,5 years old whilst 32 % are sold to parents of children 0-1 years old and only 14 % are sold when the child has past 2,5 years of age.

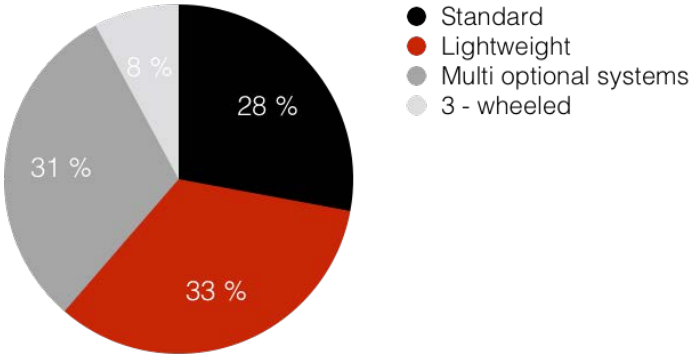


Figure 3.19. The marketshare of different product types.

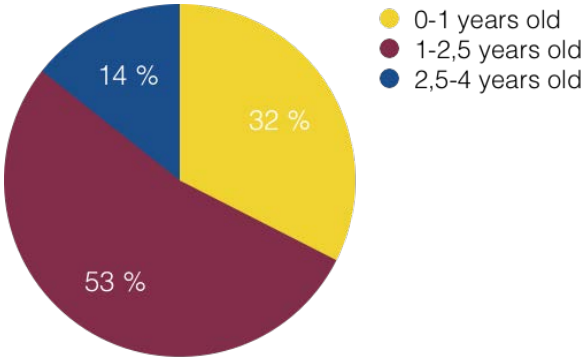


Figure 3.20. Marketshare of purchasing in relation to the age-span of the child

MARKET USER VALUE

The market user value and market competition of the most prominent products on the market were mapped in relation to the design parameters, (see chapter 1), in a value curve diagram (figure 3.22).

Notable from this result is how the Stokke Explory, a newer and rather innovative design on the European market, is scoring high in many of the parameters whilst the Bao Bao Hao 720N, a cheap solution on the Chinese market, is fairing not so well related to the others.

Further, the less innovative products, or more traditional rather, tended to score higher on the honesty rating than other solutions.

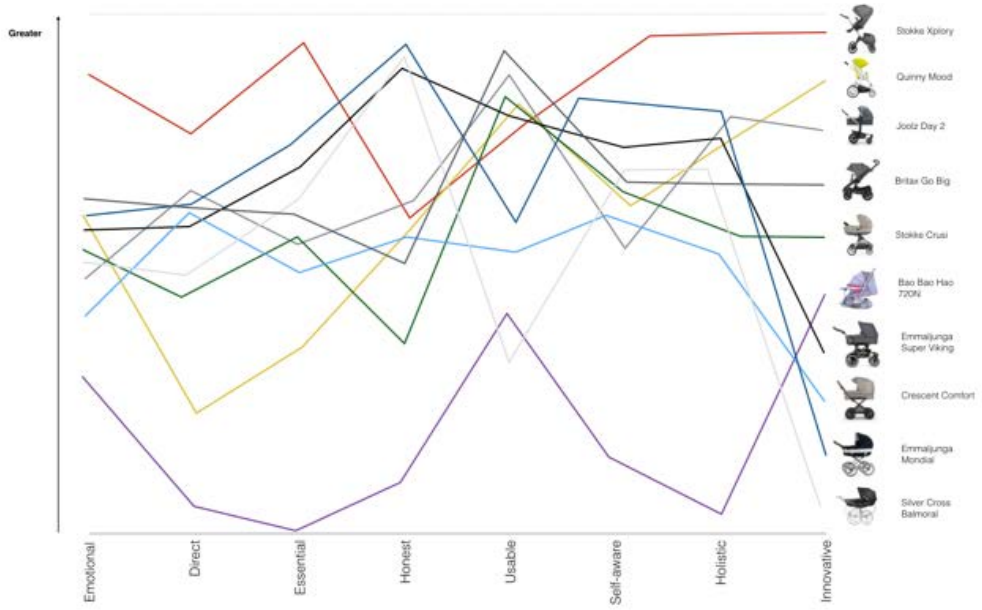


Figure 3.23. Value curve diagram of 10 different product versions.

THE SECOND HAND MARKET

Significant for the child carriage segment is the large second hand market where many of the products find a second, and sometimes even a third, life of usage after having been purchased from the manufacturer. This market as well as the value drop of the reference products were mapped through the use of ads from the Swedish re-sell website *Blocket.se* and resulted in the following.

The compilation of this market for the *Emmaljunga Viking*, the base-model of the *Emmaljunga Superviking*, can be seen in figure 3.21. An approximate value drop of 4000 SEK over the 3 years that the travel system is meant to be used can be observed. Also, notable was that a large volume of ads was found early after the date of purchase and not so many older products were on the market.

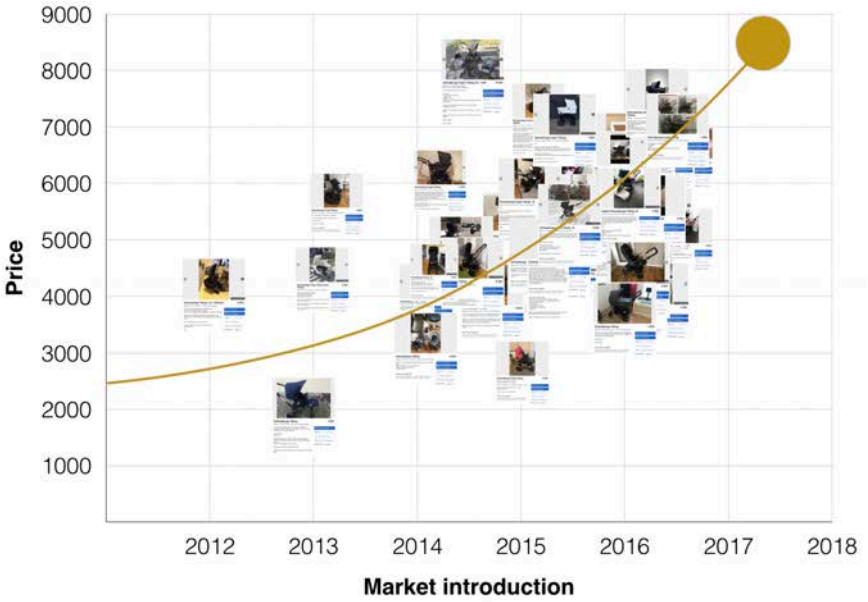


Figure 3.21. The second hand market value of the Emmaljunga Viking.

The compilation of the market for the *Britax Go*, the base-model of the *Britax Go Big*, can be seen in figure 3.22. This chart reveals a value drop of approximately 3800 SEK over the same 3 years that it is designed to be used. Further, a very even spread of the ads, over time, related to their date of purchase, could be observed and thereby very new as well as older ads could be found.

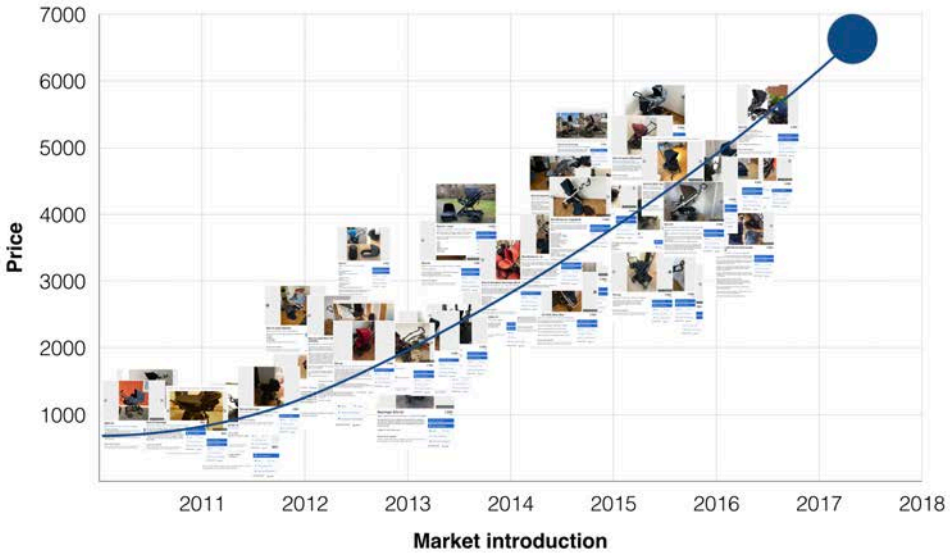


Figure 3.22. The second hand market value of the Britax Go.

THE OPERATIONAL ENVIRONMENT

The *situational analysis*, or *business intelligence analysis*, was performed by mapping out the Political, Economic, Social, Technological, Legal and Environmental (PESTLE) factors, both in terms of what major existing forces are in effect within each factor as well as how trending changes could affect the operations. (see figure 3.26.) This result was to be especially giving if the final result were to lean towards a product service system.

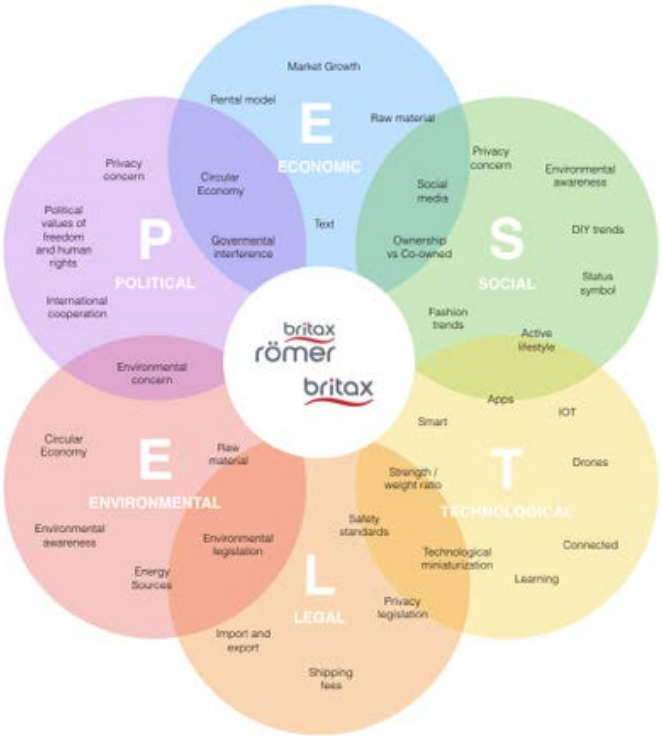


Figure 3.26. Visual presentation of the PESTLE analysis .

Political
Regarding political aspects, a rising privacy concern regarding both governmental and private organisations involvement in products is currently affecting many businesses types. Further, governmental interference in general in relation to political values, mainly regarding freedom and human rights, has an indirect affect on the operations and the possibilities of international cooperation. Furthermore, distinctive of current times is a long term environmental concern which has lead many business models to look towards a circular economy. These concerns and changes can have a long term affect on the industry.

Economic
Following the business models based on circular economy has a broader spectrum of rental models emerged, mainly regarding immaterial artefacts such as music and video rental but also traditional products designed for very specific needs. Further, the status of the currently growing economy and likewise growing market opens up the possibilities for each player in the industry. Finally, the availability of the raw materials on which the industry relies are critical to economic success.

Social
Yet again, the the public's increasing privacy concern regarding industry involvement in daily lives contradicts a growing trend of co-ownership between user and producer as well as between different users. Further, an increase in environmental awareness has lead to do-it-yourself trends (DIY) and is partly responsible for the current, so-called Hipster trend where older designs find new value. The most long lasting trend of current times is that of the baby carriage as a symbol of both status and an active lifestyle; with this follows both fashion trends within the industry and high exposure on social media.

Technological
It is on the technological side where the most rapid shift in terms of trends and development happens. Developments that have been consistent for a while are: Apps, the integration of smartphone applications in order to provide more functionality; miniaturisation, a constant development in making components smaller and, following on this, enhancement of the *Strength to Weight* ratio of all components. Further, the more recent as well as upcoming trends are: IOT (short for the *internet of things)* where every device is connected, smart and learning; and Drones: usually smaller, autonomous, flying devices mostly used for aerial- photography and delivery.

Legal
The legalities that can affect operations are those directly influenced by the governance of each country. Prominent such aspects are the safety standards that are constantly being revised and the rising privacy legislation processes. Further, the shipping fees from import and export between countries and environmental legislation are on the rise which might have an impact on baby carriage operations.

Environmental
The environmental aspects include the previously mentioned heightened awareness, concern as well as following legislation. Other factors that influence operations are the fluctuating availability of raw material and its influence on the resulting environmental impact, the availability of renewable energy sources and the rise in acceptance of a circular economy.

ENVIRONMENTAL IMPACT

The current environmental impact was mapped as an LCA, in this case referring to *Life Cycle- Assessment* rather than an *Analysis* as the scope of the investigation was not near the scale to qualify for the *Analysis* moniker. However, the overview over the subject gave a hunch for the overall environmental performance of the operations and made DFE, design for environment, possible in the later development stages of the project. The result of this *Assessment* were the following. (See figure 3.25.)

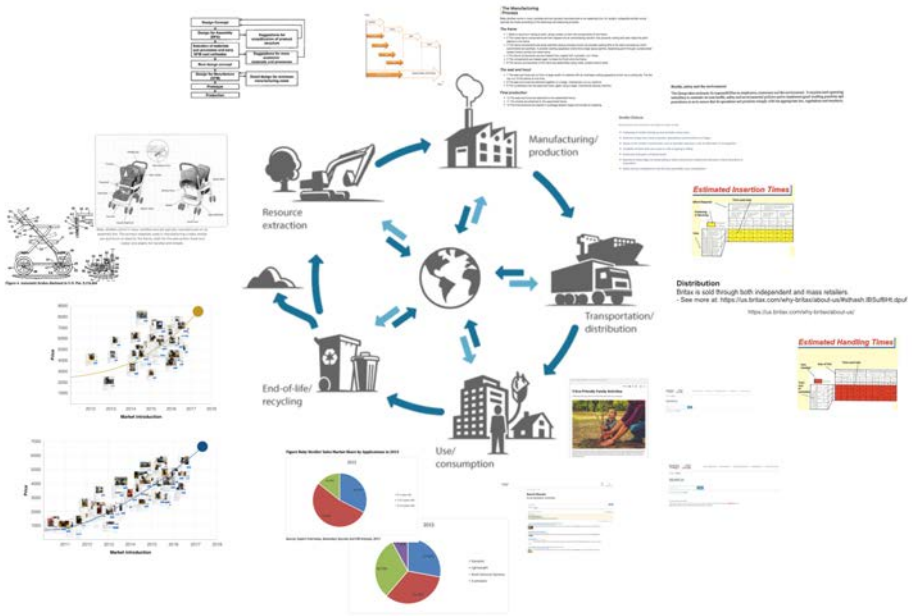


Figure 3.25. KJ analysis of the environmental impact superimposed over the product lifecycle.

Resource extraction
The most common material going into the construction of the Britax product portfolio is aluminium whilst some other manufacturers rely on steel, in almost all cases, though, the construction is joined through screws of steel. The extraction of these metals are energy demanding although aluminium is somewhat more efficient than steel. Second, a large part of most baby carriages are made of plastic, mainly ABS, PVC and PET which is obtained through processes that releases CO2. The same applies to the rubber usually found in gaskets, wheels and handles. The last big component of most baby carriages is fabric; woven nylon and cotton are commonly used. Regarding the bill of material: half of the overall mass is metal, a third is plastic and an eighth is cloth or fabric.

Manufacturing / production
The products in the Britax product portfolio are mainly built from off-the-shelf aluminium extrusions, whilst being efficient, requires welding to form larger volumes. Other manufacturers rely on bending tubular steel in order to create their frame. In most cases, assembly is achieved by screw joints of cast steel and many times welding is required demanding energy. Further, with injection moulding, many of the plastic covers are formed releasing toxic fumes. In most baby carriages, DFMA or design for manufacturing and assembly, has been considered in the product enabling a safe, ergonomic and efficient workplace. For the coloured parts, the fabric is died and the frame is spray-painted implying usually oiled based ingredients.

Transportation / distribution
Manufacturing is usually made overseas, mainly in China, meaning the transportation is done by ocean freighters to distributors around the world. Due to the relatively low impact of the other stages, this distribution process have the single largest stake in the overall environmental impact. In the case of Britax, no green branding practices are performed (as also mentioned under *The Britax Römer brand practices,*). As with most of the Baby carriage industry, products are shipped to distributors flat packed and assembly is then accomplished by the distributor.

Use / Consumption
First of all, baby carriages are so called *passive* products, i.e. they do not consume any energy within the system boundaries during use but rather relies on human power when operating. The environmental impact is thus very low during the use stage. What does impact the environment during this phase however is the fact that baby carriages need occasional repair as use means tearing of fabrics as well as plastics and the rubber on the wheels degrades. The overall lifespan of most baby carriages is also short in relation to the amount of material it consists of. Further, baby carriages usually require a larger place on public transportation as well as accessibility ramps and special safety belts, which are also torn by use, in order to be able to traverse the environment completely.

End-of-life / Recycling
Regarding end of life, a large second hand market makes sure the products get a second and maybe a third life depending on the life-span that is possible to be extracted from the use phase. From Britax and most of the industry, no re-buy or take- back programmes are offered and as the baby carriage has served its function, disposal is referred to 3rd party recyclers. Then, aluminium and steel are both highly durable and highly recyclable whilst plastic is only downgrade-able and fabric is non recyclable. After the lifespan of most baby carriages, an average of 321 kg in carbon dioxide emissions per product has been released.

3.3. Core problem definition

As the product segment was defined, back tracking was accomplished in order to find the core problem that this product segment aims to solve. This was followed by a study of whom it concerns and how it fits into the user's daily life from a systems perspective. At the core of this, the WWWWWH: whom, what, where, when, why and how inquiry framework (Tassoul, 2009) was used in order to make sure every aspect was investigated.

CORE PROBLEM DEFINITION

Figure 3.27shows a KJ analysis of everything that ultimately defines the core problem. The definition of the core problem or need were outlined in order to be as open and unbiased as possible during ideation. The following core problem were supposed to help to focus on what, in the end, must be solved.

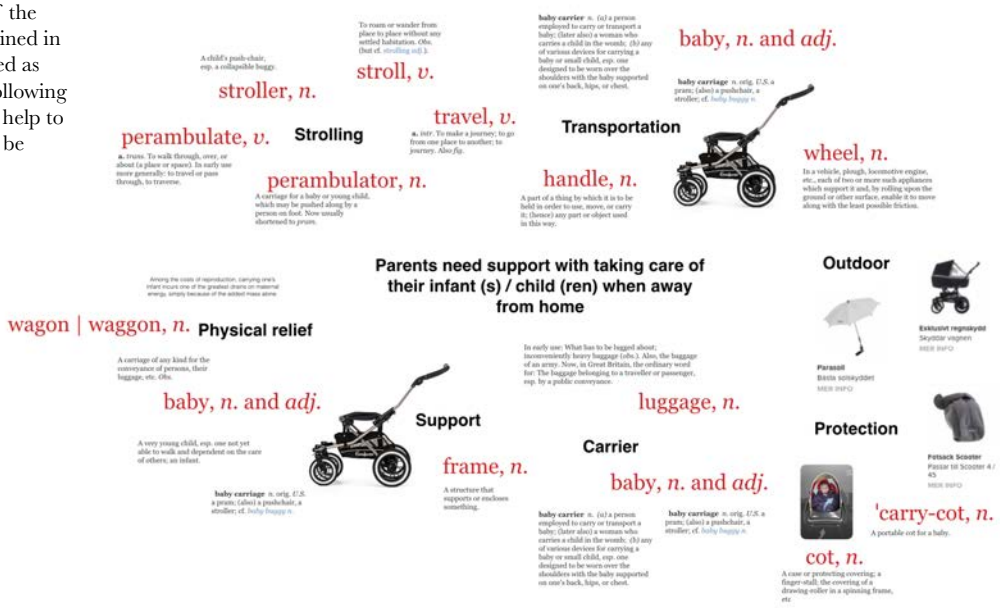


Figure 3.27. KJ analysis of the different parts of aspects to the core problem.

Be able to stroll and transport
As can be derived from both the terms; stroller, from the term *to stroll* i.e. *to roam or wander from place to place without any settled habitation* ("Oxford English Dictionary - stroll, v.", 2017), and perambulator, from the term *perambulate* i.e. *to walk through, over, or about (a place or space)* ("Oxford English Dictionary - perambulate, v.", 2017); both product categories are partially about being able to move around freely. Further, regarding getting from one place to another, the name travel system refers to the term *to travel* i.e. *to make a journey; to go from one place to another; to journey* ("Oxford English Dictionary - travel, v.", 2017). Many times the driver involved has a presumed goal that is intended to be achieved, sometimes even as efficiently as possible.

Being outdoors and protected
Travel systems, perambulators and strollers are mainly geared for either city streets or country roads and are thereby about being outdoors. In the home, many things do the same thing as travel systems; only divided by several, more focused products. Details such as a bassinet, carry-cot, child seat, hood and rain-cover etcetera all add up to a protection that is needed against the elements and related to being outdoors. Both infant and child is venerable to rain, temperature, light as well as disease etcetera and need to be protected from these.

Carrier and physical relief
The names *baby carriage* and *carry-cot*, as well as the integration of and luggage compartments refer to *carrying* i.e *to transport, convey while bearing up; of literal motion or transference in space* ("Oxford English Dictionary - carry, v.", 2017). The travel systems, perambulators and strollers are thereby partially about carrying both infant or child as well as all related articles needed in taking care of him or her. Further, baby carriages are about giving physical relief to parents as, simply because of the added mass alone, carrying one's infant is one of the greatest drains on maternal energy according to according to Wall-Scheffler et.al. (2007).

Ultimate core problem definition
When cross referencing these findings, the partial problems point towards a relatively open definition where the overall purpose of a baby carriage is as much about strolling, transporting, protecting and carrying an infant outdoors and in doing so giving physical relief to the parent. The final core problem was thereby summarised as follows: *Parents need support when taking care of their infant (s) / child (ren) when away from home.*

SOLUTIONS TO THE CORE PROBLEM

There are several different types of complementary products to the baby carriage, that solve the same core problem, as can be seen in figure 3.28., only in slightly different ways.

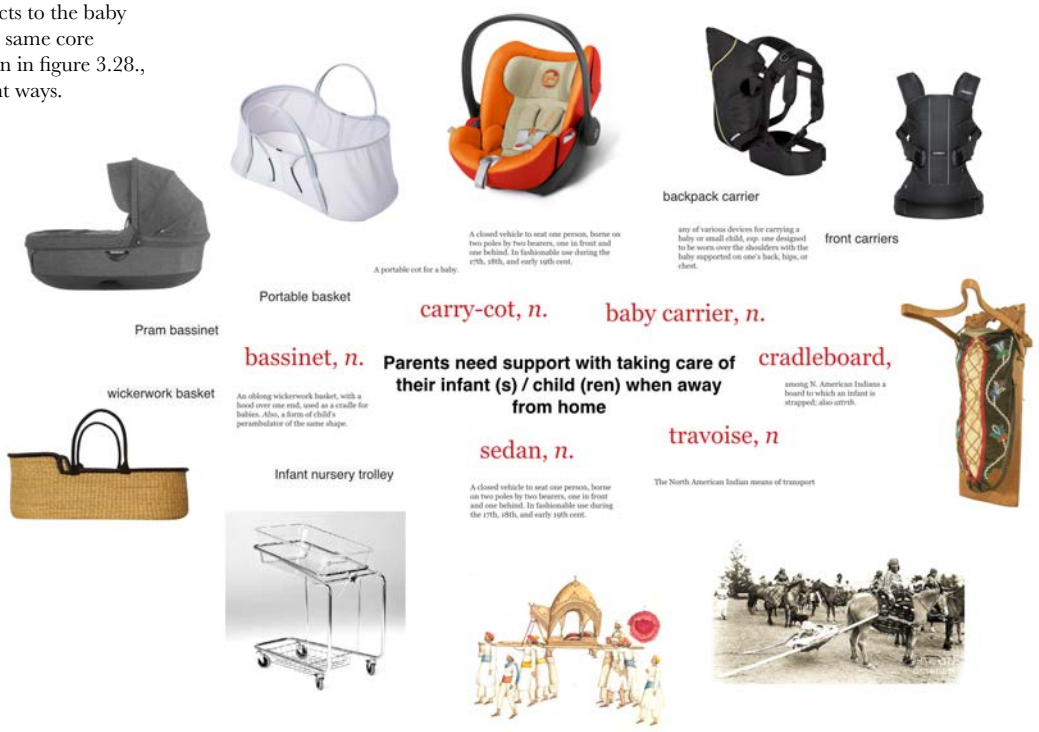


Figure 3.28. Visual compilation of the different complements to the core problem.

Bassinet
The definition of a Bassinet is according to the Oxford English Dictionary, *An oblong wickerwork basket, with a hood over one end, used as a cradle for babies. Also, a form of child's perambulator of the same shape* ("Oxford English Dictionary - Bassinet, n.", 2017). There are many different version such as a *portable basket / bassinet*, a basket with dimensions in order for a baby or small child to be carried or sleep within it; *a pram bassinet*, the part of a perambulator in which the infant or small child lie; a *wickerwork basket / bassinet*, an older, usually portable, basket made from wickerwork for a baby or small child to sleep within it; *an infant bed*, a trolley, usually made from steel with a plastic bassinet attached, as support in taking care of the infant during hospital visits.

C*arry-cot*
According to the Oxford English dictionary, the definition of a cary-cot reads as follows: *A portable cot for a baby* ("Oxford English Dictionary - carry-cot, n.", 2017). There is also a type called in-car cary-cot, usually part of travel systems, and is a carry-cot specifically designed for infants or small children's safety when traveling in a car.

B*aby carrier*
A baby carrier is according to the Oxford English Dictionary: *any of various devices for carrying a baby or small child, esp. one designed to be worn over the shoulders with the baby supported on one's back, hips, or chest* ("Oxford English Dictionary - baby carrier, n.", 2017). There are primarily two versions: a backpack carrier, i.e. a baby carrier designed for the infant or child to be carried on the back of someone with the help of straps over the shoulders and sometimes with lumbar support; and a front carrier, i.e. a baby carrier designed for the infant or child to be carried on the chest of someone with the help of straps over the shoulders and sometimes with lumbar support.

C*radleboard*
The Oxford English Dictionary´s definition of a cradleboard reads: *among N. American Indians a board to which an infant is strapped; also attrib.* ("Oxford English Dictionary - cradleboard, n.", 2017). This is an historic artefact very rarely used today.

T*ravoise*
Another relic of times past, the definition of a travoise according to the Oxford English Dictionary is: *the North American Indian means of transport* ("Oxford English Dictionary - travoise, n.", 2017). This is a type of cart pulled behind a horse, only without wheels and instead slides along with two wooden poles touching the ground.

Sedan Chair
A Sedan chair is a chair or bed lifted from the ground and carried by several people in between them.

CONCERNED BY THE CORE PROBLEM

Figure 3.29. shows a compilation of the users and stakeholders concerned by the core problem as well as the living situation they face. User profiling was performed and based only upon the living situations, empirical data and logical reasoning around the users of the system. This stand in contrast to basing personas on preconceptions about the users which was tried to be avoided.

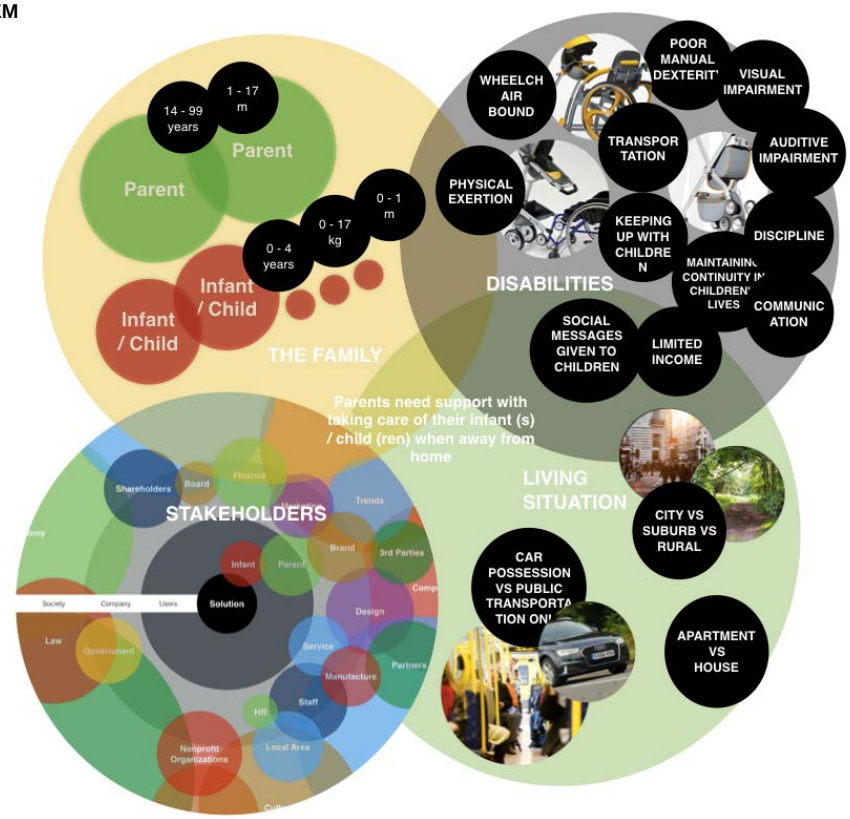


Figure 3.29. KJ analysis of the concerned by the core problem.

Stakeholder mapping
Regarding what stakeholder is the primary, secondary, third user, and so-forth, of the solutions of today, there was no hesitancy about the infant or child being the primary user as the driver can compromise on his or her comfort for the sake of the comfort of the child. Following this argument, the parent, or driver, is the secondary stakeholder of the product or service whilst either service employees, as in a product service system, or service people, as in repair work, is third. All of the above are directly affected by the performance of the solution; more indirectly affected are those on an organisational level, such as the manufacturer, shareholders and retailers. These, in turn, affect and are affected by societal forces such as governments, culture as well as history and indirectly affected by the forces of the planetary ecosystems such as the environment and global economy.

The family
The users of baby carriages are most usually part of a family and the core problem reinforces this argument as it focuses on parents taking care of their child. Thereby, the distribution of the family is of outmost importance to the solution that fits them. Families can range from 1 to, in very rare cases, 10 children or more, and usually with an age span of at least a year between each child (if not having twins). The current support from the industry spans the age of a child from 0-4 years old or 0-20 kg in weight. In general, however, children learn to walk at an age of 12 to 15 months and are skilful enough to walk mostly by themselves at the age of three years old, although fully able to walk in any scenario is usually reached at age five (BabyCenter, 2015).

Living situation
Further, regarding the living situation of those concerned by the core problem, the type and layout of the home, the surrounding area and the everyday habits of transportation all play into the details of the core problem. The most common differentiations can be outlined by observing the current solutions on the market. The most significant differences are whether the users live in a house, an apartment or some hybrid in between; whether the users are traveling by car on a daily basis, by public transportation or a mix in between; and finally, whether the family lives in a urban area, a suburb or the countryside.

Disabilities regarding the core problem
Finally, to include all people concerned by the core problem, several disabilities exist that can affect both parent and child when traveling together. The short term effects regarding the core problem come from disabilities like poor manual dexterity as well as visual- or auditive-impairment. Long term effects are usually related to the physical exertion that might come earlier to a parent with disabilities and the parents own transportation difficulties in the case where he or she is bound to a wheelchair for instance. The difference in ability between parent and child can imply difficulties in keeping up. The more indirect effects are those of a possible limited income due to disability, maintaining the wanted discipline as well as the communication and social messages given to children when traveling (Barker & Maralani, 1997).

CULTURE AROUND THE CORE PROBLEM

The core problem is seen differently and solved differently in different parts of the world, much due to differentiating values and GDP (Gross domestic product). The differences were investigated through historical records, baby carriage catalogs and social media posts and compiled in a KJ analysis, seen in figure 3.30.

Figure 3.30. Visual compilation of different cultural phenomenon, regarding the core problem, and their origin superimposed over the world map.

North America
In North America, early problem solvers regarding the core problem were the native Americans with their *Cradleboard* and *Travoise*. (as mentioned under *core problem complements*). In the 1980´s, the active lifestyle trends springing from California lead to the invention of the active stroller. In more recent years, the urban lifestyle has brought out many different solutions on the market and the baby carriage has become a trend icon as movie stars and top models have shown off their choice of brand. As of writing, a large trend called *Hipster,* originating from the United States east coast, associates higher value to objects that has been locally produced, is hand-made or is of significant age.

South America
Regarding the cultural differences in South America, the fact that infrastructure is not as extensive in the western world and does not hold the same quality standards. This, combined with a, in general, hotter climate means the fabric covered- wheeled carts, such as a baby carriage, are less optimal for traversing the landscape and this means that, in the long- run, less baby carriages are bought overall in the region.

Europe
In Europe, the baby carriages has long been considered as a status symbol which can be historically derived back to the British royal family showing of their baby carriages throughout the ages (Van Dulken, 2001). In modern times, the status symbols are more about innovative and futuristic designs that stand out on social media. Further, high people density of the European continent means the travel systems are usually an extension of an urban lifestyle. In northern Europe, people are more inclined to leave the baby sleeping outdoors much due to the colder climate and the belief that babies are better off if doing so. Further, larger baby carriages than in Northern America are popular but the hipster trend is a major phenomenon here too.

Africa
The cultural differences in Africa, where many countries do not have an extensive infrastructure at all and income is, on average, the lowest, as well as very hot conditions mean children do not need the integrated protection that baby carriages usually offer. The incompatibility of baby carriages with the terrain and conditions mean less baby carriages are bought in the region. Thereby complementary solutions are used that resemble what the native Americans used to use (mentioned under *core problem complements*). If not utilising any equipment, children are just carried by their parents.

Asia
In Asia, the cultural differences vary allot from the west to the east of the same continent, and so do the average temperature differences. An overall lower GDP and the fact that the streets do not hold the same standard means cheaper baby carriages are bought- if any. By culture, beefier and more colourful products are common in China whilst in Japan, ultra foldable variants are more common.

Oceania
The cultural differences in Oceania are how the how parents are advised not leave the baby outside, mostly due to the occasional extreme heat that can occur in the area. This also means baby carriages do not need to offer the same thermal insulation but rather need to provide a chilling and shading effect.

THE CONTEXT OF THE CORE PROBLEM

In figure 3.31. the context of the core problem has been visually compiled. The contextual differences were the following.

Firstly, wherever the user is in the world, the same types of conditions might occur: *Up vs down*, the level of up hill or down hill that lies before the user; *Crowd vs Alone*, the number of people moving around in the environment; *Hot vs Cold*, the temperature of the time and place; *Plaine vs Rough*, the level of roughness of the traversed terrain; *Out vs in*, whether being on the inside or outside related to the level of care needed; and *Night vs Day*, the time of day which affects the lighting conditions.

Secondly, the place and time of the year will go into defining the core problem. Whether traversing on city streets, suburban walkways or regular sidewalks usually means a lot of gaps and bumps to cross. If traversing an indoor environment such as in homes, stores or malls, the ground is usually plane but the objective might be several floors up or down. Then there is the more natural settings such as forest roads, grassy planes and sandy beaches which all have their own implications. Finally, there is the occurrence of snowy terrain and icy streets.

Figure 3.31. Visual compilation of the contextual differences that regards the core problem.

THE CORE PROBLEM OVER TIME

When viewing the core problem from the 4th dimension, a map of the physical environment as traversed over time where made (seen in figure 3.32). The map was based on testing the two reference products outdoors whilst also outlining the customer journeys (seen in chapter 3.1), and eliminating all aspects that are not solution neutral and not related to the overall core-problem. One of the first obstacles that is faced in order to get outdoors together with a small child are doors. To pass through doorways and having to open doors both in a direction to and away from you can be difficult. Secondly, not always occurring however, are elevators which can sometimes be small and cramped full of people. When having reached outdoors, many different terrains of different roughness influence the core problem as well as going up or down-hill, i.e. working with or against the gravitational force. Further, the occasional buss ride and the limits of movement that are involved in that experience, such as space constraints and gaps between platform and vehicle, as well as going by car and the even more tight space constraint and safety issues related to that, all change the core problem.

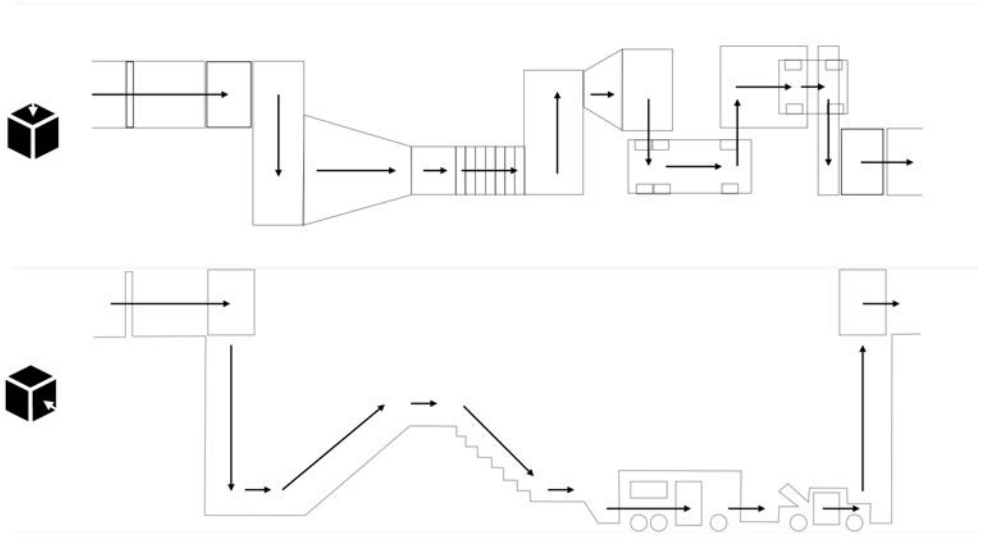


Figure 3.32. Visual representation of the core problems 4th dimension.

THE CORE PROBLEM HIERARCHY

If the core problem is viewed from a systems perspective, important insights of how the solution, in the end, should solve the problem, can be gained. To put the core problem into a systems perspective and map how it fits into a larger purpose, an HTA, or hierarchical task analysis, and problem / user relations map were put together. These detailed how the overall system, as well as several subsystems, relate hierarchically. The result were the following.

The core problem, i.e. needing *support away from home*, is part of the bigger problem that is the need of taking care of a baby in general. On the same level as the core problem lies also the need of *support in the home*, where several solutions exist to help solve the problem. The current products on the market together solve the core problem by complementing each other. Those are the travel system, in turn consisting of frame, seat or bassinet and in-car carry-cot; the diaper bag, usually hangable on the carriage; the parent, for guidance, steering and kinetic energy; changing tables, usually occurring in many restrooms; and, occasionally, the baby nest. The hierarchical task analysis can be seen in full detail in figure 3.33.

The need of taking care of a baby, and the infant self, are integral parts of the solution, usually a stroller. The solution stand, in turn, in relation to the parent whom in turn is subject to the core problem. The core problem is finally an offspring of the overall emotional need. From this, also the most direct influences between these aspects follow this relation in the same way (seen in figure 3.34.)

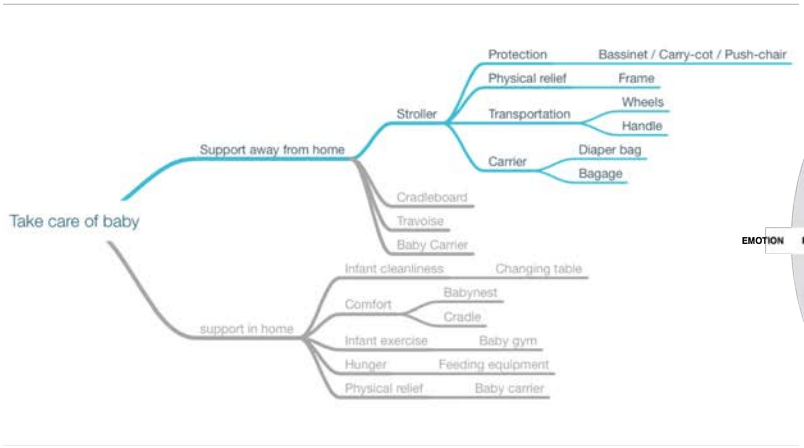


Figure 3.33. Hierarchical task analysis of the core problem.

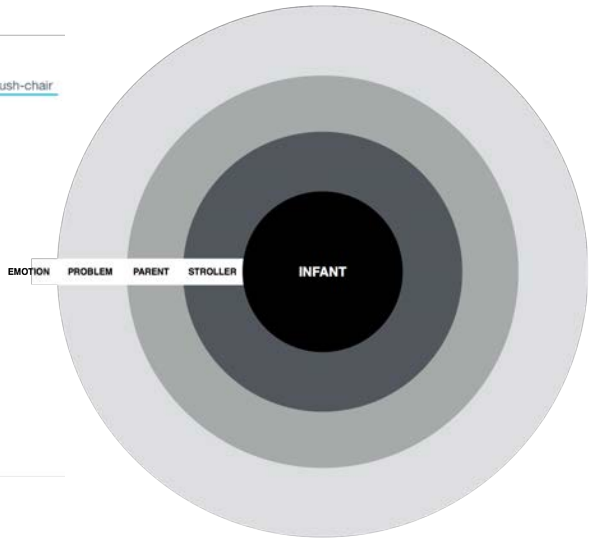


Figure 3.34. System model map of the user / problem relation.

CORE PROBLEM FRAMING

To follow this systems perspective, the frame and what lies in the periphery of the core problem were outlined in order to map what affects the problem at hand, both directly and indirectly. A system model was made to layout the framework of the core problem. The system model describes what elements lay outside the core problem but affecting it and what elements were part of today´s solution and lay within the limits of the core problem. This system model can be seen in figure 3.35. This was later used as a facilitator for ideation in order to stay open and solution neutral.

Narrowed down by the core problem, the border incloses *support away from home.* Outside of this border lies the effect of time, an overall purpose, the temperature-, lighting- and ground- conditions; all very related to the factors mentioned earlier (*the context of the core problem*). Within the system lay the parent, the infant further arranged under the subsystem of baby carriage, diaper bag and changing table. Finally, the result of this system was that the baby had been taken care of. The relation in between these factors can be observed in figure 3.35.

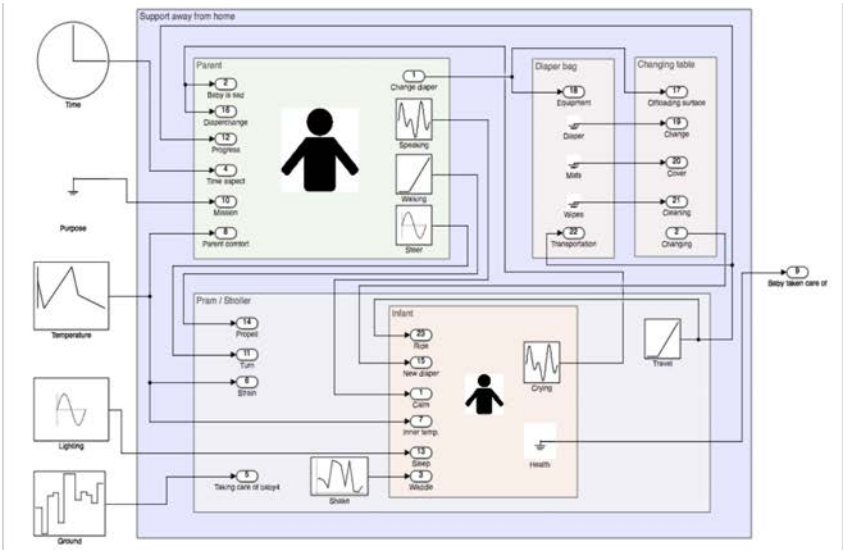


Figure 3.35. System model of the interaction with the travel system and the affecting factors from outside the system.

3.4. Investigate Core Emotions

In order to know the strollers ultimate purpose as a consumer product, the underlying emotional reason for why the core problem has to be solved was investigated through what emotions is being elicited today and what meaning is related to it.

Figure 3.36. The tree of life, an international symbol for midwifes.

MEANING AND EMOTION

The product area of baby carriages was investigated in terms of what meaning and emotion are attributed to the segment and what purchase decisions is being made that leads to the particular choice of stroller. Based primarily on research around midwifes and their doctrine of taking care of children, the same emotional values were derived for why a child should be looked after in the first place.

Firstly, there is the plethora of symbolism regarding midwifery that relates to life, care and growing. The official symbol for midwifes is the *tree of life* (seen in figure 3.36), a symbol originating from the veins on a placenta but more so symbolises life branching out into several different directions. It also symbolises how midwives must help parents in taking care of the newborn at an early stage and thereby be the stable stem of early development. Further, the tree symbol is used as a discussion medium at child nurseries in order to describe how the family can be supported through their stay (Svenska Barnmorskeförbundet, 2007).

To continue the systems perspective, taking care of a baby is about being part of society and doing what is expected of you as a parent but also what is deemed morally right. According to the the British Institutes of Human Rights, the basic humanitarian rights that the midwifery profession fulfils in taking care of newborns as well as small children is (BIHR, 2016):

- *The right to respect for private and family life, home and correspondence.*
- *Right to life*
- *Right to not be tortured or treated in an inhuman or degrading way.*
- *Right to liberty*
- *Right to not be discriminated against in relation to any of the human rights listed above.*

These findings were related to the HTA (seen in chapter 3.3.) through how taking care of a baby, from a systems perspective, is about being part of human society, and in turn, about wanting to live up to these, previously mentioned, five human rights. The cause and effect can thereby be derived all the way from human right down to single features of a baby carriage (seen in figure 3.37.).

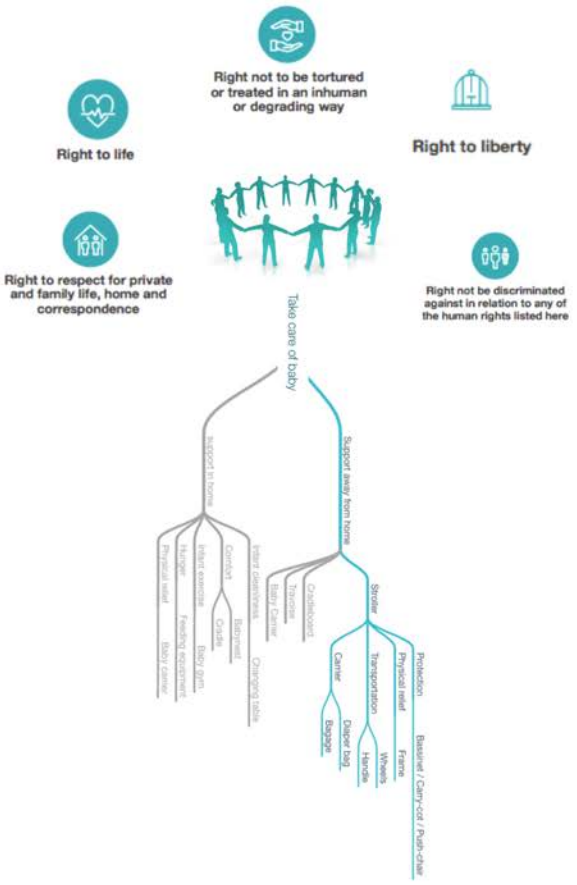


Figure 3.37. Visual presentation of the core problem hierarchy as a part of society and the human rights associated with it.

EMOTIVE ATTACHMENT

The reference products were evaluated by means of the Product Personality scale and SAM, self assessment manikin, scale. Ten participants estimated 19 different product personality aspects on a 7- rated scale. The products were shown to the participant whom got to answer how well the product fulfils the aspect in question. This was accomplished in order to make a connection between product personalities and the form as well as functionalities in question. Further, the scales were also meant to act as a benchmark and reference of where to aim with the new design. The differences between the Britax- and the Emmaljunga- travel system on the aspects of fun, friendly, calm, lively, predictable as well as serious can be seen in figure 3.38. The most significant differences were the following. The Emmaljunga Superviking was, in general, deemed more friendly, honest, predictable, reliable and serious than the Britax Go Big. The Britax Travel system, however, was deemed more fun, aggressive and lively.

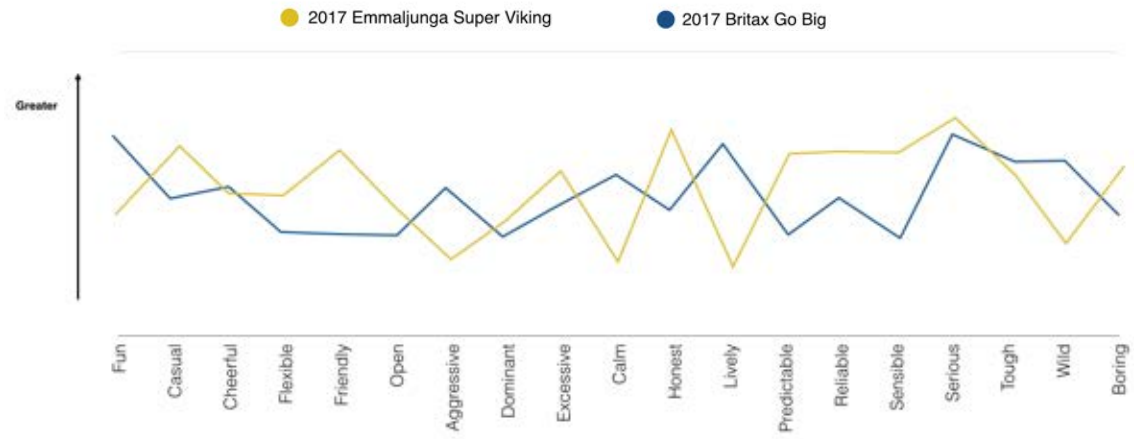


Figure 3.38. the performance of the two reference products on the product personality scale.

Further, the ten interviewees were shown the two travel systems and got to rate them on the Semantic Assessment Manikin, SAM, scale where the animated figure represents the interviewee at the very point in time he or she gets to see the product and the perceived state of mind shall be related to the corresponding figure on the scale. The following results were then drawn from the average outcome of the ten interviews:

The Britax Go Big
The Britax travel system scored moderately on both the Sad - Cheerful and Calm - Active scales whilst the participants, on average, leaned towards being able to dominate the product rather than being dominated by it. This result can be seen in figure 3.39.

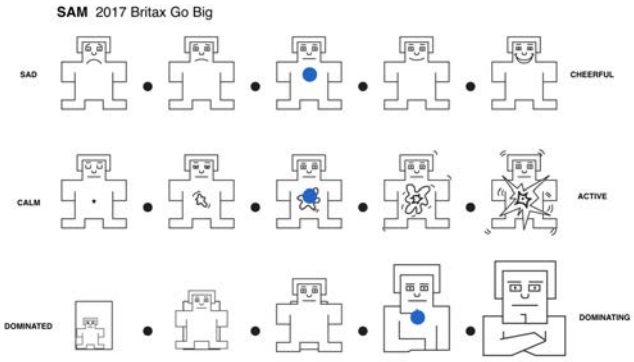


Figure 3.39. the performance of the two reference products on the product personality scale.

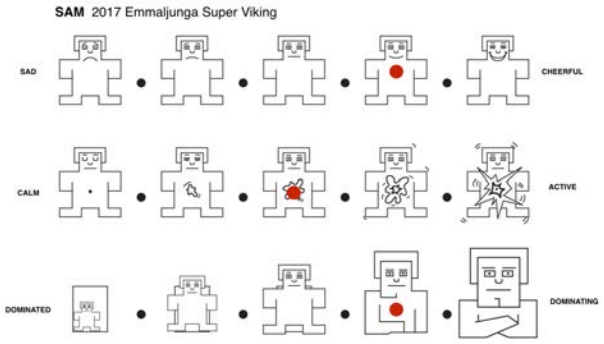


Figure 3.40. the performance of the two reference products on the product personality scale.

The Emmaljunga Super Viking
Regarding the Sad - Cheerful scale, the participants leaned somewhat towards the more cheerful side for the Emmaljunga travel system whilst the response for the Calm - Active scale was moderate. Like the Britax travel system, the participants, on average, leaned towards feeling dominant over the Emmaljunga Super Viking and the result can be seen in figure 3.40.

Overall
From the ten participants, the average responses for both products were corresponding well with a slight differentiation on the Sad - Cheerful scale. The Calm - Active scales both resulted in a moderate response whilst the Dominated - Dominating scale showed respondents having a dominating feeling over the two products. This is argued for by van Rompay et al. (2005) to have to do with the overall height of what is being perceived in relation to the perceiver.

EMOTIONAL FULFILMENT

All the previous findings of the investigation phase were related to Maslow's hierarchy of need, where many of the previous findings, mainly concepts, historical inventions and the humanitarian rights were superimposed over the theory. This showed how the product segment can relate to all parts of the hierarchy: The physiological needs as in the baby carriage allowing for rest and warmth; fulfilling safety needs in protecting the child from the environment, evoking belongingness and love through the emotional connection between parent and child and in how it is about being together and embraced, builds upon esteem as a trendy product and as a status symbol; and finally; self actualisation through active lifestyles, freedom, technological advancement and being a good parent (Maslow, 1943). These findings can be seen in figure 3.41.

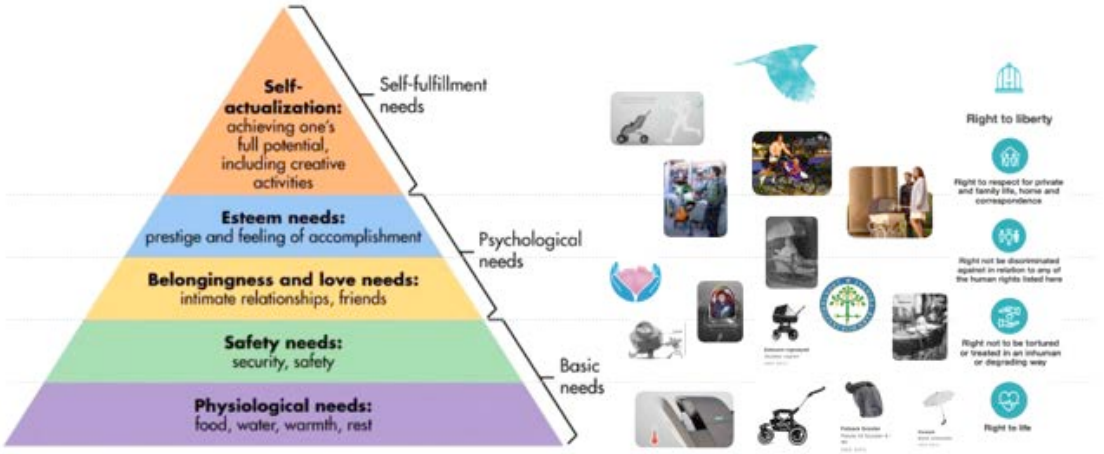


Figure 3.41. Visual representation of the emotive aspects mapped and superimposed over the hierarchy of needs.

ABSOLUTE EMOTIONAL NEED

Based on Plutchik's basic emotions, the absolute emotional need, being the fundamental underlaying reason for why the core problem needs fulfilling and, in turn, why the baby carriage is bought, was investigated. The result can be seen in figure 3.42. superimposed over Plutchik's wheel of basic emotions.

When relating the earlier findings and mainly the humanitarian rights, conceptual solutions and symbols of midwifery onto these basic emotions it is clear how it is about the emotions of

joy, trust, anticipation, love, admiration, acceptance, optimism and ecstasy.

When relating the ironic concepts (seen in chapter 3.1), to Plutchiks basic emotions, however, they underscore the emotions listed above by highlighting what basic emotions are not related to the absolute emotional need:

anger, boredom, fear and surprise.

(Plutchik, 2001)

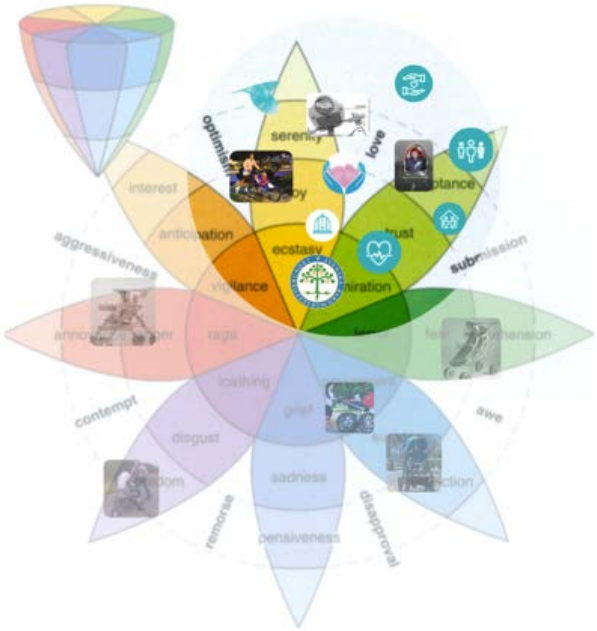
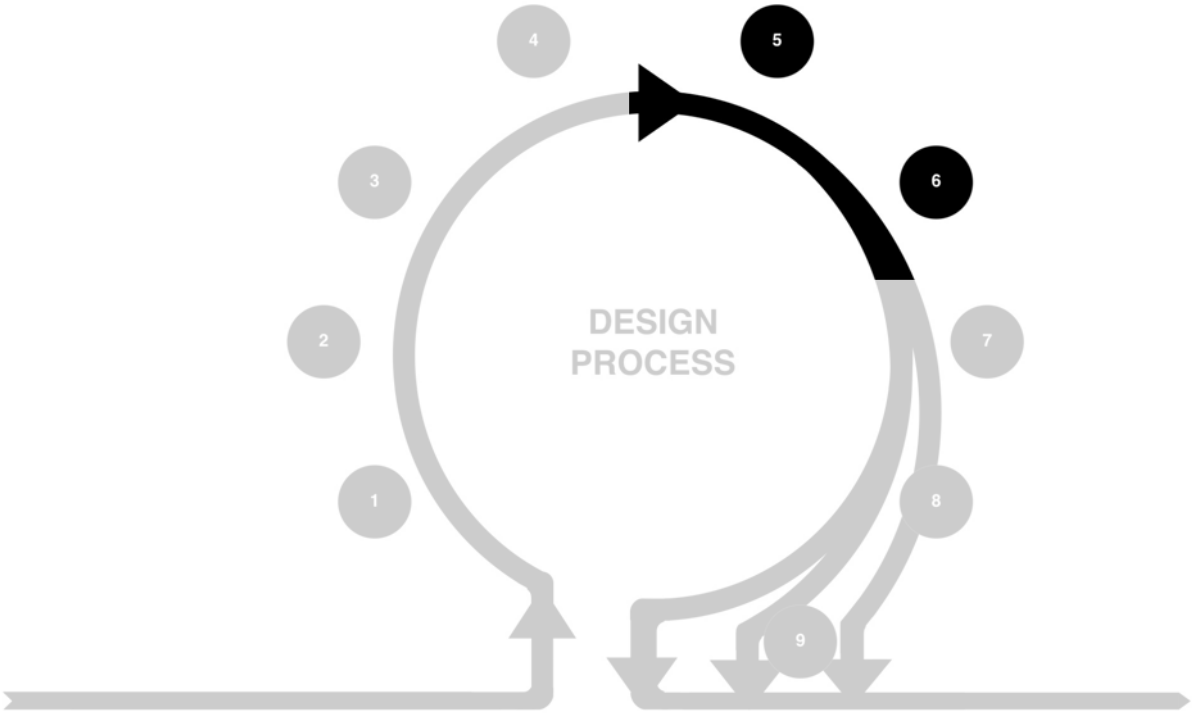


Figure 3.42. Emotive aspects of travel systems mapped and superimposed over Plutchik´s basic emotions.

4

Results from the intention phase

Chapter 4: Results from the intention phase compiles, cross-references and discusses the result of the intention phase.



4.1. Emotive Vision

To start in the absolute most fundamental aspect of the design process, the emotions that the product or product-service system were meant to elicit when used were mapped and worked as the starting point for the creative phase. Based upon these, as well as the key characteristics found in the investigation, a series of guidelines were formulated.

VISION OF EMOTIVE NEEDS

In order to visualise what emotional values the final design was meant to embody, an emotions board was made for that (seen in figure 4.1.). The board was meant to convey the following emotional needs.

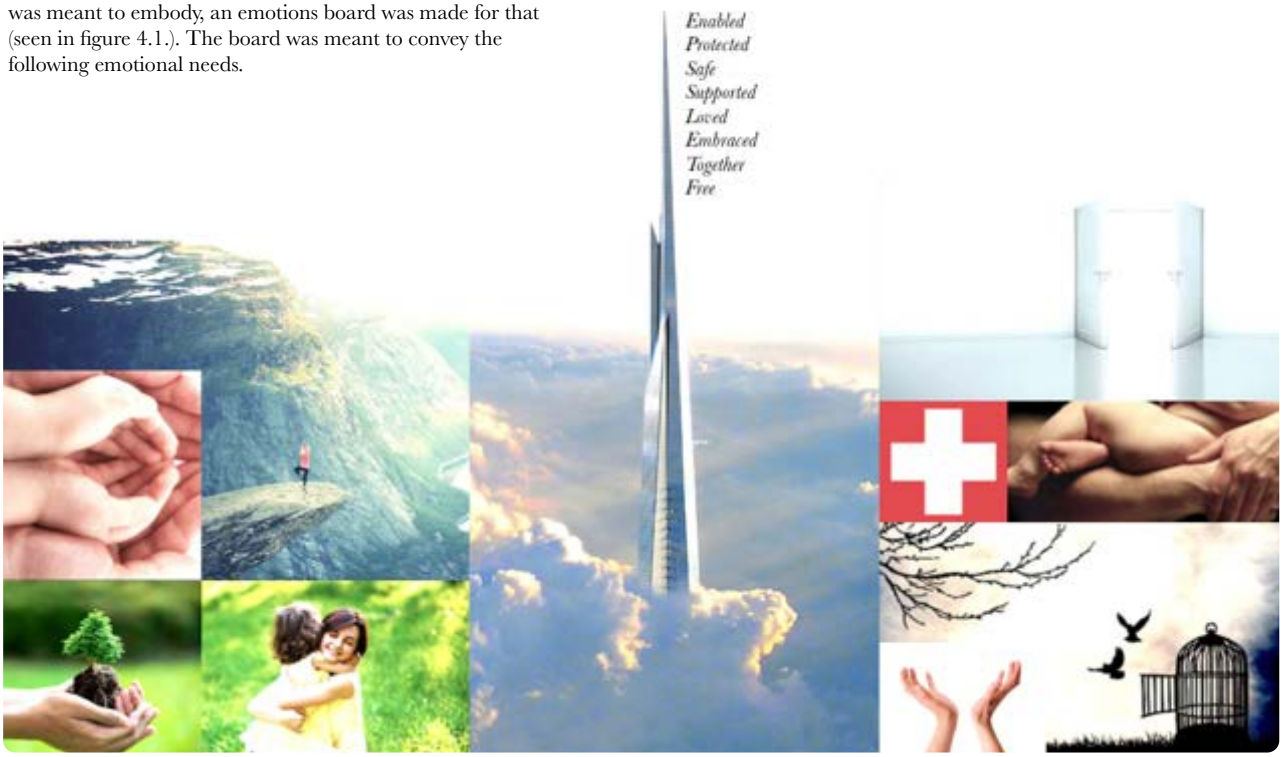


Figure 4.1. Emotions Board representing the absolute emotional needs to be fulfilled by the design.

Enabled
The users has an emotional need to feel enabled by the final design, i.e. not being locked into the home but able to go basically anywhere together with the child.

Protected
The emotional need of feeling protected whilst using the final design is vital due to the fragile nature of newborns and small children.

Safe
Closely relating and following on eliciting a feeling of protection comes a feeling of safety where the design should give an overall safe feeling in all of its aspects.

Supported
Following on being enabled, the user must feel supported in the mission to fulfil the overall purpose; to go out together with the child.

Loved
The love and affect between parent and child were meant to be facilitated by the final design.

Embraced
Both parent and child are meant to feel uplifted through being embraced by the design.

Together
The design must elicit the feeling between parent and child of being together.

Free
The final design has to convey the feeling of being free from what is otherwise felt as an inclosure.

VISION OF EMOTIVE EXPRESSION

In relation to the two reference products, the desired emotive personality expression of the final design was outlined, superimposed over the product personality scale, as seen in figure 4.2. This acted as a guideline for further design work.

The final design were regarded to be advantageous if expressing more, in relation to the existing reference products, cheerfulness, flexibility, friendliness, calm, honesty, liveliness, predictability, reliability and sensibility. Further, the final design was also deemed to be advantageous if expressing less aggressiveness, excessiveness and the sense of being wild as well as boring.

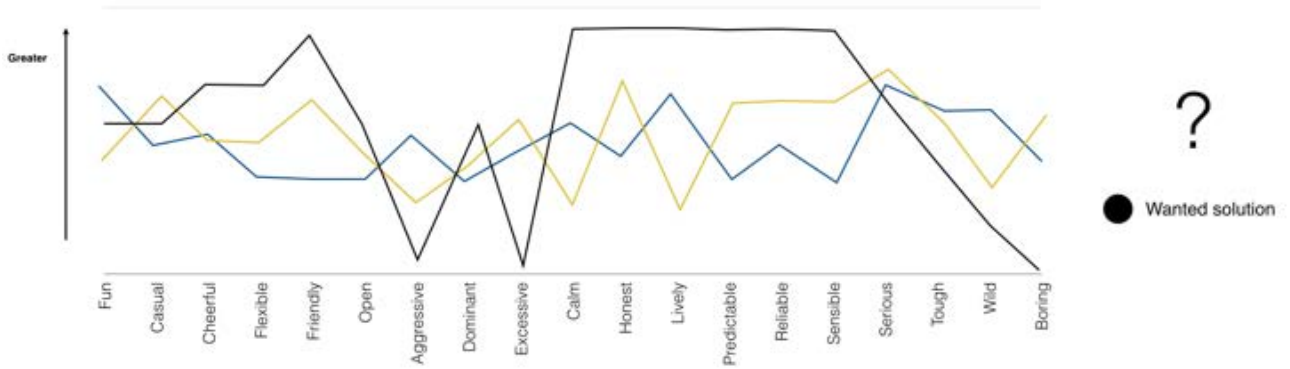


Figure 4.2. The wanted emotive expression to be fulfilled by the design.

VISION OF DESIGN ENTIRETY

As superimposed over the value curve diagram from chapter three, the emotive design focus could be pinpointed and visualised, as seen in figure 4.3.

Firstly, the relation between not so innovative, or conservative, products (The Super Viking, Mondial and Balmoral) and their honest construction was one such finding. This honesty could be the decisive factor for buyers originally looking at more innovative solutions and could thereby be a design opportunity.

Secondly, the lack in emotional connection between parent and child in most products (seen only in the Stokke Xplory), yet argued as a very important part of early child development by Dr. M. Suzanne Zeedyk (2008), was also deemed as an opportunity.

Whilst the ultimate product, according to and in line with the argument in Chapter 1, would maximise all of the design parameters; these two factors were still to be the two foci of the project going forward in order to maximise the effect.

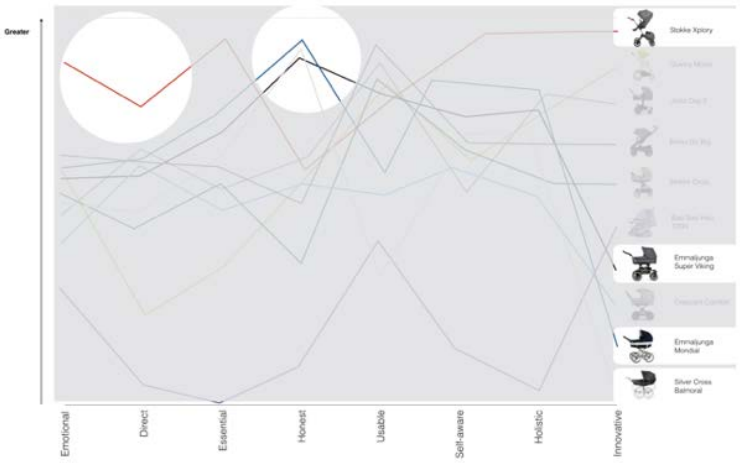


Figure 4.3. Representation of the Findings in the value diagram.

EMOTIONAL VISION

"To evoke the feeling of being enabled and free, whilst being closer and safer than ever"

4.2. Functional Vision

CORE PROBLEM DISCUSSION

Core problem prevention
In order to solve the core problem as directly as possible (argued for as advantageously in chapter 1), an investigation around how to prevent the problem all together was achieved. This resulted in a few different possibilities by, for example, allowing the children to walk by them selves at an earlier stage, this problem could be prevented for the parents and achieved by exoskeletons for children, as seen in figure 4.4., or by a type of baby walker that allows really small children to learn to crawl and then walk earlier (seen in figure 4.5.). Another approach would be to create a service that helps parents with their underlying reason to go outside, such as going to the store etc., and thereby allows the family to stay at home and together. All of the above, however, were regarded to be not what the solution should be about as the core problem is broader than only about transportation but also about being free as well as being outdoors. Also, as the emotive vision is about being together as well as safe, these types of solution were regarded inappropriate and indefensible from an ethical point of view.

Figure 4.4. an exoskeleton designed for children with walking difficulties.

Figure 4.5. A testing rig for brain activity during early child exploration and development

Outdoor and indoor
The core problem of today is partially about being outdoors (seen in chapter 3.3.). The use of most baby carriages, beyond outdoors, are just as necessary indoors and in homes, the products are only not optimised for it. Whilst the baby carriages are trying to cover most needs outdoors, in homes there is a system of several more focused products that together cover the same functionality. In a world where democratic welfare and environmentally friendliness are of great concern, every family on earth having that amount of products in order to take care of a baby simply is not sustainable. This could therefor be an opportunity where one and the same product could solve the core problem both indoors and outdoors.

Transition
Another approach was to work with the transition between home and outdoors. As the climate in a home is much more stable and the environment much more predictable inside than outside, there is usually some work needed in order to move between them. In today´s solutions, the child is usually required to be dressed in warmer clothes before going out and covered in blankets. If it is much warmer outside than inside, to keep the room-temperature in the bassinet can be very difficult. Further, the type of wheels and level of agility needed are different for going indoors and outdoors as the amount of available space and fragility differs. Whilst this could be an opportunity for product design, the difficulty in achieving a *great* solution might be to large.

Home away from home
There is always a risk when trying to incorporate too much functionality, especially when it has not been done before, that too many compromises will be made. This may, thereby, lead to a poor product and making something more focused could be the way to go. One such approach was to focus on the solution being the *home away from home,* meaning it could be a better product by doing more of the things that users buys products for to use in the home, but made for the outdoors. Such things could be the integration of a nursing table or a baby gym into an ordinary travel system for instance.

More Focused
Following the previous argument, there is also the changing needs due to the child's age, where the product can take different focuses. Historically, there was a clear divide between perambulators, focusing on the age when the child is best off lying down on her or his back, and strollers, focusing on the ability for the child to sit up and being easily folded when not used. In more recent years, the travel systems have erased this boundary by trying to be both a perambulator and a stroller making it semi-agile and semi-foldable. Thereby, there might be an opportunity to gain back the focus in order to create a better product by, for instance, integrating the baby carriage together with a rental system.

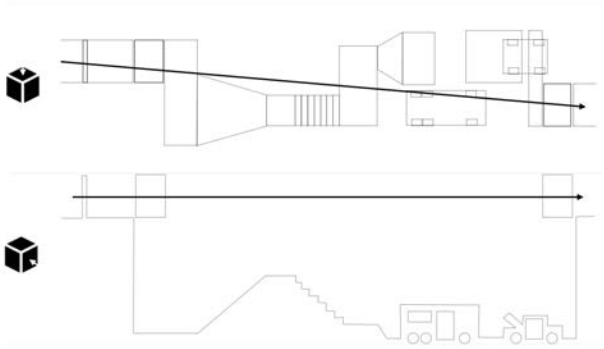


Figure 4.6. Visual compilation of what the functionality should not be about

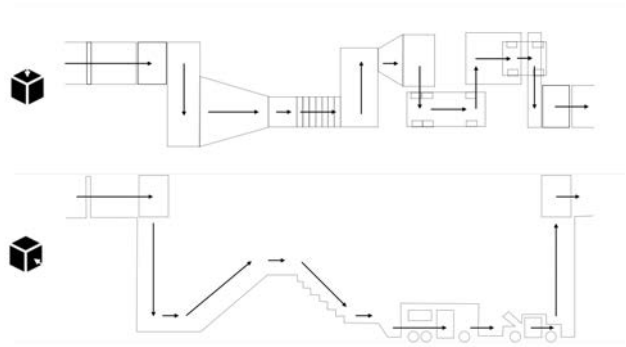


Figure 4.7. Visual compilation of what the functionality should be about.

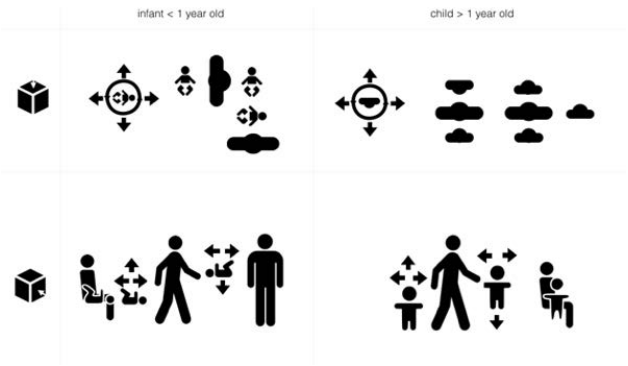


Figure 4.8. Visual compilation of the functional needs

Before ideating around the functionalities of an inevitable product, easily taking for granted what it can and can not do, one must question both what it intuitively *could* and *should* be. The first question that was asked was therefor whether the product should solve the core problem fully autonomously. However, as the core problem is about more than just transportation (mentioned in chapter 3.3), a related product should thereby not be about fulfilling the ultimate efficiency or achieving the shortest route from A to B (seen in figure 4.6.)

Rather than efficiency, the emotive vision describes how the product's functionality should enable a sense of freedom and possibility of being together whilst, at the same time, being protected. In functional terms, this means that the infant or child is able to go with the person taking care of it, free and without limitation

For the child to be able to go where the parent or care giver can go, and thereby, the family being able to be free, it must traverse an extremely varied and unpredictable environment. As the design was considered to advantageously be about *being beside each-other at all times* (seen in figure 4.7), the core problem was thereby unavoidably part of the bigger system as in *society* (mentioned in chapter 3.3) which is also the situation with the baby carriages of today.

This interaction with the infrastructure of human society could thereby be divided into several smaller obstacles that the parent and child would tackle together. This meant that needs, or ultimate functionality, in every step could be derived without taking for granted the functionalities of the final product and , by doing so, stay solutions neutral. All the functional needs were then compiled in the relation between parent and child (seen in figure 4.8). The results showed that the child should be able to be kept at the most comfortable height at any moment and thereby ensure the parent geting the most closeness and feeling of safety as possible.

This meant that, when outdoors walking, the child should be kept in a level above the waist of the parent whilst a lower position would be preferred when the parent is sitting or when balance is an issue, as on the buss or going on an escalator etcetera. This means that the solution should be very flexible height wise.

In terms of movement, it was found that at high walking speeds, no sharp turns were needed as this is not the way a grown human being tends to travel. At medium speeds, however, to be able to turn and rotate on the spot were preferred but the point of rotation could be located un centred in terms of the child if necessary. Finally, at really low speeds and where space was limited, to be able to move side ways was preferred.

The position between the child and parent was also investigated and was regarded to be different in different scenarios. In most cases the parent would prefer to have the child in front of him or her, but in situations such as crossing traffic and passing through doors, having the child behind him or her was deemed safer.

USER CATEGORIES

Based on the living situations outlined in Chapter 2, a three by three chart with the transportation habits on the y-axis and the type of built environment on the x-axis, the different types of user categories could be identified. The aspect whether the user lived in an apartment or house was rationalised due to the correlation between between type of living space and population density. This was done in order to not keep the amount of user categories at a manageable level.

The result was 9 user categories (seen in figure 4.9), where the axes affected wether they needed a solution that focuses on agility, foldability or packability. the four corners of the chart presents the users with the need of a more focused solution whilst the users in between needs an all-round type of solution.

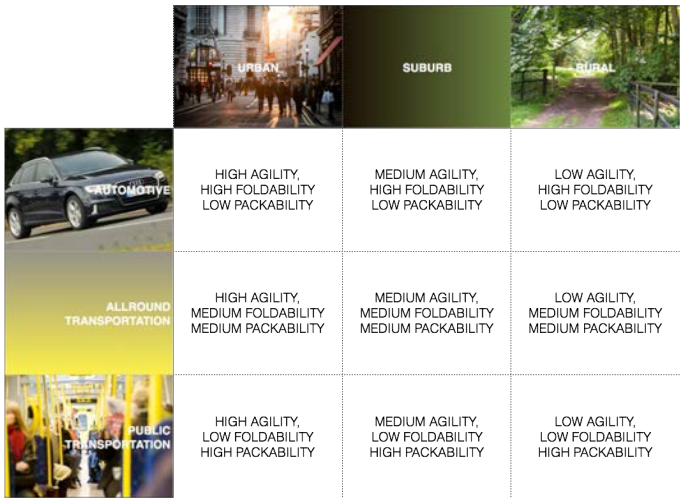


Figure 4.9. Visual presentation of the 9 user categories.

KEY CHARACTERISTICS OF THE ISSUE

The key characteristics of the issue were outlined in order to acquire an additional direction regarding the direction of the design-work.

Open vs closed
As the nature of a product can be either an open platform to which changes can be made or a closed system where the parameters are more determined in the design process, this needed to be determined. Further, the overall design can be either predicting, or guiding, of how it is going to be used or more open towards the problem and be the lowest common denominator in what is needed. The nature of the core problem in this case means that the design should be closer to a lowest, common, denominator but a more closed system that ensures that everything works the way it should to the greatest extent possible.

Tailored vs design for all
The core problem is a global problem and whilst solutions can be made more tailored to the specific user category through modularity and customisation options, the baby carriages of today are produced for the masses and thereby harder to tailor. Customisation is thereby preferred but is not essential to include.

Focused tool vs platform / multi-tool
Today, a baby carriage is a tool focused on solving the core problem and all extra functionality, such as cup holders or luggage compartment, are smaller parts in solving that problem as gracefully as possible. This stand in contrast to a multi-tool, or platform, where multiple problem solving solutions are embedded into the same product due to their likeness in design. The final design where deemed to keep this focus or rather find an even greater focus due to the initial complexity of solving the core problem.

FUNCTIONAL GUIDELINES

Based on the previous findings mentioned in this chapter, functional guidelines were formulated as sentences without any strict measurable parameters in order to remain solution neutral:

The product should not be about efficiency, it should be about parent and child being together at all times.

The product should ease the transition between the home and the outdoors.

The product would preferably be flexible in terms of height adjustment.

The product should preferably enable movement in all directions at low speeds, but not necessarily at high speeds.

The product would preferably be flexible in terms of the position of the child relative to the parent.

The product should be a closed system and the smallest common denominator in solving the core problem.

The product should preferably be able to be customised by the user.

The product should be a focused tool set on solving the core problem.

FUNCTIONAL VISION

”A magical, flexible cradle that just follows wherever you go”

4.3. Operational vision

The last stage of the intention phase about formulating the opportunities that existed based upon the previously investigated branding and market position. This was related to where the Britax Römer brand should and aspire to be.

BRAND VISION ADHERENCE

Firstly, the decision whether to question the current brand strategy or operational system needed to be decided upon. The systems perspective was thereby yet again utilised in order to determine wether the design-work should adhere to the overall vision and idea that the entire organisation strives for or wether to take a different approach.

Brand message
Firstly, if relating to the *absolute emotional needs* as mentioned in chapter 3.4, the Britax Römer brand currently perform very well the reasoning around- and message presented- regarding freedom and safety, perfectly in line with both the emotive needs and the emotive vision of chapter 4.1. This meant the design process was to build upon this brand-message rather than question it. However, as the Britax Römer brand focuses on these two emotional needs, it rarely claims to have the overall best solution. Thereby, it was decided that the branding activities related to the final product would put more emphasis on the overall performance of the product in the everyday family life. Further, as safety and freedom might sometimes be in contrast, the solutions where the product focuses on safety over freedom where to be highlighted in the branding. Finally, the most notable part of the brand activities related to the Britax Römer brand, as mentioned in chapter 3.2, is the poor green brand performance and was thereby also to be a focus of the final design.

Visual Brand
The most noticeable aspect of the visual brand is the connection between the brand and the safety features; mediated by the colour red. However, different types of hues found in the many products and marketing material meant this un-unified visual branding-cue degraded this connection somewhat. The red brand colour should thereby be unified and utilised more in the entire visual brand portfolio.

Further, the Britax Römer visual brand portfolio is in-cohesive due to the different series originating from different brands. This should be unified into one visual style in order to enhance brand recognition. This change to the brand was thereby considered possible to begin with the resulting product of this project. To follow on this, and the emotive intent of chapter 4.1; the Britax Römer brand was deemed to benefit from a more rounded visual appearance as opposed to the current, more *edgy*, impression. This in order to bring out the caring and embracing emotional values of the emotive intent. This is argued for by both Arnheim (1974) as well as Bar and Neta, (2006); their research showed that angular shapes can attribute aggressiveness to the product as it can be interpreted as a clash between stimulus and surroundings. Rounded shapes, however, were found to not have the same effect. Further, also Zhang, Feick, and Price (2006) showed in logos how angular shapes were regarded as more aggressive in relation to the more harmonious rounded shapes. As argued in chapter 4.1. aggressiveness was an unwanted expression in the product whilst harmonious was a wanted expression.

Furthermore, a detail in the Britax Römer visual brand that is characteristic and recognisable are the wide aluminium bars of the Go- series with the brand and model name written in bold text on the side of it. In case this was an appropriate, functional, aspect of the design, it were considered to be utilised and maybe even used as a visual brand-cue in marketing material around the product as well.

Brand Naming Conventions
Regarding the names of the products in the Britax Römer´s product portfolio, there is specifically two of the naming conventions where either the brand recognition is well known or the connection to the overall brand is clear. Firstly, the Go- series brand is well known and has been built upon since the ownership under the BRIO- brand (as mentioned in chapter 3.2.) and works well as a flexible naming platform for different versions of products. The name *GO-* relates to going and thereby refers to the possibilities that the product in question enables. Secondly, the B-series branding has a clear connection to the brand and is, as the G0-series branding, also a good naming platform. The *B-* acronym refers to both *Britax* and *being* at the same time and, when followed by a product specific phrase, tells how the product is meant to be used. What is lacking in this regard, however, is that there is no connection to the care of children, as in what the product solves for the user overall. This would be a preferable addition.

MARKET OPPORTUNITIES AND MARKET CHOICE

At this stage, the vision was related to what markets and businesses were ripe for change and where a, so far, insufficient user experience was permeating the product category. This needed to be related to the current brand and market position in order to evaluate the potential impact of an expected solution.

The product portfolio of Britax Römer was superimposed over the 9 different user categories, by how well they fit their needs, and thereby what users have not been covered by the portfolio were determined. The result was three user categories without any product fitting their needs, as seen in figure 4.10. These were the following.

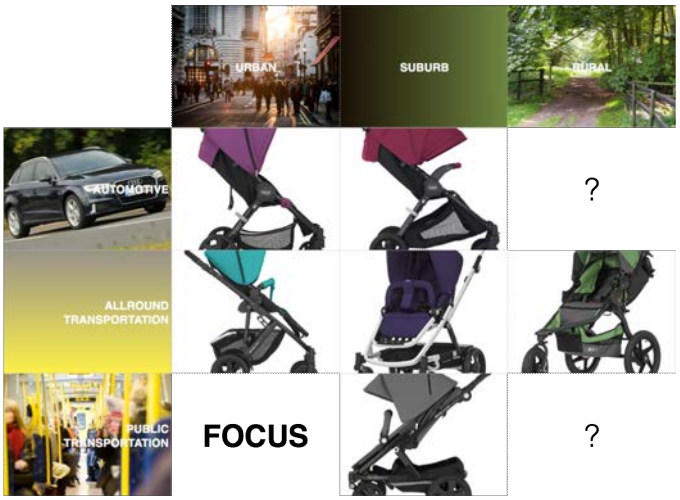


Figure 4.10. The Britax Römer product portfolio overlaid the table of the 9 user categories.

The rural family with car
The top right corner of the figure describes the users that lives in a very low density area but has a car in order to travel long distances. This means the families need a solution with very high foldability in order to store it in the car easily, but, can compromise on agility and packability as they tend not to travel in very dense areas with the child and the car takes most of the goods. Of families living in rural areas, this constellation is the most common.

The rural family going only by public transportation
The lower right corner of the figure makes up users that live in the country side but never or very rarely has access to a car for transportation and rather rely on public transportation. This family has a specific need of high packability that can carry the luggage that otherwise could be stored in a car, the family can however compromise on foldability and agility.

The urban family going only by public transportation
The lower left corner represents the family that lives in a city, or area of high density, and who is not in the possession of a car but rather relies on public transportation. This means the family needs high agility, due to the narrow streets, high number of shops and many pedestrians in the streets; as well as high packability but can compromise on foldability. This urban family, only relying on public transportation, is the fastest growing segment of all of the 9 user categories and thereby the overall need is growing rapidly.

Following this argument , the chosen user group to focus on is *the urban citizen without car*; a segment that is growing rapidly and for whom there is no solution that fulfil their needs as yet.

VISION OF ULTIMATE OPERATIONAL STRATEGY

Based in the earlier observations, a vision for what an ultimate operational strategy would be was conceived based on the following line of argument: Firstly, as described in chapter three, there is a big second hand market to seize for the producers as well as a common view of baby carriages as fairly expensive for the customer. Further, in relation to the material consumption and cost of the product, the time of use for the customer is very short. In addition, the eventual changes in need for the user as the child grows, or if the family moves to a new area, buys a car or makes other big changes to their habits, means putting down a large sum for a single type of stroller is a large commitment.

In terms of both the environment and the production line, the baby carriages of today mean a large material consumption that would be benefit both if reduced. When current trends surrounding circular economy and subscription services are taken into consideration, as well as all the previous arguments; the ultimate vision leans towards creating an integrated product-service system based upon a subscription fee. This would mean safety in renting for the user and seizing the second hand market, through co-ownership, for Britax. At the same time, the environment gets the biggest advantages from the resulting circular economy, as seen visually in figure 4.11. (MacArthur, 2017).

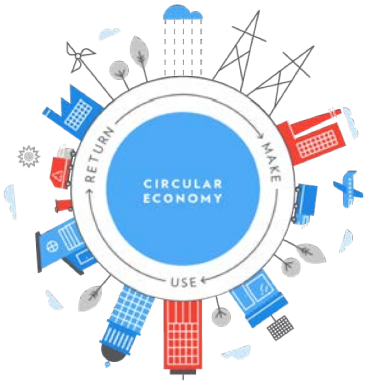


Figure 4.11. Visual Presentation of the meaning of the Circular Economy.

OPERATIONAL VISION:

"To focus on green branding and be the first to integrate circular economy into the products"

4.4. Concluded intent

To conclude the *Results from the Intention Phase* chapter, all guidelines were summed up under one headline to give a clear framework on which to ideate and build the final design. So was done with the three visions i.e. the emotive vision, the functional vision and the operational vision, to pinpoint the vision as a leading star for the creation phase in order to see if some of it, in the end, can be realisable.

THE GUIDELINES

The product should...	*convey the feeling of being Protected, Safe, Supported, Loved, Embraced, Together and Free.*
	focus on the emotional and honest design values.
	not be about efficiency, it should be about parent and child being together at all times.
	ease the transition between the home and the outdoors.
	be flexible in terms of height adjustment.
	enable movement in all directions at low speeds, but not necessarily at high speeds.
	be flexible in terms of the position of the child.
	be a closed system and the smallest common denominator in solving the core problem.
	be able to be customised by the user.
	be a focused tool set on solving the core problem.
	build upon the brand message of the Britax Römer brand.
	focus on enhancing the green aspect of the Britax Römer brand.
	utilise the red colour of the Britax Römer brand to an even greater extent than today.
	take on a more rounded aesthetic than compared to the visual brand.
	utilise the wide profiles with superimposed bold branding text from the Go-series.
	build upon either the GO- or B- naming convention.
	focus on the urban user that relies only on public transportation.
	be integrated into a subscription service and circular business model.

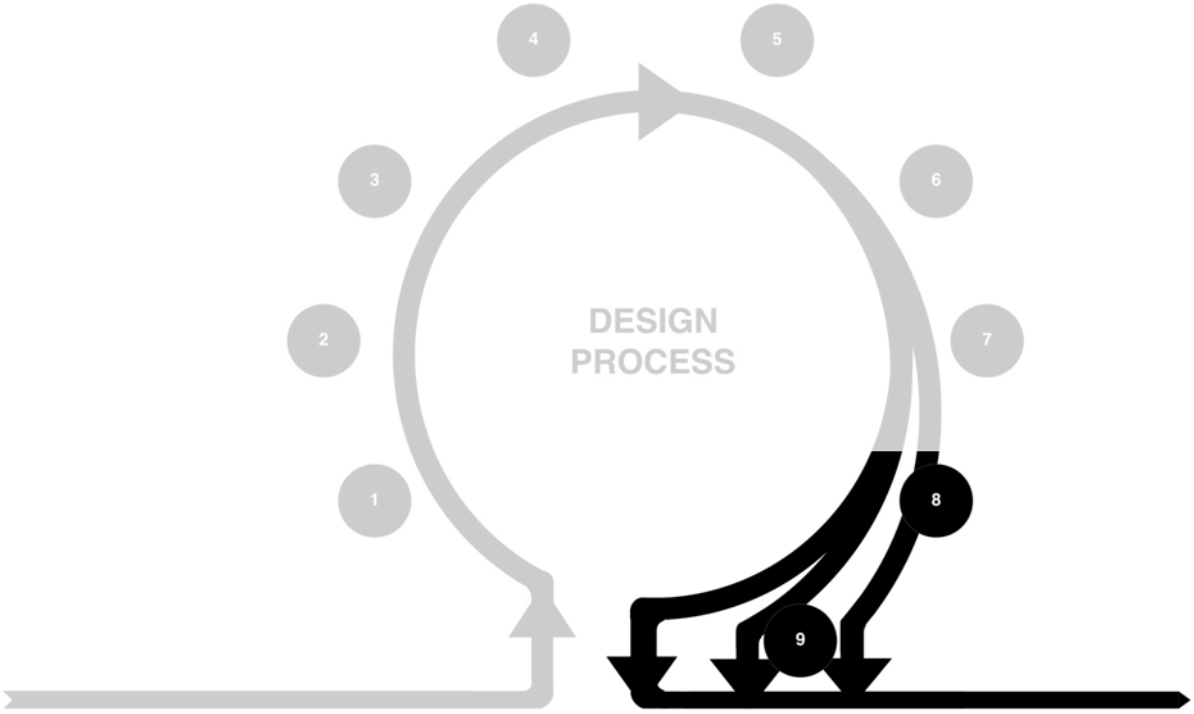
THE VISION:

"To evoke the feeling of being enabled and free, whilst being closer and safer than ever. This should be done through a seemingly magical, flexible cradle that is able to just follow wherever the driver/ parent goes and also by focusing on green branding through being the first product to fully integrate circular economy"

5

Results from the creation phase

Chapter 5: *Results from the creation phase* compiles, cross-references and discusses the result of the creation phase.



5.1. Ideation

To start the creation phase, an iterative and vision based idea development process was initialised, taking in mind the previously gathered information and insights.

VISION BASED IDEATION

Vision based ideation means to formulate what the ultimate product would be and then try to come up with how to solve it on a technical level. This is done continuously, firstly defining what delimitations to be set and then reiterating the ultimate vision based on these delimitations, as well as mainly focuses on the main stakeholders point of view. At this point, every earlier finding was only considered as a guidelines or inspirational notes in order to let the ideation stage be as free and solution neutral as possible. When ideation tend to stall, they can be good to have at hand. Following this line of argument, whilst the solution was deemed to adhere to the overall societal infrastructure, the visual representation of the core problem and framework around it at the start of ideation were no more than what is seen in figure 5.1 which is based on the system model from chapter 3.3. This means the ideation could start with the core problem and further included the aspects of time, purpose, temperature, ground conditions and lighting that needed to be considered. In the end, to insure that what had been done really helped in taking care of a baby was of outmost importance.

Figure 5.1. The system model with only the problem framework shown.

FIRST VISION - CREATION ITERATION

Firstly, to look at the product in the most overarching manner and to assess the possibilities of integrating all parts of a solution, i.e. the user it is meant for, how the core problem can be widened or more narrowed, what functional vision to include and what type of business model or ownership it is based upon, were seen as a way to come up with a better product. These four factors were then inserted into a Morphological matrix from where the process of deriving the final design could start (table 5.1.)

Table 5.1. A morphological matrix over the integration between user, user need, functional vision and type of ownership.

User group	The one who values high agility and packability						
User Need	Outside and inside	Home away from home	Task Service	Baby transportation and walking help	full outside, car and home transition	from cradle to 5 years old	All environments and activities
Functional vision	Magical Cradle / chair	Chair for adult	Focused tools	Leaning cradle / Chair	Baby exoskeleton	Baby walker	wheel- switcher
Ownership / Business model	Linear economy	Circular Economy					
	Traditional Ownership	Rental models				Buy-back	Co-ownership
		Freemium / Preemium	Subscription	Advertising	Utility	Buy- back store	Material ownership

According to the argumentation of the Emotional-, Functional- and Operational visions described in chapter four, several of the functional visions could be removed from the matrix. Further, so could also be done after trying to ideate around the possibility to widen the core problem regarding the different user needs. Two possibilities were also removed regarding the type of business model / ownership that were to be integrated into the product. In table 5.2. the possible needs, visions and types of ownership that were left at this point is represented.

Table 5.2. Morphological matrix with the unrealistic or unfitting alternatives removed.

User group	The one who values high agility and packability						
User Need	Outside and inside	Home away from home	Task Service	Baby transportation and walking help	full outside, car and home transition	from cradle to 5 years old	All environments and activities
Functional vision	Magical Cradle / chair	Chair for adult	Focused tools	Leaning cradle / Chair	Baby exoskeleton	Baby walker	wheel- switcher
Ownership / Business model	Linear economy	Circular Economy					
	Traditional Ownership	Rental models				Buy-back	Co-ownership
		Freemium / Preemium	Subscription	Advertising	Utility	Buy- back store	Material ownership

From this point, in order to inspire and guide the continued design process, an ultimate vision of a product-service system was created, based on the opportunities of continued ideation, this would be fulfilled to the largest extent possible while the other, not removed, possibilities in the matrix were still options to choose.

ULTIMATE VISION: THE *MAGICAL* CRADLE

Of all the functional visions, it was still that of *"a seemingly magical and flexible cradle that follows you wherever you go"* that was deemed to have the greatest impact and potential as a solution as well as what the baby carriage intuitively ought to be. As mentioned in chapter four, the child is then meant to be in a position equivalent to floating in the air at waist level of the driver and always be within reach for the parent without him/her having to bend or reach forward. Further, the bubble-like zone in which the child either lies (if he or she is very young) or sits will offer a protection against: light, temperature, disease and un-comfort (figure 5.2.).

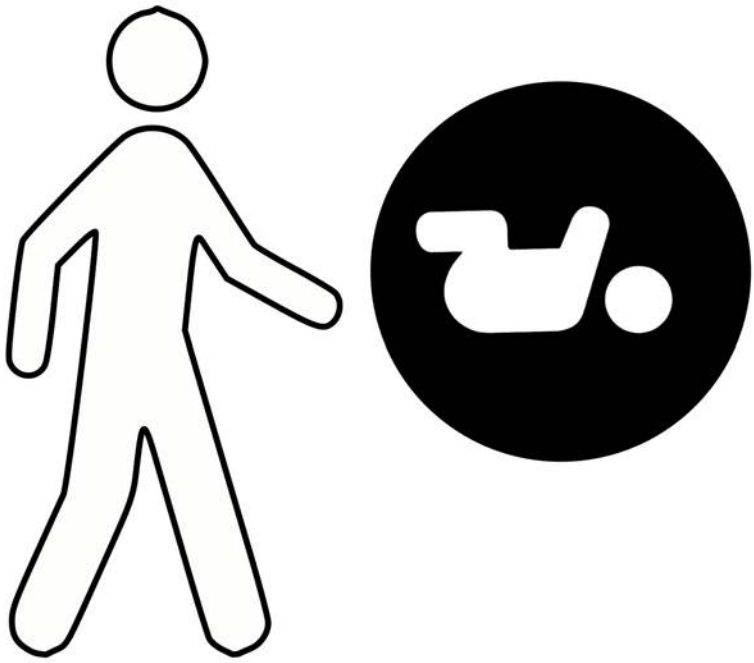


Figure 5.2. Visual representation of the *magical* cradle.

This bubble would be dynamic through both height adjustability, direction of movement as well as position during movement as seen in figure 5.3, 5.4 and 5.5. This was deemed as the ultimate solution if it could also focus on being the *home away from home* for the users whilst still having the transition between outdoor, indoor and car as an integrated feature. Further, the ultimate was also deemed so that if the solution could be part of a bigger rental service, there would be a large gain for the user; mainly in terms of safety for the parent as it means that the family does not need to tie themselves to a certain *bubble.* So if the need changes the family is able to change the *bubble* to a different type that fits them better. This would be in line with the advantages for the environment and Britax can *reap* the benefits of a circular economy.

Figure 5.3. The child situated above the waist of the parent when strolling or interacting normally.

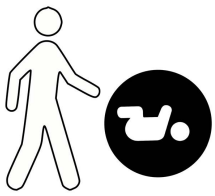


Figure 5.4. the child situated below the waist of the parent when riding a bus or sitting on a bench etc.

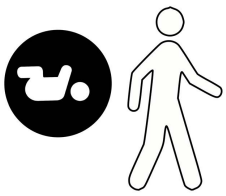


Figure 5.5. The child situated behind the parent when crossing a road or getting through doorways etc.

SECOND VISION - CREATION ITERATION

Trying to realise this vision, several iterations towards a more tangible product that adheres to the actual laws of physics had to be made .i.e. realising the design intent through engineering. However, to start narrowing down the project in order to not be overwhelmed by choices whilst still not taking anything for granted, only what was solely derived through argument was set as requirements. Firstly, in order to keep the child at waist level most of the time and be able to flexibly change the height position at different occasions, some form of *elevation* or *collapsible structure* was needed in-order to counteract gravity. Secondly, in-order to get the structure to be able to move, some form of *friction reduction* between the structure and the ground was needed. Finally, in some way *kinetic energy* must be able to be added in a way where the solution can stay beside the parent at all time. As this was realised, these three areas could be mapped out in terms of categories containing all types of solutions that have been invented so far and compiled into a morphological matrix with the three requirements: *Elevation/ structure*, *Friction reduction* and *Kinetic Energy* listed on the y-axis (figure 5.3.).

Table 5.3. Morphological matrix over Elevation/ structure, Friction reduction and Kinetic Energy.

Elevation / collapsible structure	Rigid Origami	Guiding Rail / Screw	Rotatable arms/ Scissor mechanism / Parallelogram / crankshaft	Tensegririty structure	Deconstruct-able structure	Inflatable / Deflatable structure	Tensile / Foam structure	Telescopic / stackable structure	Inverting structure	Rollable / Bistable structure
Potential to Kinetic energy	Human power	Animal power	Mechanically Stored energy	Chemically stored energy	Electrically stored energy	Stored pressure to thrust	Atomic energy	Ellastic / Innelastic collsions	Thermally stored energy	Radiant energy
Friction reduction	Wheels / Rolling	hover / Maglev / Vaccum	crawling / climbing	Skid / Spinning	Vibrations / Jumping / Hopping	Lubricant / Slithering	Walking	pressure / sailing	Hanging / Brachiation	Fluid friction / Flight / swimming

Then, in the same way as with the previous morphological matrix, there was a large amount of options that, for several reasons, was not realisable. Some reasons were the overall complexity of some of the solutions, inherent safety concerns, their implications on the overarching system etc. The result of this can be seen in figure 5.4.

Table 5.4. Morphological matrix with the unrealistic or unfitting alternatives removed.

Elevation / collapsible structure	Rigid Origami	Guiding Rail / Screw	Rotatable arms/ Scissor mechanism / Parallelogram / crankshaft	Tensegririty structure	Deconstruct-able structure	Inflatable / Deflatable structure	Tensile / Foam structure	Telescopic / stackable structure	Inverting structure	Rollable / Bistable structure
Potential to Kinetic energy	Human power	Animal power	Mechanically Stored energy	Chemically stored energy	Electrically stored energy	Stored pressure to thrust	Atomic energy	Ellastic / Innelastic collsions	Thermally stored energy	Radiant energy
Friction reduction	Wheels / Rolling	hover / Maglev / Vaccum	crawling / climbing	Skid / Spinning	Vibrations / Jumping / Hopping	Lubricant / Slithering	Walking	pressure / sailing	Hanging / Brachiation	Fluid friction / Flight / swimming

From this point in time, again, a vision was derived that was deemed to be, in its overall approach, the ultimate product based on the limitations that were set at this point in time.

VISION 2050: THE CRADLER

If the solution is meant to follow the parent every step of the trip and travel wherever the a human is able to go; the solution should be based on the same principle of locomotion as the human i.e. meaning to be powered by legs. Human-beings are based on the principle called *bipedal drive* but there are many different forms of this principle usually defined by the amounts of legs involved. An 8-legged configuration of this principle can bee seen in the vision for 2050 called *the cradler* as visually represented in figure 5.6.

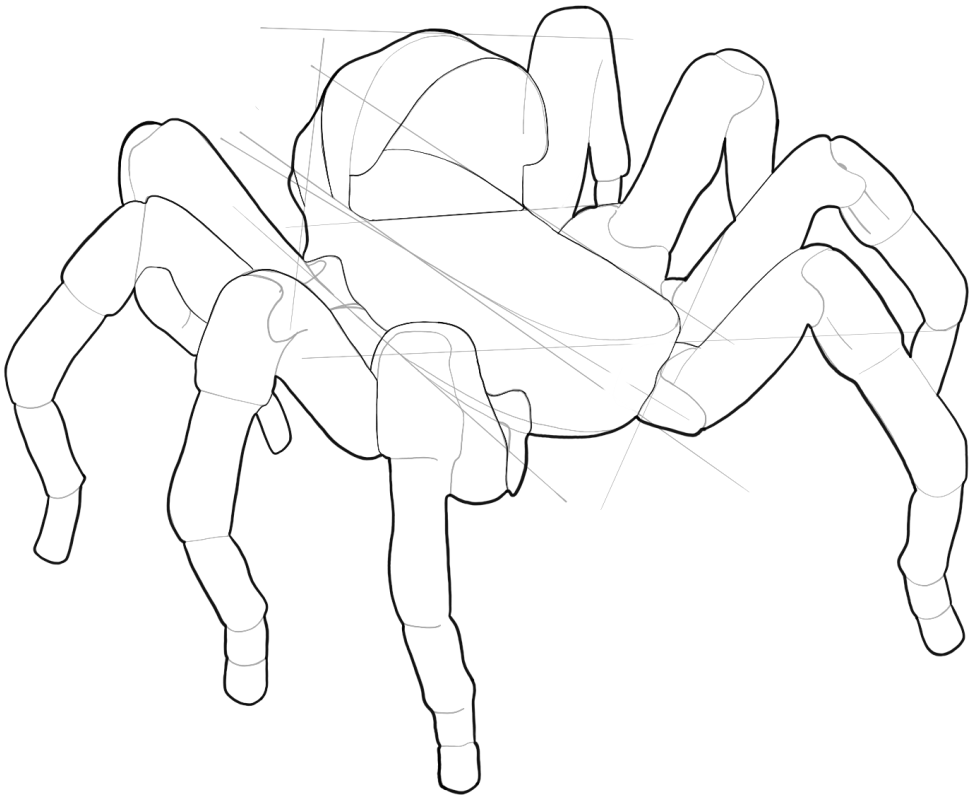


Figure 5.6. Visual representation of the Cradler.

Further, a leg driven solution means it can be adapted to perform the best when operating at the same speeds as the human-being and can adapt to different terrain and weather conditions as well as with different heights of the cradle. A real-world example of this type of robotic-motion model can be seen in the Boston Dynamics *BIG DOG* robot (figure 5.7.). Further, such a product would be based on a mechatronic system which means a combination between a mechanical structure and electronic computer system including sensors and actuators (figure 5.8.).

Figure 5.7. The Boston Dynamics *BIG DOG.*

Figure 5.8. A mechatronic system of computer, sensors and actuators.

THIRD VISION - CREATION ITERATION

As this vision is still far from realisable (at the time of writing), due to technical, operational and economical limitations, the work continued with a third iteration towards a more plausible solution where the requirements of the morphological matrices were extended to every possible variant there is within each sub-category. As this was achieved, the three areas could be mapped out in terms of all relevant types of solutions that humanity has come up with so far and compiled into a morphological matrix with the three requirements, *Elevation/ structure*, *Friction reduction* and *Kinetic Energy* listed on the y-axis (table 5.5.).

Table 5.5. Expanded morphological matrix over Elevation/ structure, Friction reduction and Kinetic Energy.

Elevation / collapsible structure	Guiding Rail / Screw	Rotatable arms/ Scissor mechanism / Parallelogram / crankshaft				Telescopic / stackable structure					Inverting structure	Rollable / Bistable structure		
Variants	Screw	rotatable arms around center	crankshaft	Scissor mechanism	Parallelogram	telescopic arm	Outward Stacking	Inward stacking	male to female	Puzzle / Tetris	Inverting structure	structurally stable in one direction	detachable linkage	bistability / one way rolling
Potential to Kinetic energy	Human power										Electrically stored energy			
Variants	Pushing	Pulling	Pedal power	Cranking	Harness	Skating	Skiing	Trikke power	Rowing	wheelchair / direct power	Direct drive / hub motors	Powertrain	touch- less magnetic drive / Flywheel	electric drive wheel
Friction reduction	Wheels / Rolling								crawling / climbing	Walking	Skid / Spinning			
Variants	Caster Wheels	Ball wheels	Omnidirectional	Ackerman steering	Differential steering	Independant drive	Articulated drive	Tricycle	Multi-pedal	Bi-pedal	fixed wheels	Catterpillar wheels	Crab drive	Skids
Following	Push Handle	Pull handle	Mechanical steering tiller	Mechanical steering handle	Mechanical steering wheel	harness	pulling string	direct grip	differential steering levers	Remote control	Steering input	Gps based	bluetooth / NFC tracking	Robot with sensors

For a third time, there was a large amount of options that for several reasons were not feasible. The reasons this time were more related to user interaction where some solutions required too much of the ”driver”, it was to invasive on the relation between parent and child or it was based on large movements. This resulting morphological matrix can be seen in table 5.6.

Table 5.6. The expanded morphological matrix with the unrealistic or unfitting alternatives removed.

Elevation / collapsible structure	Guiding Rail / Screw	Rotatable arms/ Scissor mechanism / Parallelogram / crankshaft				Telescopic / stackable structure					Inverting structure	Rollable / Bistable structure		
Variants	Screw	rotatable arms around center	crankshaft	Scissor mechanism	Parallelogram	telescopic arm	Outward Stacking	Inward stacking	male to female	Puzzle / Tetris	Inverting structure	structurally stable in one direction	detachable linkage	bistability / one way rolling
Potential to Kinetic energy	Human power										Electrically stored energy			
Variants	Pushing	Pulling	Pedal power	Cranking	Harness	Skating	Skiing	Trikke power	Rowing	wheelchair / direct power	Direct drive / hub motors	Powertrain	touch- less magnetic drive / Flywheel	electric drive wheel
Friction reduction	Wheels / Rolling								crawling / climbing	Walking	Skid / Spinning			
Variants	Caster Wheels	Ball wheels	Omnidirectional	Ackerman steering	Differential steering	Independant drive	Articulated drive	Tricycle	Multi-pedal	Bi-pedal	fixed wheels	Catterpillar wheels	Crab drive	Skids
Following	Push Handle	Pull handle	Mechanical steering tiller	Mechanical steering handle	Mechanical steering wheel	harness	pulling string	direct grip	differential steering levers	Remote control	Steering input	Gps based	bluetooth / NFC tracking	Robot with sensors

Yet again, proceeding with this rationalisation, a vision was outlined that was deemed to be the ultimate product in its overall approach, based on the limitations that were set at this point in time.

VISION 2030: THE STRAFER

This vision, called *the strafer* (figure 5.9), is closer to reality than but for several reasons not a product still possible for mass production. If *bipedal* drive now was out of the question, the second best kind of friction reduction and drive type would be based on wheels and electric motors. This is so as the larger system that the product adheres to, i.e. the infrastructure of society, is designed for humans, domestic animals and vehicles that are based on either walking- or wheeled locomotion. Further, to make sure the solution follows the parent every step of the journey, the cradle is directly attached to a gas spring that can quickly raise and lower it. This gas spring also works as a joystick for the lower base meaning the parent can pull or push the cradle in any direction and the base responds.

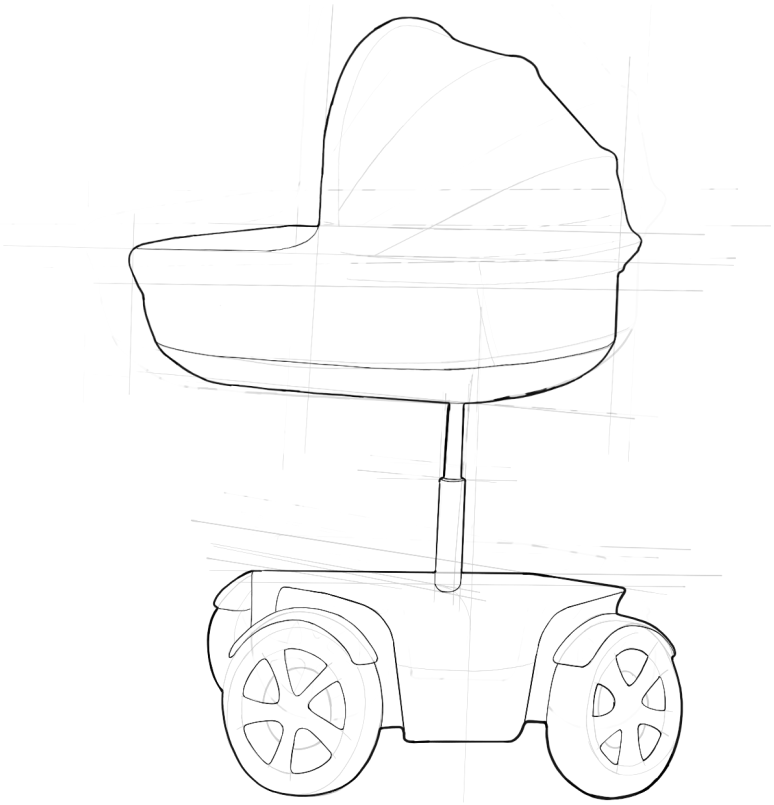


Figure 5.9. Visual representation of the Strafer.

This concept is achieved through four electric motors each attached to a wheel making it based on a so-called independent drive (figure 5.10.). In this configuration, all four wheels can turn independently of one another allowing *the Strafer* to drive sideways as well as turn on the spot. A real world example of this is the EO Smart Connecting Car 2 (figure 5.11.).

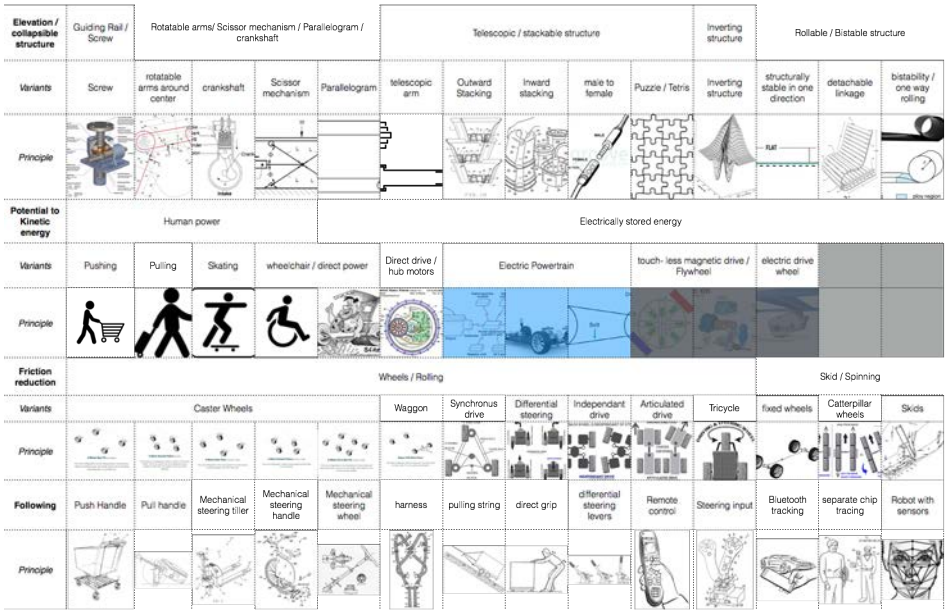
Figure 5.10. Visual representation of an independent drive

Figure 5.11. The EO Smart Connecting Car 2 in rotation mode.

FOURTH VISION - CREATION ITERATION

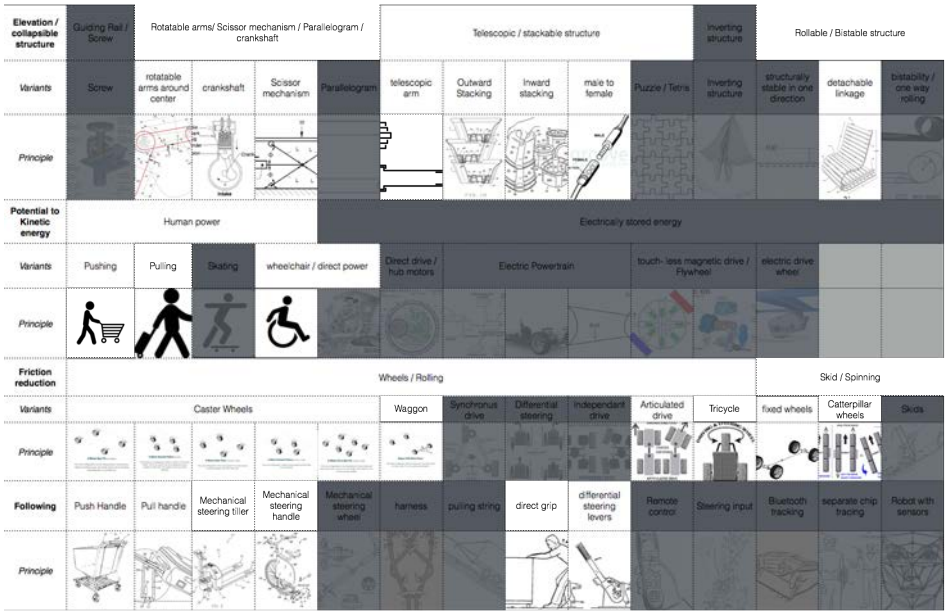
Beyond this, it was not the realisability of the product anymore that would define what direction the design should take as most of the ideas and principles at this point were deemed as fully plausible to produce. To move on, the alternatives were now visualised with pictures of their principle in order to facilitate the argumentation and ideation for how to create a design that in some way fulfils the ultimate vision of the *flexible cradle.* This resulting morphological matrix can be seen in table 5.7.

Table 5.7. The final morphological matrix with images representing each principle.



Then, for one last time before a large modelling and conceptualisation stage began, the final types of solutions were removed due to their implications on either the parent or the child in terms of what they would mean for the user experience and how they did not add in terms of realising the ultimate vision. The resulting morphological matrix can be seen in table 5.8.

Table 5.8. Morphological matrix with the unrealistic or unfitting alternatives removed.



5.2. Concept generation / Synthesis

When the time came to combine the ideas and principles into concepts, testing was primarily made through sketch modelling and creating small scale mockups. At this stage, outer functions had to be be tested in the intended, full, scale by fast modelling materials. Technical principles could, however, be tested by the help of smaller technical models, as seen in figure 5.12.

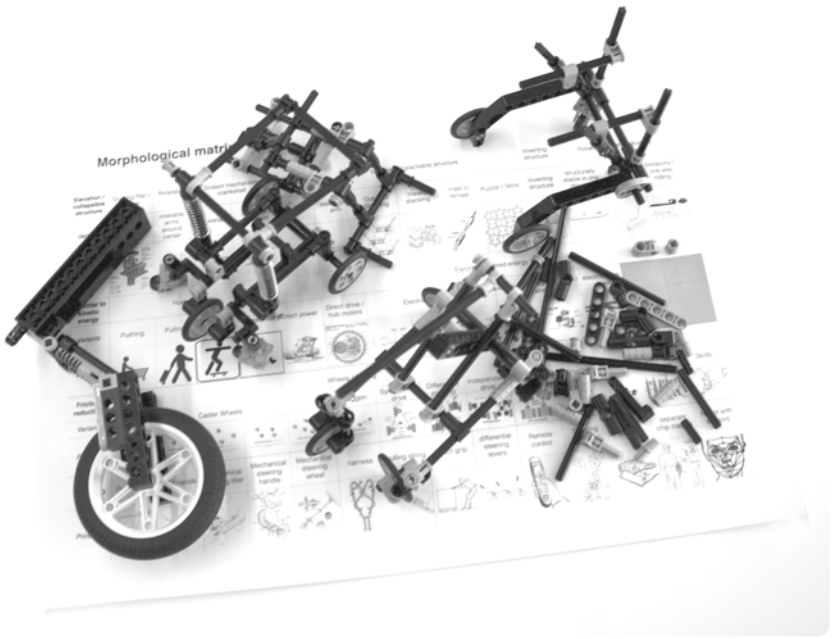


Figure 5.12. The different lego models that were built for testing technical principles and a printout of the final morphological matrix.

TESTING COMBINATIONS

As the final morphological matrix indicated a similar overall concept to that of the normal travel system, a deeper investigation into the possible conceptual improvements that could be achieved was made parallel to this effort. However, although being narrowed down to a wheel based principle, there was still allot of creative freedom left regarding both choice of wheel configuration and elevation principle as well as what would add kinetic energy to the solution and how it would be driven alongside the parent. There was also the implications to try to integrate the final physical product design with a subscription service and the gained focus that was enabled by doing so, as mentioned in chapter 4.2. *Functional Vision.* To quickly iterate possible product compositions, technical models were made in lego in which technical principles, such as caster wheels, could be tried in several different combinations. As a result, mainly three types of elevation principles and three types of wheel configurations were deemed relevant in achieving the *ultimate* vision and lead to a total of three lego-model combinations. Adding kinetic energy to the equations were recurrently considered best achieved through either the parent pushing or pulling and whilst doing so also navigating the product. Although different pushing and pulling handles, harnesses and tillers were tried, not having any handle at all but rather an integrated place to hold in the same part within which the child were lying or sitting as it was was deemed the most *emotionally connecting* and *direct* solution.

Firstly, a lego model was made for testing the combination of a lever lifting mechanism and a centred rotation point around the user (figure 5.13). Further, a lego model was made for testing a combination of a dual frame scissor lift and four rotating casters (figure 5.14). Finally, there was a lego model made for testing a combination of a lifting frame based on two gas springs and a wheel configuration with rear mounted casters (figure 5.15.) The result of these tests was ultimately that the second combination including four caster wheels was not an optimal solution as this would mean at least two of them would have to be really big in order to transfer gracefully over obstacles and, in turn, have a large casting radii. Also the elevation principle was deemed to complex and meant a high risk of pinching the user´s fingers if used often.

Figure 5.13. A lego model for testing a combination of lever lifting mechanism and a centred rotation point around the user.

Figure 5.14. A lego model for testing a combination of a dual frame scissor lift and four rotating casters.

Figure 5.15. A lego model testing a combination of a lifting frame based on two gas springs and a configuration with rear mounted casters.

CONCEPT: **THE LEVER**

Overall Concept

One of the lego models, with some alterations, became *concept Lever,* primarily a combination of a lever lifting mechanism and a centred rotation point around the user (figure 5.16.). The Lever concept consists of a regular baby carriage wheel configuration with the rigid wheels in the rear, where the driver stands, and with caster wheels in the front (figure 5.19.). A difference to regular travel systems however is the centred rotation point which is achieved through letting the rigid rear wheel be extended on each side of the driver. This means the rear wheels turn around the same axis as the driver does and the concept can thereby be rotated around the body of him or her.

The elevation is based on a, in terms of mechanical construction, very sophisticated lever lifting mechanism (figure 5.17) due to its overall simplicity. The mechanism works by a large lever, for the user to pull, and which lifts the wanted object whilst also staying completely horizontal, either guided by rail or gravity. In this case, the wanted object is the bassinet which can quickly be adjusted in height with minimum effort. There is also the possibility of going sideways by lifting up the rear, rigid wheels and thereby only letting the caster wheels touch the ground (figure 5.19) and thereby being able to push the product in whatever direction wanted.

In this concept the child is reachable at all times as the lever handles do not get in the way between driver and driven. The concept also opens up for the possibility to have an integrated handle in the bassinet during the first months of use. At any time, the concept can be turned around the axis of the driver and go into a dragging mode, much resembling a tuk-tuk.

Figure 5.16. Sketch representation of the *Lever* concept.

Figure 5.17. Lever lifting mechanism

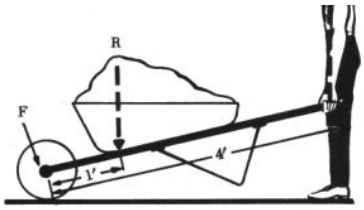


Figure 5.18. The wheelbarrow effect.

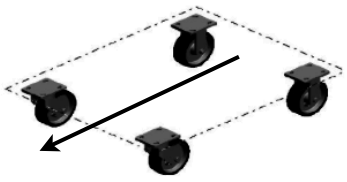


Figure 5.19. centred rotation point around the user.

Platform based rental model

The concept was also meant, as mentioned earlier, to be part of a bigger product service system meaning implications regarding both rental model and physical integration. In this case, a platform based rental model meant the user initially rents the frame from Britax ltd. together with a cradle unit. By letting the cradle unit be detachable from the frame, as traditionally solved, it would then be swapped at a retailer for a seating unit when the child has grown to a certain age. Further, the physical integration extended to where the concept had to be designed for stack-ability, and the possibility of taking only the cradle or seat part with you on flights and trains etc. This was solved by letting the frame be tapered like a shopping trolley and thereby able to slots into several other baby carriages at the airport or train station.

CONCEPT: **THE LEANER**

Overall Concept
Another lego model turned into *concept Leaner,* after some slight modifications and developments. The concept was primarily a combination of an elevating frame based on two gas springs and a wheel configuration with rear mounted caster wheels (figure 5.20.). In order to get a more stable and agile driving characteristic, the concept was based upon a wheel configuration with rigid wheels in the front and rear mounted casters (figure 5.23.). Such a configuration means that the rigid wheels almost plow through the environment and act as a stable point in the front. This is in contrast to the typical wheel configuration of most baby carriages where both driver, whom can also be seen as a point of stability, and the rigid wheels are both located in the back of the baby carriage, leaving the front with the looser castor wheels to take up much of the weight in lateral inclination etc. Also, this alternative configuration means there is a smaller leverage between the castor wheels to the centre of rotation in relation to the leverage of the handle. That means the concept is easier to steer, especially with one hand.

The elevation functionality is based on gas springs (figure 5.21.), integrated into the telescoping frame which means that the bassinet can be quickly raised or lowered with little or no effort. This was also regarded as a very simple, and thereby sophisticated, solution to the elevation functionality that would mean basically no risk of pinching or getting caught in the frame. In the bassinet mode, the handle is integrated for a close relation to the child whilst when in sitting mode, a handle can be folded over for pushing but also for dragging in both modes. By having a centred fulcrum, much as in ordinary baby carriages to get over obstacles and seen in figure 5.22, although with castors mounted at the very tipping point means the concept can be driven in any direction when in this mode.

Figure 5.20. Sketch representation of the *Leaner* concept.

Figure 5.21. The lift is based on gas springs.

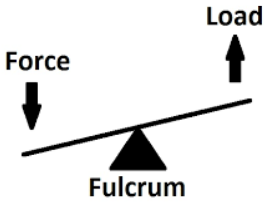


Figure 5.22. A centred fulcrum.

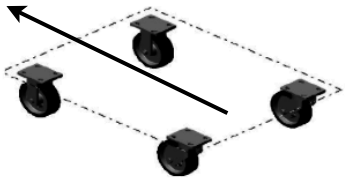


Figure 5.23. Configuration with rear swivels

Trade in- based rental model
The integration of this concept with a bigger product service system was achieved with a trade-in based rental model, meaning the user initially rents a complete baby carriage focused on only carrying children in a cradle to then be swapped in for a carriage that is solely focusing on a seated position. Further, stack-ability was incorporated by letting the frame be foldable at the joints connecting to the gas spring. When in the contracted mode, the length of the telescopic part and the lower- as well as upper frame is equal and can thereby be folded up into a small package. The possibility of taking only the cradle or seat part with you on flights and trains etc is achieved by a plastic inlay that is inserted into the protective shell of the baby carriage.

MODELING, CONCEPT EVALUATION AND CONCEPT CHOICE

The concepts were primarily evaluated through crude model making and Pugh matrices were utilised to compile as well as clarify the results. The concepts were related to the customer journey map in terms of what number of steps an action required. Finally, the concepts were evaluated in terms of how well they fulfilled the overall vision and absolute emotional intent.

Firstly, a full scale functions model of the *Lever concept* (figure 5.24.) was constructed. The model was based on a walker, which also was the inspiration for the functionality of a rotation point in the middle of the driver, utilised for its frame and wheel configuration. The child was meant to lie or sit in a child seat that was taken from the Go Big reference product provided by Britax. The wheelbarrow functionality was integrated by two extendable table legs and the entire construction was held together by cable ties.

A full scale functions model of the *Leaner concept* was also constructed (figure 5.25.). This one was made mainly from the parts of the Go Big Travel system provided by Britax; the frame constituted the Go Big frame, rotated backwards, in order to get the rigid wheels in the front. The bassinet was attached to the frame through some office equipment to get the right height. Also this construction was hold together by cable ties.

After extensive, practical evaluation of the two functions-models, the pros and cons of each constellation became evident. The *Lever* concept was deemed very agile and the wheelbarrow functionality worked surprisingly well. The direct access to the child that was enabled by almost being, as a driver, surrounded by the product was also considered a great experience. However, the cons of this design was the intrusion that was made from the very sprawling and unintegrated layout. The steering tillers were pointy, sticking out towards the sides of the driver and whilst this unobtrusive design gave a great connection with the child, it also made the driver feel boxed in. The concept also made the transition between standing besides the product to driving it clumsier and thereby compromised on the *Usable* and *Essential* evaluation criteria. The *Leaner* concept, however, performed quite the opposite as the integrated functionalities such as the centred fulcrum did not work quite so smoothly as it was difficult to achieve and maintain a small incline while moving sideways. Further, the fulcrum, or pivot point, also moved as the caster wheels shifted between the forward and backward position. Most problematic, however, was that as the casters were leaned into a significant incline, when trying to pass an obstacle for instance, they risked quickly swivelling from the backward to the forward position and thereby creating a judder in the construction. Positive, however, was the extensive integration that enabled a transition between driving and not driving as well as pushing and pulling the concept. Finally, the absences of anything resembling an external handle, but rather holding in a part much more directly linked to where the child was also lying in, was deemed a positive thing as it enabled a much closer and more direct connection between parent and child.

Figure 5.24. Full scale functions model of the *Lever concept.*

Figure 5.25. Full scale functions model of the *Leaner concept.*

5.3. Concept Refinement

The final stage of the project involved extensive concept refinement that meant seeking out the essence of what the concept were about and then perform more testing and detailing of the final design (figure 5.26.). This detailing affected the functions as well as the visual branding of the final design. The marketing and message were developed in concert with the development of the product and the final touches were achieved through surface design and digital visualisation.

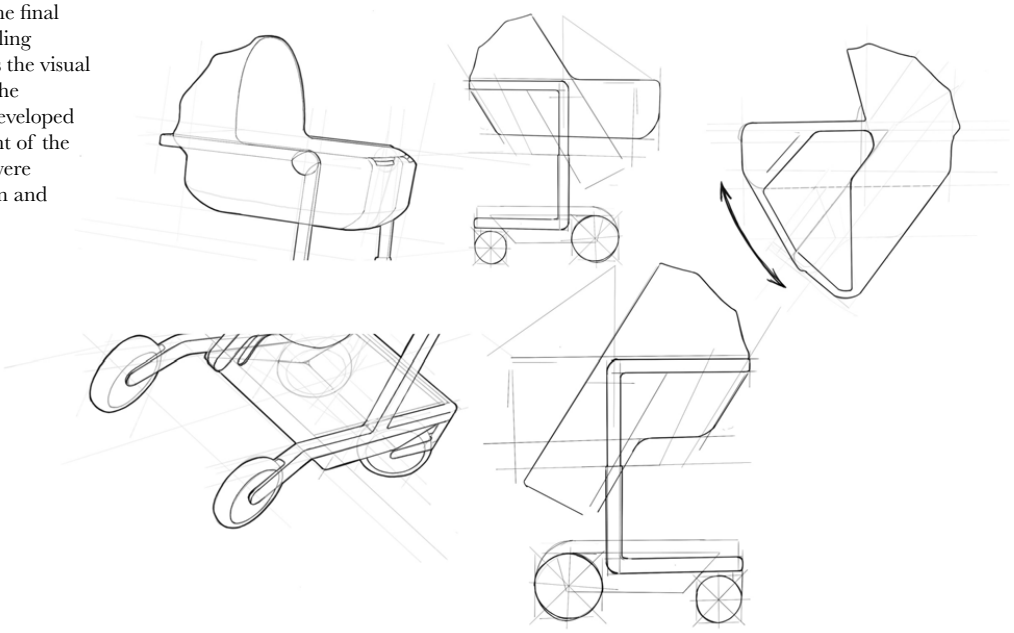


Figure 5.26. Bits and pieces from the two concepts that were to be combined.

CONCEPT CHOICE

As mentioned in the methodology chapter, a final concept choice was to be made. As a combination of several concepts was considered to fulfil the evaluation criteria the best, (cf. *modelling, concept evaluation and concept choice)* there was no clear winner between the two concepts. A combination of the two concepts was sought where the compromises that come from trying too achieve to much was avoided. This meant trying to find a combination that included the wheelbarrow functionality, an ordinary wheel configuration, the well integrated and unobtrusive handle and the transition between pushing and pulling.

The concept was also to be part of a product-service-system (PSS). Whilst the service part of the concept was not developed in detail, it was meant to be part of the concept in order to see what a full integration between the subscription service and the physical product would mean for the final design. The service was therefore derived from the ultimate vision (cf. chapter 4.4), i.e. a subscription service providing safety and exchangeability for the user.

SEEKING THE ESSENCE

As the overall direction of the final concept was chosen, it was very important to find the essence of the concept in order to achieve the type of *product self-awareness* (cf. chapter 2.1) that was strived for. By doing so the final product could be designed with great clarity, as exactly what it should and should not be about could be derived from that essence. Thereby, before taking for granted the final design based on how the chosen concept parts were visualised, the *essence,* or underlying idea, was formulated in an overarching but short sentence.

As the project, at this point in time, resulted in both an overall product-service system concept on a operations level as well as a more user specific product concept, two conceptual essences were outlined. The essence of the operational concept was deemed to be the following:

A subscription service for taking care of a child including a bassinet modular platform and exchangeable, rented base chosen based on need.

Further, the essence of the user specific concept was concluded as:

A flexible combination of frame and wheels that enable the child to be within reach at all times whilst maximising agility and storage-space.

Figure 5.27. A functions model combining the wanted functionalities from the *Lever* and the *Leaner* concepts

Figure 5.28. The Tente *Integral* wheel was deemed a great technological showcase of how the caster wheels could work.

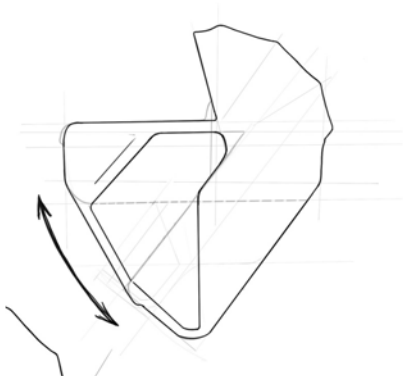


Figure 5.29. A logical and intuitive transition between the lying and sitting mode was researched.

TESTING AND DETAILING

Combining the concepts

The final design was determined through an iterative process, primarily consisting of making a model in full scale in order to get the actual emotional output from the final design. A functions model combining the desired functionalities from the *Lever* and the *Leaner* concepts, (figure 5.27.), was accomplished including all the functionalities except for the height adjustability of the cradle and extendability of the luggage compartment. The functions-model was put together in order to be able to determine the final, functional details of the conceptual travel system. The ultimate configuration was deemed to be a combination of the two concepts: the Lever and the Leaner (cf. chapter 5.2.). The way the *Lever* concept behaved with the wheel barrow functionality was deemed very well whilst the more clear and integrated shape of the *Leaner* concept was preferred. The final model thereby focused on integrating the wheelbarrow functionality into the sides of the bassinet instead of as pointy handles sticking out.

Functional details

As more detailed functionalities of the concept were investigated, a visit to Tente, a global manufacturer and retailer of caster wheels, was made. There, several caster wheels and wheel configurations where tested together with a sales representative. Although Tente was primarily focused on manufacturing wheels for indoor use on flat warehouse floors, the ideas and functionalities their wheels showcased were regarded able to be utilised but in a wheel made for an outdoors environment. The Tente *Integral* wheel (figure 5.28) had an integrated locking mechanism that prevented the wheel from turning, fitting for when the concept would travel over bumpy roads and essential when taking the escalator with the front wheels touching the stairs. Further, the wheel could also be locked by wire meaning that the functionality could be placed at the fingertips of the user. The Tente *Integral* wheel was regarded as a suitable technological showcase of how the actual caster wheels could work and was therefore integrated into the final concept, thereby leaving the outdoors adaptation for further product development.

Full integration

As the subscription service part of the concept meant that the user was not tied to the product they first ordered. They could change the type at any time and thereby get a product that better fits their needs. For the concept, this also meant the possibility of a focus on specific needs not otherwise available. In order not to compete with really lightweight strollers, such as umbrella strollers for use when the child can walk most of the time, and at the same time compete with prams focused on the very first years of the child's life, a product focusing on the time from birth to the day that the child starts walking on its own were considered to be the most reasonable alternative. Whilst this meant the concept did not need to be extremely lightweight or foldable for those last years when it is used just in case the child gets tired, it still meant it had to incorporate both a lying mode as well as sitting mode. Following this, a logical and intuitive transition between the lying and the sitting mode was researched (figure 5.29.). It was regarded as logical and intuitive if the head of the child could always remain at the same level, in order to keep the possibility of eye-contact between the parent and child, whilst as the child grew, her or his body would be rotated downwards into a sitting position. The possibility of the protective shell being able to morph from the first position to the second was deemed possible by integrating a *double soft top* functionality into the concept, with one mounted to cover the head of the child, as in how baby carriages works today, whilst the other was mounted up-side down by the feet of the child. The subscription service was also meant to enable easy subscribing, renting, exchange, repair, and an overall feeling of safety. A *store-in-store* experience and train-station/airport hub was therefore fundamentally integrated into the concept, both through designing the overarching look and brand connection of these features but also by enabling high stack-ability of the carriage concept. The circularity of the concept meant the frame and wheels had to be made of more lavish, durable materials whilst other parts that would endure staining ought to be materials that was cheap and easily replaced between users. It was also considered that the bassinet and seat part of the baby carriage should be kept by the user and could therefore act as the ticket into the subscription service.

VISUAL BRAND DETAILING, MARKETING AND MESSAGE

Brand message
As the final design was considered best to adhere to the overall brand message of the Britax Römer Brand (cf. chapter 4.3.); the brand message that was meant to be conveyed by the final concept was the following: The marketing material, the naming convention of both service and product as well as the overarching name of the product-service system were to convey first and foremost safety and being together whilst being empowered and free. Further, also an added emphasis on environmental friendliness was meant to be conveyed.

Visual brand
As the final design was decided not to adhere to the overall visual brand of Britax Römer (cf. chapter 4.3), related to research by both Arnheim (1974) as well as Bar and Neta (2006) about how an aggressive annotation can be derived to angular shapes due to its confrontation with the surroundings whilst more rounded shapes do not, a more round aesthetic was developed (figure 5.3.). Also, to further support this argument; according to Zhang, Feick and Price (2006), rounded logos are perceived as more harmonious than angular ones. Despite this decision not to adhere to the overall design language, a visual brand assessment was performed in order to ensure a connection to the brand heritage and brand recognition through some of the concept details. The result from this was visual brand details, such as the rear wheels and wide aluminium bars of earlier Britax travel systems, was kept (figure 5.31.).

Naming
As the final design was considered best to adhere to the brand naming conventions of Britax, (cf. chapter 4.3.).; fitting names that related to this precedence was investigated. Names for both the overall product-service system and the user specific product was sought after whilst also trying to make them somewhat clearer than previous Britax Römer brand names. The resulting argumentation considered (as the GO moniker related from *going*, i.e. an action performed over time) that the GO- brand should be related to the services part of the concept whilst the B- brand (as the B- moniker relates to *being* i.e. having physical presence) should be related to the physical parts of that product-service system concept. Further, the product service system was thereby going to be called either GO - Unlimited or -Limitless, both hinting to the subscription and circular economy parts of the concept. The choice ultimately fell on *GO Unlimited*, a name only found to be used by the *National Belgian Railway Company* for ticket purposes (SNCB, 2017) and thereby regarded as acquirable. In the same way, the logo for the GO brand (figure 5.32) was developed and meant to convey, not only the word go, but also circularity and infinity through symbolics. Thereby, the branding would also convey the more environmentally friendly aspects of the concept. For the user specific product, the name B-Urban was investigated and whilst considered to be close to Bourbon, a whiskey type of liquor, the parallel was considered as affordable.

Figure 5.30. A more rounded aesthetic was developed.

Figure 5.31. Visual brand details such as the rear wheels and wide aluminium bars was kept.

Figure 5.32. The logo for the GO brand was developed and meant to convey the symbol of infinity.

Figure 5.33. A sketch of the final concept incorporated features inspired from the Brno chair, famous for its endless tubular steel design.

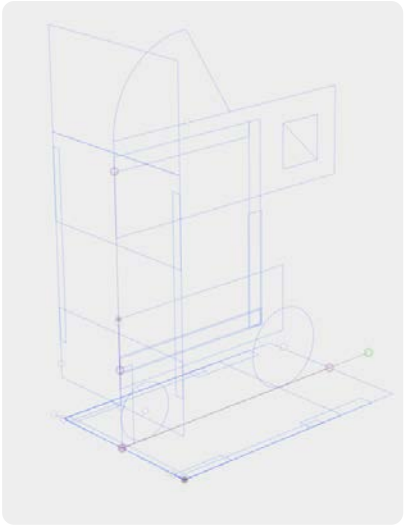


Figure 5.34. Development of the proportions of the final design within Fusion 360´s constraint-view.

Figure 5.35. Physical investigation into the dimensions and functionalities of the final design.

DIMENSIONALITY'S AND PROPORTIONS

As the enclosing surfaces of the design were starting to take shape, a frame constituting an unbroken line through the design was incorporated, inspired by the Brno chair (figure 5.33.). It acted as a bumper to evoke the feeling of safety and protection, of parent and child, in the design. Further, the development of the proportions of the final design was achieved with the help of the constraints view in Fusion 360 (figure 5.34.) that enables the designer to both see the overall proportionality but also to see how moving parts will work in relation to eachother.
The golden ratio was considered during this process both in terms of how the different volumes related to each other, as well as how the negative space related to the overall shape of the product and in how the frame cut the product into two separate segments. Further, also the relation between the height and perceived dominance, relevant according to Rompay, Hekkert, Saakes and Russo (2005) was considered when creating a tall product concept.

Further, an investigation into the dimensions and functionalities of the final design was achieved parallel to creating the final aesthetics model (figure 5.35) that was also made for presentation purposes. From this model, as well as the two reference products, measurements were taken on which the dimensions of the final design was based. The aesthetics model was also, afterwards, created from the parts of the Britax GO Big reference model. Furthermore, Siemens Jack was also used to give an ergonomic input to the final design as the final concept meant an interaction with physical objects, not a given in the beginning of the project. The program helped with the placement of the buttons activating the gas springs for adjusting the height of the bassinet. Also the wide banner-like branding was developed in fusion 360 in conformity with the design of the Britax booth and hub (figure 5.36.). A large image of the sketch representing the complete baby carriage can be seen in Appendix V: concept sketch.

Figure 5.36. Wireframe of the Britax store-in-store experience.

SURFACE DESIGN, DIGITAL VISUALISATION

During and after the final functions of the concept had been set, the surface design was accomplished determining the exact shapes, lines and enclosing surfaces of the concept. This were achieved through both solid- and surface modelling made in Autodesk´s Fusion 360 software. Further, the final visualisation of the final concept was carried out through fusion 360 's built in software but also through the Autodesk Showcase software.

Wireframes
The wireframe model of the travel system was made in Fusion 360, (figure 5.37.), and is the combination of both solid and surface modelling as well as point-clouds in the form of downloaded freeware. Further the wireframe of the Britax *store-in-store* experience booth as well as -hub (figure 5.37) was modelled completely in solid modelling.

Visualisations
The visualisations of all parts of the concept was carried out trough either the built in visualisation software in Fusion 360 or in Showcase. The results from Fusion 360 came out better with less work, although in Showcase there was the possibility to do more. The final result of this process will be shown in the next chapter: *Final Result.*

Videos
Videos that were made for marketing and presentation purposes were quickly rendered using the *scenes* tool within Autodesk Showcase, rendered on several computers simultaneously as well as cut and edited in Apple iMovie. The music tracks; *If you want to sing out, sing out* by Cat Stevens and *What a wonderful world* by Louis Armstrong were utilised as background audio and defined the rhythm of the movie as well as where cuts were made. The songs were chosen based on how they fit with the brand message and product concept as well as how well they associated with children and happiness.

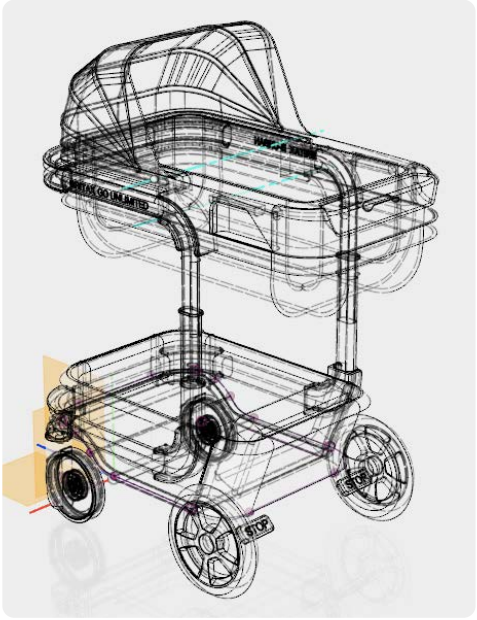


Figure 5.37. Wireframe model of the travel system made in fusion 360.

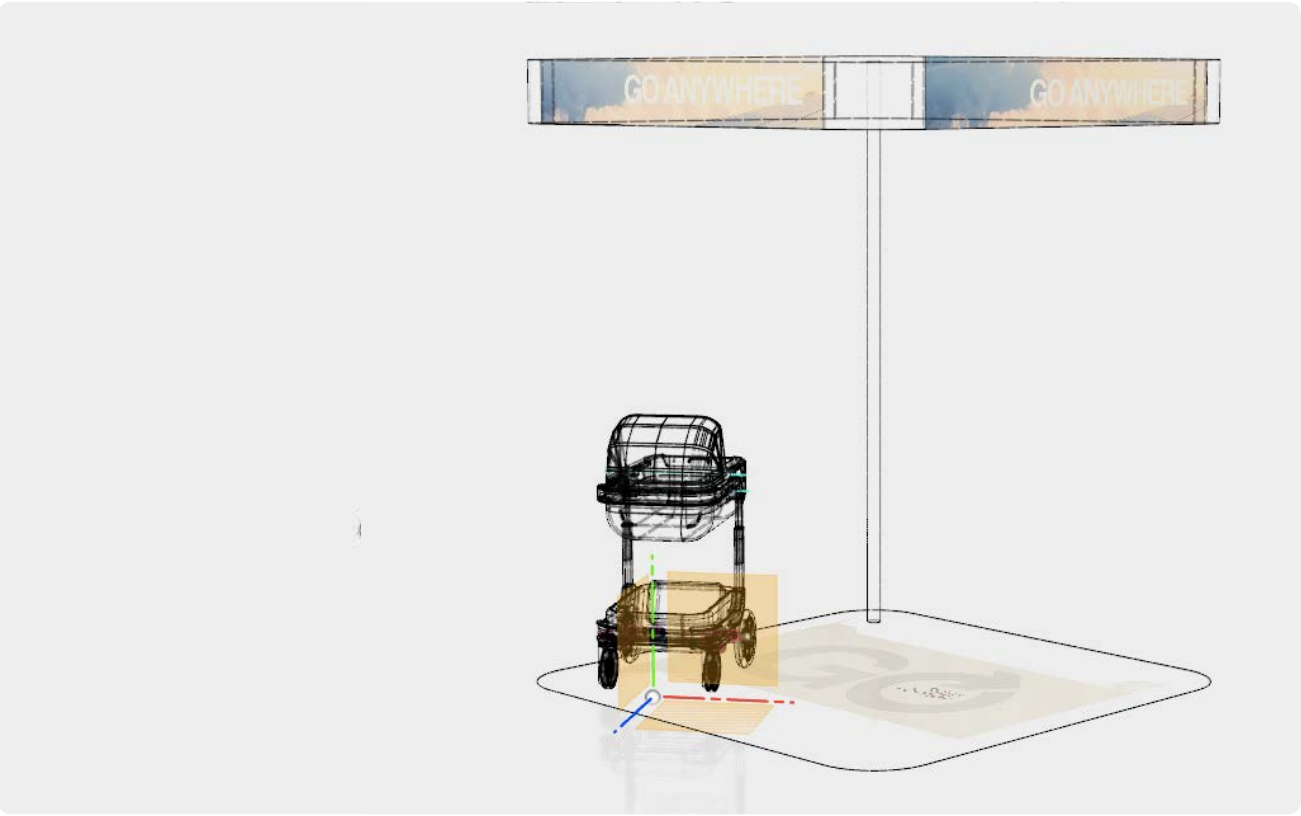


Figure 5.38. Wireframe of the Britax train station hub.

6

Final result

BRITAX GO UNLIMITED: A BRITAX PRODUCT- SERVICE SYSTEM

The final result of this design-study was a product-service system called the *Britax GO Unlimited*. This system is a pioneering subscription service solution that, in turn, consists of two separate, yet fully cohesive, parts: the *Britax B-ooth,* a store-in-store experience embodied by a *Britax GO Unlimited* branded area, and the *Britax B-urban,* a groundbreaking travel system for the city-dwellers relying solely on public transportation. The entire system is integrated in all aspects and thereby contributes with an excellent user experience across the entire customer journey. The resulting user experience is benefited by a concept that allows for greater care, safety as well as protection in both ownership and use whilst also enables a greater freedom and ability to be together more than ever. The logo for the *Britax GO Unlimited* product-service system can be seen illustrated in figure 6.1. whilst an overview of the concept is compiled in figure 6.2.

Figure 6.1. The Britax GO Unlimited logotype.

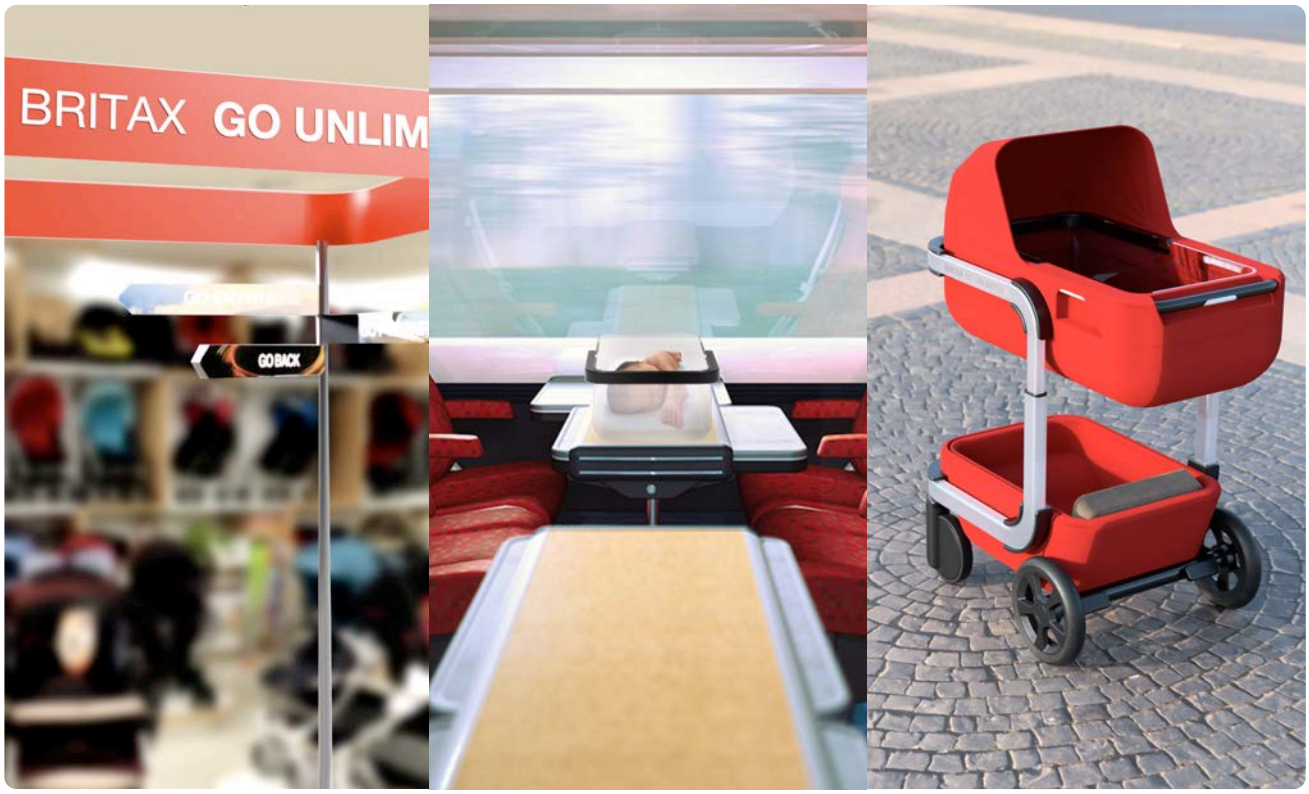


Figure 6.2. A collage of the Britax GO Unlimited product-service system.

BRITAX GO UNLIMITED

The subscription service includes a Britax travel system and the Britax- GO Anywhere, GO P-repaired and GO Back services, all in one monthly payment. The overall service is part of a circular business model agreement between Britax ltd and the customers in which the travel systems are being continuously refurbished and reused. The service is priced reasonably for the user in relation to the tear that a family causes on the parts. The Britax GO Unlimited Service is subscribed to either in the Britax B-ooth´s or on the Britax website. Further, the Britax GO Unlimited banner (figure 6.3.) is highlighted in all marketing material and the Britax GO Unlimited service will be followed by the tagline: *-for the children, of all time,* in order to both highlight the fact that it is a product meant for child care and that it is part of a green branding effort.

Figure 6.3. The branding banner for Britax GO Unlimited.

Britax GO Anywhere
The Britax GO Anywhere service allows for the possibility to pick up a frame, or rent an entire baby carriage, when going out of town with the child. At hubs located at the airport or train station, the frame of the travel system can be deposited for others with a Britax GO Unlimited Service to take advantage of. When the user is arrives at the destination together with the child, a frame is ready to be picked up at the hub without additional charge. These hubs will be highlighted by the Britax GO Anywhere banner (figure 6.4.).

Figure 6.4. The branding banner for Britax GO Anywhere.

Britax GO P-repaired
To ensure the user is feeling secure, the Britax GO Unlimited service includes a repair service called Britax GO P-repaired. This service means that the subscriber can, at any time during the use of a Britax travel system, visit a Britax Booth to get repairs of their system. The Britax GO P-repaired banner will highlight the opportunity to utilise the service (figure 6.5.).

Figure 6.5. The branding banner for Britax GO P-repaired.

Britax GO Back
At the core of the Britax GO Unlimited service lies the possibility to return the travel system to Britax and be able to collect a different type if the need has changed whilst the frame and wheels that are being returned will be refurbished and used by a new customer. For non Britax GO Unlimited subscribers, the Britax GO Back service will work as a re-buy program where Britax buys the frame and wheels in good condition. The service will be branded with the Britax GO Back banner (figure 6.6.) that will be highlighted in the Britax Booth and website.

Figure 6.6. The branding banner for Britax GO Back.

As a complement to the GO Unlimited Service, all strollers will still be available for purchase separately and the separate services are there to complement for these occasions. The products will then be more expensive than when under a Britax GO Unlimited subscription. Finally, Britax GO Unlimited will be a store-in-store experience which will be embodied with the Britax Booth.

Figure 6.7. The Britax Booth.

Figure 6.8. The Britax Booth.

Figure 6.9. The Britax GO Anywhere Hub.

BRITAX BOOTH

The Britax Booth is the embodiment and point of contact with Britax GO Unlimited for the user. The Britax B-ooth is a store-in-store experience recognisable by the Britax GO Unlimited branded station, (figure 6.7.), situated in the baby carriage department of the baby equipment store. At the booth, the Britax GO Unlimited brand banner is first and foremost highlighted throughout the design (figure 6.8) and refers customers in the store to where to go to subscribe to the Britax GO Unlimited service. Just below are three signs displaying the three sub services; GO Anywhere, GO P-repaired and GO Back. Beyond being the place to subscribe to GO Unlimited, the Booth is also meant to act out these sub-services as in enabling renting through the GO Anywhere service, through stacked baby carriages at the Booth; offer repair service through the GO P-repaired service by taking in the frame and loaning a spare in the meantime; as well as be the point for returning or exchanging the baby carriage through the GO Back service.

Britax GO Anywhere Hub
In order to utilise the Britax GO Anywhere service, smaller versions of the Britax B-ooth that are meant for rental and travel called GO Anywhere hubs are created. These hubs will be located at the biggest airports and train stations in the world. As the user gets off the airplane or train, the child is either carried in the Britax Bassinet that he or she gets with the Britax GO Unlimited Service and this can be attached directly to a frame that is collected in the Britax GO Anywhere Hub, or the parent can rent an entire travel system from the Britax GO Anywhere Hub if not having a Britax GO Unlimited Subscription. These hubs will look similar to the Britax Booth although being smaller and only hold the Britax travel systems that are relevant for the location and stacked in a way that its easily collectable by the user. Renting can either be achieved at the Hub or a travel system can be reserved through the website ahead of the trip. The Britax GO Anywhere Hub is shown in figure 6.9.

Figure 6.10. The Britax Bassinet.

BRITAX BASSINET

The Britax Bassinet is the ticket to the Britax GO Unlimited Service. The bassinet is a part that is bought by the customer and is the only one that is not co-owned by Britax. When buying the Britax Bassinet, the user gets a 3 month- free trial of the Britax GO Unlimited service and the charge for that bassinet pays for the refurbishing of the trial carriage if the user chooses to not continue the service.

As the Britax Bassinet is the ticket into the Britax GO Unlimited service, the frame base is the equivalent of the modular product platform usually found in car operations. The Britax Bassinet works with all user-specific product bases, not only the B-Urban, and can be attached as well as detached from the frame when in need of a new one. The Britax Bassinet consists of a handle and plastic bucket (figure 6.10.) in which the child lies and can do so both when attached to the baby carriage or when detached during time in the home, for instance, thereby simplifying the transition between the two contexts.

BRITAX B-URBAN

The Britax B- Together represents the first model fully integrated into the Britax GO Unlimited subscription service. It is designed to be the base model for the growing urban user that relies on public transportation and will thereby be the entry into the service for those users. The Britax B-Together is intended to be used for the first three years of the child´s life when facing backward is still the recommended seating position. The users can then exchange the stroller for one focused on their needs. All product images can be seen in Appendix IIII and the branding banner for the Britax B-urban can be seen in figure 6.11.

Figure 6.11. The branding banner for the Britax B-urban.

Focusing on the ages 0-3 years old, the Britax B-urban (figure 6.12.) is enabled to be a more emotional, more focused and more functional product for the urban family. The baby/child is closer to the parents at all times through a dynamic frame that enables adjustment of the child´s position, not only due to different heights of the parent but due to different situations when moving about.

Figure 6.12. Both the lying and sitting configurations of the Britax B-Urban.

Figure 6.13. The integrated handle of the Britax B-Urban.

Figure 6.14. The Britax B-Urban in use in the lying configuration.

Direct control

By being able to hold directly in the very same cradle in which once own child lies (figure 6.13.), the emotional bond between parent and child grows stronger. Having eliminated the handle bar, that is commonplace in basically all other baby carriages, by fully integrating it into the bassinet the possibility to get closer and have a lot easier access to the child make a big difference (figure 6.14.). Further, by holding the sides of the cradle directly gives the user the feeling of being in direct control rather than distanced from what he or she is trying to navigate.

Height adjustable

The Britax B-together is a very dynamic system, designed to follow the changing needs of the urban user, whether he or she sits on a bench, strolls down the street, sits on a bus or takes the escalator up a floor, the cradle can be quickly adjusted to the most comfortable and safe level. This quick height adjustability is achieved by two gas spring integrated inside the frame, one on each side. The pressure is released from the springs through a control located in the integrated push-handle on the bassinet. Then, when in a lowered setting, the gas springs are extended by two controls on each side of the bassinet in the integrated side handles. This lift enables the user to perform the shift in an ergonomic fashion and makes sure the pressure is applied above the two gas springs which are also installed at an angle in relation to the frame. This functionality is also used by the parent when setting the desired ride height of the baby carriage (figures 6.15, 6.16 and 6.17.).

Figure 6.15. The Britax B-Urban when used by a short person.

Figure 6.16. The Britax B-Urban when used by a person of average length.

Figure 6.17. The Britax B-Urban when used by a tall person.

Figure 6.18. The inner frame in the protective cover that enables the morphing.

Figure 6.19. The inner shell that replace the Britax Bassinet when in the sitting configuration.

Figure 6.20. the rain-tight cover that can transform from cradle to seat mode.

Much smaller footprint
As the regular handle simply does not exist in this concept, the overall footprint can be significantly reduced. This reduction, in turn, has a positive effect both on the storing of the travel system when not in use and how it behaves when driven around the city. The overall shorter length of the system means that the rear wheels can be further displaced under the bassinet and thereby achieve a centre of rotation closer to the centre of the bassinet. Further, the smaller wheelbase means the front castor wheels do not get the same leverage from their position to the pivot point on the rear axel meaning the resisting forces, generated by the castor wheels, will be lower both in the pushing mode and especially in the pulled mode. The overall shorter length of the travel system means that when taking corners where the amount of available space is limited, as in a store for example, the turning radius is smaller and the travel system does not oscillate as much when turned.

In order for the users to not have to have two separate parts lying around at home, one for the lying position and one for the sitting modes, of the baby carriage that does mostly the same thing, the protection part of the Britax B-urban is instead morphing from one mode to the other (figures 6.18, 6.19 and 6.20.) This means not only a smaller footprint from a physical point of view for the user but also a smaller environmental impact on the environment and cheaper for Britax to manufacture.

Figure 6.21. The Britax B-urban when in the sitting configuration.

High agility
To further expand on the agility of the Britax B-Urban, when being inside stores or in the home, where space to move around is sparse and there might be obstacles and people in the way, going sideways is enabled by an intuitive handle. integrated into the sides of the bassinet (figure 6.21.) and located at a level lower than the comfortable setting set for the push-handle. This is so the driver can grab hold of the handles on both sides of the travel system and get a wheelbarrow like leverage over the two front castors. Lifting only slightly results in the rear wheels coming off the ground and the travel system is able to move sideways to the location that is wanted. Further, the two handles have a 45 degree tilt in order to get a leverage not only around the horizontal axis but the vertical one as well.

Further, when in a situation where it would be better to keep the child behind the driver; as when passing a door, moving in traffic or going down escalators, the Britax B- Together enables a simple transition between a pushing and pulling mode. This is achieved by letting the frame around the bassinet also work as a handle and the wheel configuration supports this with the centre of rotation located in the back, as preferred when pulling.

In addition, this handle can be extended into a push mode where the travel system is made to travel in the opposite direction as in a more open mode when the parent wants the child to take in the environment. The characteristics of the travel system then change, as the rigid wheels and the centre of rotation are now located in the front. This makes the travel more stable and the castor wheels will swivel backwards and thereby bring a larger wheel base. The pivot point will also fall behind the handle thereby making it almost impossible to lean over and thereby avoid falling castor wheels.

Figure 6.14. The polycarbonate inlay.

Simplified transition
In order to enable the easy transition between both outdoors and indoors as well as also between rented solutions when traveling by the *GO Anywhere* service or when changing to a new baby carriage through the *GO Back* service, the *Britax B-urban* has a detachable, polycarbonate inlay called the Britax Bassinet. The *Britax Bassinet* is easily placed into the *Britax B-urban* (figure 6.14.) and when about to be lifted out, as the soft top is folded down, the hand is guided to the handle which can then be lifted up and thereby lifting the *Britax Bassinet* out. The handle is long in order to be able to lift the bassinet out when the B-Urban is in its lowest configuration.

Further, the Britax Bassinet can be brought with the user on the train or plane, where usually no place for the child is offered, and be reattached to a baby carriage picked up at a GO Anywhere Hub.

High packability
A great, large luggage compartment (figure 6.15.) that can be utilised to its full potential by how the inner storage can be pulled out like a drawer (figure 6.16) is integrated into the Britax B-Together. This is achieved by putting the rear wheels on this extendable luggage space which, when pulled out, thereby extends the wheelbase of the travel system in the process as it could otherwise risk the entire thing falling over. An integrated nursing bag comes with the travel system and can easily be placed in the rear part of the luggage compartment. This means the handles lie in an angle facing the driver and thereby is easy to reach without pulling out the drawer.

Figure 6.15. The big luggage compartment.

More graceful transition
The plastic bucket inlays that come with the Britax B-Together travel system enable a much more graceful transition between home and outdoors. The child can simply continue lying or sitting in the bucket only to be lifted out of both frame and rain cover and be carried into the home. These plastic covers can potentially be integrated with other tools in the home, such as a cradle or child seat.

In the same way, when it is time to leave the home, the child is put into the corresponding bucket (if not already lying or seated in it) and the bucket is lifted into the Britax B-Together travel system. Room tempered air is then trapped between the airtight rain-cover and the plastic shell which helps the bassinet stay thermally insulated and will thereby cool the child during hot summer days and bring warmth during winter time.

Figure 6.16. The luggage compartment in the extended mode.

PRODUCT ROADMAP

If laid out over time, the visions are intended to be part of the product roadmap (figure 6.14.) in the following way:

VISION 2018: BRITAX GO UNLIMITED

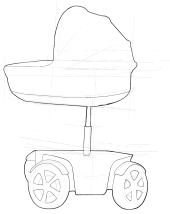
This pioneering system consists of three parts: the *Britax GO Unlimited* subscription service that in turn consists of two parts: the *Britax B-ooth,* a store-in-store experience, and the *Britax B-urban,* a travel system for the urban family without a car. The entire system is integrated in all aspects and thereby contributes with an excellent user experience in the entire customer journey. The resulting use for the customer is benefited through greater care, safety as well as protection in both ownership and use whilst enabling a greater freedom and ability to be together more than ever.

VISION 2020: BRITAX B-URBAN

The Britax B- Together presents the first model fully integrated into the Britax GO Unlimited subscription service. It is designed to be the base model for the growing urban user that relies on public transportation and will thereby be the entry into the service for those users. The Britax B-Together is intended to be used for the first three years of the child´s life whilst facing backward is still the recommended way for the child to travel. The user can then exchange the stroller for one focused on traveling forwards and enables a more emotional, more focused and more functional product for the urban family.

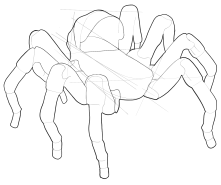
VISION 2025: A BRITAX B- FRAME FOR EVERY NEED

The Britax Bassinet is the ticket into the Britax GO Unlimited service and the equivalent of the modular product platform usually found in car operations. The Britax Bassinet works with all user-specific product bases and can be attached as well as detached from the frame when in need of a new one. The Britax Bassinet consists of a loose, rain-tight cover that can transform from cradle to seat mode, and two interchangeable baskets in which the child either lies or sits.



VISION 2030: THE STRAFER

This vision is closer to reality but for several reasons not a product still possible for mass production. As a vision, however, if *bipedal* drive was out of the question the second best kind of friction reduction and drive type would be based on wheels and electric motors. This is so as the larger system that the product adheres to, the infrastructure of society, is designed for humans, animals and vehicles based on either walking or wheeled locomotion. Further, to make sure the solution follows the parent in every step of the journey, the cradle is directly attached to a gas spring that can quickly raise and lower it. This gas spring also works as a joystick for the lower base meaning that the parent can pull or push the cradle in any direction and the base responds. This is achieved through four electric motors each attached to a wheel, making it a so called independent drive. In this configuration, all four wheels can turn independently of one another allowing the *Strafer* to drive sideways as well as turn on the spot.



VISION 2050: THE CRADLER

If the solution are meant to follow the parent on every step of the journey and travel wherever the human goes; the solution should be based on the same mechanical principle as the human. This means to be powered by legs, Humans are *bipedal driven* but the *Cradler* utilises a 6-legged version. Further, a leg driven solution means it can be adapted to perform the best when operating at the same speeds as the human-being and can adapt to different ground types and weather conditions as well as with different heights of the cradle.

ULTIMATE VISION: THE MAGICAL CRADLE

Of all the functional visions, it was still that of *"a magical and flexible cradle that follows you wherever you go"* that was deemed to have the greatest impact and potential as a solution as well as mainly what the baby carriage intuitively ought to be. As mentioned in chapter four, the child is then meant to just *float in the air* at waist level and always be within reach for the parent without bending or reaching far beyond the body. Further, the bubble-like zone in which the child either lies, if he or she is very young, or sits will offer a protection against light, temperature, disease and dis-comfort. This bubble would thereby be dynamic through both height adjustability, direction of movement as well as position during movement.

Figure 6.14. The product roadmap

LIST OF REQUIREMENTS

Intended for further product development, as the core problem and fundamental emotional need were deemed to have been converted from a wicked problem into several smaller, tame problems, by the conception of the Britax GO Unlimited product-service system concept, a requirements list were formulated.

Table 6.1. Visual representation of the creation phase.

Nb	Type	Description	Requirement/ wish	Priority
1	Size	Maximum width of 60 cm	R	
2		Maximum length of 140 cm	W	2
3		Shorter than average travel system	R	
4		avoid feet-storage space collision at low speeds	R	
5	Functionality	Height adjustability between 110 and 85 cm	R	
6		Storage space supporting a minimum10kg of mass	W	3
7		Storage space supporting a volume of 30 litres	W	4
8		Gas spring lift support in both directions	W	5
9		Develop foldability of travel system	R	
10	Material	Highly reusable/ recyclable materials	R	
11		Frame made of aluminium	W	6
12		Long life	R	
13	Safety	Low centre of gravity	R	
14		No possibilities of pinching	R	
15		Ergonomic height adjustability	R	
16		Ensure stability during heavy wind	R	
17	Objectives	Minimise mass	R	
18		Minimise cost	W	7
19		Maximise product lifespan	R	
20		Minimise length	W	1
21	Free Variables	Material choices		
22		Manufacturing methods		
23		Cross-section shape of frame		

7
Discussion

Method Discussion

First of all, the project was based on a very long process when compared to commonplace industrial design engineering. Where the more traditional master thesis project might focus on a smaller part of a similar project, this project was meant to take on an overarching scope and thereby reach a type of quality by quantity. Another reason for this is approach was based in how Industrial Design Engineers are scholars of how to get an overview over a subject and how to make *the whole larger than the sum of its parts*, whereas other types of engineers are better suited to take on solving the more *in-depth* issues. Thereby, this project was meant to not only result in a new conceptual design but also to clarify the role of industrial- and product design in the overall design process as well as the red thread between the aim, the methodologies and the final result.

As the academic procedure of a project like this advocates that a long process, such as this one, should be thoroughly detailed in a report, the overall undertaking became almost overwhelming. However, it was still deemed that the actual methodology can and should be performed in every design project; just not necessarily as thorough or recorded to the same extent. Although the pre-study was done in a very overarching manner, the time spent before coming into the ideation phase can be significantly reduced. The important thing is to early get through many ideas in order to decide the conceptual direction of the project. Then, this direction can be investigated deeply and thereby ensuring not having wasted time on investigating something that was never needed. The ratio of which, in this project, could have been adjusted significantly.

Further, not necessarily all methods were of use. The interviews were short as well as the number of participants small, only 10. This can easily be increased in order to really acquire a scientific believability. That means the results of the SAM and Product Personality Scales can be seen as indications at best and as some of the interviewees owned one of the travel systems in question, their answers might have been compromised. Further, there might also be more insights to be acquired, especially as the saturation limit for qualitative studies lies between 15 to 20 participants.

Furthermore, as not all sources were scientific books, reports or journal articles, which might compromise the scientific believability, the statements of the other sources would have to be double-checked. One such source were Suzanne Zedyk as it was later found that she showcases her research in advertisements by Stokke which means her believability might be compromised. Also, throughout the project, the Oxford English dictionary was deemed as a great objective source and were regarded as global definitions.

In line with the purpose of the project, after having assessed the potential and possibilities of a more integrated, usable and pure solution to the core problem through an extensive research phase, an extensive intention phase and an extensive creation phase; and although a small user study was performed and several methods were completed only in an overarching manner, the overall extent of the project and the amount of methods and investigations achieved has given it a that sought after quality through quantity.

Result Discussion

In order to achieve the overall goal of the project, the three objectives, formulated at an early stage, were fulfilled. Firstly, the investigation thoroughly outlined the core-problem that is solved and emotional need that is fulfilled by today´s baby carriages, the Britax Childcare brand as well as the market opportunities. Secondly, an intent was successfully formed around the market opportunities, emotional aspiration as well as core problem. Finally, from crafting a product or product-service system for baby transportation, a better overall result was achieved.

As intended, the investigation phase was considered to give an overviewing, but significant, insight into the core-problem and the emotional need of the user. As mentioned earlier, however, many results of this phase might be superfluous when considering the final outcome of the project. Thereby, this phase is probably where most of the overall time consumption can be reduced when performing a smaller project.

The intention phase used the findings of this previous investigation and thereby successfully crafted three intentions, all of different perspectives: the emotional, functional and operational, as sought after. These intentions also turned out to have a clear role and guiding ability when it came to the following conceptual development, just as intended. However, as also predicted by the methodology, these results would balance on the border of being obvious and naive. Further, there was the importance of being solutions neutral, where these intentions could be argued as the start of a solution before ideation had even begun. In the end, however, the line of argument that these results followed was still considered to be waterproof and their existence thereby to be of more help than harm.

Another part of the project where a lot less time could have been spent was in visualising the three futuristic visions to a level that, in fact, was considered unnecessary. This was achieved anyway due to finding these results interesting and the effort pleasing. The results did, however, help as intended and the fact that they were visualised to that elaborate level meant that the result of the final product roadmap became more power-full and connected the project and methodology together in a clear way.

Further, when it came to formulating a requirements list, however, the transition from design thinking to requirements engineering was crude and where the methodology needs to be developed further. This sentiment was based on the how the actual resulting requirements list was lacking detail and the gap between it and the rest of the design work was significant. Furthermore, due to the large potential scope of the final conceptual direction the problem was not solved to the full extent and a lot more design work needs to be done, especially in terms of the service- and store in store experience parts of the concept as these were only meant to facilitate what such a system would mean for the baby carriage design. Finally, the project and report successfully served just as much as a developmental project and describing piece, on the process and result behind Britax GO Unlimited, as it is a summary of what design and the industrial design process was deemed to be, or should be, in the opinion of author.

8

Conclusion

In conclusion, the project was successful in achieving the overall goal of the project. Firstly, by having investigated the core-problem solved and emotional need fulfilled by today´s baby carriages, the Britax Childcare brand as well as market opportunities a solid basis for design was acquired. Secondly, by having formed an intent around the market opportunities, emotional aspiration and core problem, a design direction could be designated with great clarity. Finally, after having crafted around the intention to form a better solution for baby transportation an exceptional product-service system was formulated.

After having assessed the potential and possibilities of a more integrated, usable and pure solution to the core problem through an extensive research phase, an extensive intention phase and an extensive creation phase; the question remains wether having answered the overall aim of the project: *To design a product or product-service system that better suits the core- problem, or need, that child strollers are meant to fulfil today.* There is no doubt that, if the final concept were realisable through a continued product development process in the way the product is presented in this report, the improvements would be significant.

Finally, although a small user study was performed and several methods were achieved only in an overarching manner, the overall extent of the project and the amount of methods and investigations achieved has given it a so-called quantitative quality. By recognising the success of the project, the red thread that combines all methods and investigations in the form of an overall methodology makes the project, and its result, larger than the sum of its parts. Thereby, the project and report should serve just as much as a developmental project and describing piece, on the process and result behind Britax GO Unlimited, as it is a summary of what design and the industrial design process was deemed to be, or should be, in the opinion of author.

9

Sources

Allabolag. (2017). Britax Nordiska Barn Aktiebolag - Koncernstruktur. Allabolag.se. Retrieved 2 April 2017, from http://www.allabolag.se/5563569465/koncern

BabyCenter. (2015). Your child's walking timeline | BabyCenter. BabyCenter. Retrieved 7 April 2017, from https://www.babycenter.com/0_your-childs-walking-timeline_10357004.bc

Barker, L., & Maralani, V. (1997). Challenges and strategies of disabled parents. Berkeley, CA: Through the Looking Glass.

BIHR. (2016). Midwifery and Human Rights: A Practitioners Guide. The British Institute of Human Rights.

Britax Childcare. (2013). Britax Historiska Milstolpar. Britax.se. Retrieved 7 April 2017, from http://www.britax.se/media/4445/se_sps_binder_key_milestones_lowres.pdf

Britax Nordiska Barn. (2016). Årsredovisning. Malmö: Bolagsverket.

Britax - The #1 Brand in Safety Technology.. (2017). Us.britax.com. Retrieved 27 February 2017, from https://us.britax.com

Beverland MB, Napoli J & Farrelly F (2010) *Can all brands innovate in the same way? Towards a typology of brand position and innovation effort, Journal of Product Innovation Management.* 27(1):33–48. DOI:10.1111/j.1540-5885.2009.00698.x

Charlie Rose, (2013). [TV programme] PBS.

Design, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 21 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/50840?rskey=Zu7fpb&result=1#eid

Esslinger, H. (2014). Keep It Simple. Stuttgart: Arnoldsche Art Publishers.

Frågor och svar | Kundservice | Britax Childcare. (2017). Britax.se. Retrieved 27 February 2017, from http://www.britax.se/kundservice/fragor-och-svar/

Gibbs, S. (2014). Apple's Jony Ive: copying designs is 'lazy thieving'. the Guardian. Retrieved 4 April 2017, from https://www.theguardian.com/technology/2014/oct/10/apple-jony-ive-copying-designs-lazy-thieving

Good design | About Vitsœ | Vitsœ. (2017). Vitsoe.com. Retrieved 21 March 2017, from https://www.vitsoe.com/gb/about/good-design

Hestad, Monika; Hiort, Viktor & Groenli, Anders (2014). *Craft brewery brands: Self-awareness through performance.* 19th DMI: Academic Design Management Conference Design Management in an Era of Disruption London, 2–4 September 2014

Holmes, K. (2008). Black inventors. New York: Global Black Inventor Research Projects.

Home : Oxford English Dictionary. (2017). Oed.com. Retrieved 17 February 2017, from http://www.oed.com

Löfgren, J. (2016). *Löfgren branding*. [online] Lofgrenbranding.se. Available at: http://www.lofgrenbranding.se [Accessed 25 Oct. 2016].

Mars, R. (2017). 247- Usonia the Beautiful. 99% Invisible. Retrieved 24 March 2017, from http://99percentinvisible.org/episode/usonia-the-beautiful/

Oxford English Dictionary - stroller, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 6 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/191769?redirectedFrom=stroller#eid

Oxford english dictionary - baby, n. and adj.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 6 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/14250?redirectedFrom=baby+buggy#eid30782944

Oxford English Dictionary - perambulator, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 6 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/140513?redirectedFrom=perambulator#eid

Oxford English Dictionary - travel, v.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 28 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/205268?rskey=2P1kJA&result=2&isAdvanced=false#eid

Oxford English Dictionary - perambulate, v.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 28 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/140511?rskey=2oX7Gc&result=2&isAdvanced=false#eid

Oxford English Dictionary - stroll, v.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 28 February 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/191768?rskey=HHoWka&result=2&isAdvanced=false#eid

Oxford English Dictionary - wagon | waggon, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/225056?rskey=69LseQ&result=1&isAdvanced=false#eid

Oxford English Dictionary -handle, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/83878?rskey=cdjmhG&result=1&isAdvanced=false#eid

Oxford English Dictionary - wheel, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/228139?rskey=K6FGCu&result=1&isAdvanced=false#eid

("Oxford English Dictionary - travel, v.", 2017) Oxford English Dictionary - travel, v.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/205268?rskey=2P1kJA&result=2&isAdvanced=false#eid

("Oxford English Dictionary - luggage, n.", 2017) Oxford English Dictionary - luggage, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/110985?redirectedFrom=luggage#eid

("Oxford English Dictionary - frame, n. and adj.", 2017) Oxford English Dictionary - frame, n. and adj.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/74151?rskey=kiH3gY&result=1&isAdvanced=false#eid

("Oxford English Dictionary - cot, n.", 2017) Oxford English Dictionary - cot, n.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/42379?rskey=lDUpDm&result=1&isAdvanced=false#eid

("Oxford English Dictionary - carry-cot, n..", 2017) Oxford English Dictionary - carry-cot, n... (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 13 March 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/28256?redirectedFrom=carry-cot#eid

Oxford English Dictionary - carry, v.. (2017). Oed.com.proxy.lib.chalmers.se. Retrieved 5 April 2017, from http://www.oed.com.proxy.lib.chalmers.se/view/Entry/28252#

MacArthur, E. (2017). Beyond plastic waste. Science, 358(6365).

Maslow, A. (1943). A theory of human motivation. Psychological Review, 50(4), pp.370-396.

Plutchik, R. (2001). The Nature of Emotions. American Scientist, [online] 89, pp.344-350. Available at: http://www.emotionalcompetency.com/papers/plutchiknatureofemotions%202001.pdf [Accessed 18 Apr. 2017].

Pricerunner. (2017). Emmaljunga störst på barnvagnar | PriceRunners Nyhetsrum. Nyhetsrum.pricerunner.se. Retrieved 13 May 2017, from http://nyhetsrum.pricerunner.se/emmaljunga-storst-pa-barnvagnar/

Rittel, H. and Webber, M. (1973). *Dilemmas in a General Theory of Planning*. [online] uctc.net. Available at: http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf [Accessed 29 Oct. 2016].

Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. Policy Sciences, 4(2), 155-169. http://dx.doi.org/10.1007/bf01405730

Rompay, T., Hekkert, P., Saakes, D., & Russo, B. (2005). Grounding abstract object characteristics in embodied interactions. Acta Psychologica, 119(3), 315-351. http://dx.doi.org/10.1016/j.actpsy.2005.02.001

Silver Cross | Harrods.com. (2017). Harrods.com. Retrieved 17 March 2017, from https://www.harrods.com/en-gb/designers/silver-cross

SNCB. (2017). NMBS/SNCB - Go Unlimited. Belgianrail.be. Retrieved 8 June 2017, from http://www.belgianrail.be/en/travel-tickets/passes-cards/go-unlimited.aspx

SvD. (2013). Britax köper Brio-verksamhet. SvD.se. Retrieved 4 April 2017, from https://www.svd.se/britax-koper-brio-verksamhet

Svenska Barnmorskeförbundet. (2007). Trädet. Svenska Barnmorskeförbundet. Retrieved from http://www.barnmorskeforbundet.se/wp-content/uploads/2013/11/Tradet-Svenska-Barnmorskeforbundet.pdf

Sweet, F. (1999). Frog: Form follows emotion. London: Thames & Hudson.

Tassoul, M. (2009). Creative Facilitation. Delft, Netherlands: VSSD. Retrieved from http://www.delftacademicpress.nl/bij/b005extract.pdf

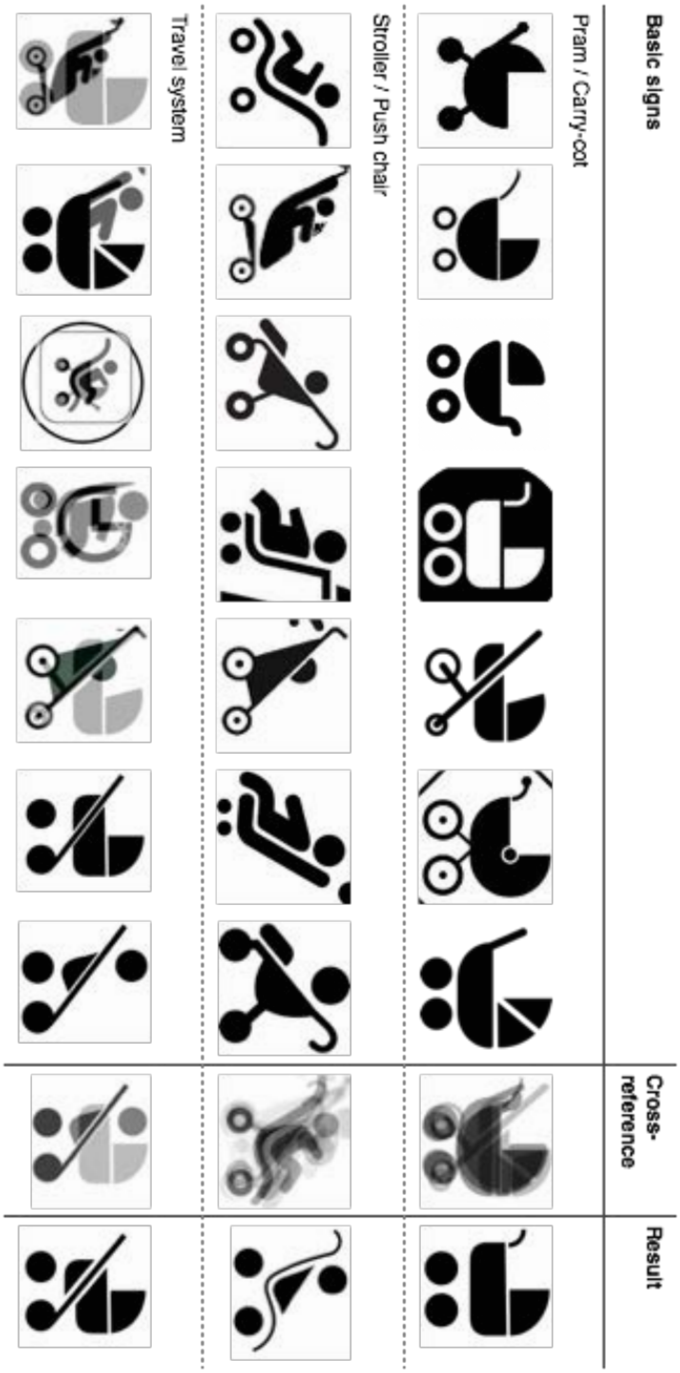
Van Dulken, S. (2001). Inventing the 19th century (p. 88). London: British Library.

Wall-Scheffler, C., Geiger, K., & Steudel-Numbers, K. (2007). Infant carrying: The role of increased locomotory costs in early tool development. American Journal Of Physical Anthropology, 133(2), 841-846. http://dx.doi.org/10.1002/ajpa.20603("Oxford English Dictionary -handle, n.", 2017)

Zeedyk, S. (2008). What's life in a baby buggy like?: The impact of buggy orientation on parent-infant interaction and infant stress. Dundee: University of Dundee. Retrieved from http://www.literacytrust.org.uk/assets/0000/2531/Buggy_research.pdf

10
Appendix

Appendix I: Symbolic definition



Appendix II: Questionnaire

What equipment do you have for help in taking care of your child when going outdoors?

Which are your most primary reasons for going out together with your child / children?

Describe your process from deciding to go outside together with the child all the way to being back home and do not need to perform any more related activities.

What are the three worst/ least pleasurable parts in this process?

What are the three best/ most pleasurable parts in this process?

How well do you think your equipment helps you/ performs in this process?

Extend on why / why not this is?

Please fill out this SAM- scale on the performance of the Britax Go Big and Emmaljunga Super Viking (shown indiscriminately).

Please fill out this Product personality- scale on the performance of the Britax Go Big and Emmaljunga Super Viking (shown indiscriminately).

What pros and cons do you see with the Britax Go Big?

How well/ not well do you think the Britax Go Big would perform in your Process?

What pros and cons do you see with the Emmaljunga Super Viking?

How do you think the Emmaljunga Super Viking would perform in your Process?

Appendix III: Use Definition

Appendix VIII: Product images


BRITAX GO UNLIMITED

Appendix V: Concept sketch