Designing Mass Customization:

A Product Configurator for a Startup Company

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Designing Mass Customization:  
A Product Configurator for a Startup Company

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“Fundamentally customers don’t want choice, they just want exactly what they want.”

cyLEDGE (2009)
Thank you

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Abstract

In an uncertain environment where resources are scarce, how could an online mass customization service be designed and implemented to befit the requirements of a startup company?

Mass customization is increasingly utilized as a competitive production strategy by companies to differentiate themselves on increasingly fragmented markets. Mass customization is defined as the mass production of individually customized products and services. As a production process mass customization has rather unorthodox requirements. Allowance of customer interaction with the different levels of the production flow causes completely different types of managerial needs than a typical mass production process. In other words mass customization can be a risky, expensive, and demanding process. For this reason it is mostly utilized by medium- and large-sized companies. A startup company implementing mass customization faces all the same challenges, but might additionally have to deal with continuous uncertainties and extreme resource restrictions. In this thesis it was discovered that mass customization is a valid strategy for small startup companies. The key is to be able to focus and limit the process to the most important customizable elements.

This Master thesis describes the design process of an online mass customization service for the startup company Catchbox. The theoretical part of the thesis reviews literature that is relevant to the requirements for implementing a mass customization process as well as the design principles of the online mass customization service. The amount of literature addressing mass customization in startup companies was found to be limited. To this end, general mass customization processes were adapted for use on the thesis. Theoretical frameworks were discovered however, which point out that mass customization can be implemented on different levels dependent on the use case and the size of
The empirical part of this thesis is composed of several practical studies that focus on the implementation of the mass customization service in detail. The goal of these studies is to validate the theoretical results by testing them in practice. The empirical studies show that the customization possibilities should be limited to a handful of options that make the experience feel creative for the customer while not inferring unnecessarily in production and logistic costs. Too many features will complicate the process and confuse the customer. Too few features will not necessarily satisfy the customer’s creative needs. The customization process should be an easy, simple, fairly short, and highly visual experience. The customization experience has to be interactive and immersive as well, so that the user gets constant feedback from their actions and achieves a better working flow.

Based on this analysis, the outcome of the thesis is a detailed visual prototype of a mass customization service for Catchbox. All of the key design decisions made on the prototype are based on the knowledge gained from the theoretical and empirical parts of this thesis. The prototype is an illustrative representation of the service with focus on the service features and the process flow.

**Keywords:** mass customization, startup, product configurator, service design
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Introduction

In an uncertain environment where resources are scarce, how can a small startup company design and implement a successful online mass customization service?

It is becoming more and more important for companies, to be able to differentiate themselves on the vastly fragmented markets. The use of competitive production strategy such as mass customization is growing in popularity amongst product-based companies Hart, (1996). Mass customization is defined as the mass production of individually customized products and services Pine II, (1993). However due to its unorthodox production process requirements, mass customization can be a very risky, expensive and demanding process to implement. For this reason it is mostly popular amongst medium and large sized companies. A startup company implementing mass customization faces all the same challenges as the large stable companies, but might additionally have to deal with continuous uncertainties and extremely limited resources.

This masters thesis delivers concrete guidelines for a startup company Catchbox, on how to implement an online mass customization service. The research In this study focuses on the risks and benefits of the strategy as well as past implementation guidelines. The empirical work focuses highly on the practical side of the implementation such as usability of and design of the service.

The thesis question can roughly be divided into two, how should the product Catchbox be customizable? And how should the customization process be represented to the user? In the study I answer to both of these questions, but the emphasis is higher on the representation of the customization for instance the service flow and the visual design of the service. One of the most important components of the online mass customization service is the product configurator, the tool that displays the customization choices made to the product before its implementation. According to Vink, (2003) the successful design of the product configurator is one of the most important elements of implementing a mass customization process. For this reason the delivered guidelines at the end of this thesis mostly focus on the representation of the service and the design of the product configurator.
Objectives and thesis questions

This thesis paper will explore the possibility of implementing a mass customization strategy for a startup company. The focus will be on the benefits and risks of implementing the process for a startup company; Catchbox. The purpose is to learn about the process itself as well as the implementation of such a process in practice. How should the usability and the design aspects be thought of for the service in order to maximize the benefits for both the company and the customer.

Essentially this thesis will create knowledge on two main questions. It is important to acknowledge that this information is highly related to the case company Catchbox and hence should not be directly reflected on other cases. The two main questions as followed.

*How should the Catchbox product be customizable?*
This question studies the product in detail and points out the different ways to customize it. The focus is on understanding the parameters of a mass customization process, what is the right amount of customization?

*How should the customization process be presented to the users of the service?*
This question focuses more on the service and how it should be implemented. The focus is on understanding the value of design and the visualization of the process.

Thesis structure

The thesis starts with a literature review chapter (figure 1). The literature review is divided into two parts, in the first part the concept of mass customization, the implementation requirements and the key frameworks are explained. The second part gives an understanding to the designing of a mass customization process. In the beginning of the literature review three development questions are formed. Throughout the chapter these questions are reflected on as new information is gained. Finally in the end of the literature review chapter the research questions are answered.

The goal of the empirical chapter is to validate the results of the theoretical part by testing them in practical manners. The empirical chapter consists of three practical exercises. The product configurator analysis, examines and analyses existing services from the customer point-of-view. The aim of the idea generation workshop is to create content for the first draft of the final service. The last part of the empirical chapter is the customer interviews. The goal of the interviews is to
validate the draft of the final service, with real customers.

The goal of the design process chapter is to illustrate and explain the process and the reasoning that lead into the final concept. The design process chapter is divided into two parts. In the first part the final design process is opened up and sketches and variations of the final design are presented visually. The second part visualizes and explains the final concept in a more detailed level. The purpose of the final concept is to function as a detailed functional prototype that can be used as a guideline when implementing the functional product.

The final chapter of the thesis is the discussion. This chapter reflects back to the thesis process and answers the two thesis questions that were formed in the beginning of the thesis. The discussion chapter also recommends the possible future research areas around the topic and gives the next step recommendations for the case-company Catchbox.
Catchbox Oy

Catchbox is a startup company that was founded in 2012 in Finland. The company produces physical tools that aim to improve audience engagement in different environments. The company’s first product is called Catchbox 2.4. It is a wireless microphone that is designed for the use of audiences (Figure 2). The product differentiates from typical microphones by being lightweight and big enough in size for people to be able to pass it around by throwing. With its positive and unorthodox nature the product aims to break the ice between people in a typical audience environment. In a way Catchbox functions as a physical totem amongst the crowd. It catalyzes and motivates the members of the crowd to initiate and communicate.

The Catchbox 2.4 consists of three components; the cover, the transmitter and the receiver (figure 3). The transmitter is a cylindrical object that houses the technology and the microphone itself. The cover is a soft cube shaped object upholstered in fabric. The cover seals the transmitter within itself and works as the protective layer for the product. Once integrated, the transmitter and the cover
form the microphone.

Figure 3. Main components of Catchbox microphone

Literature review

“Mass Customization is a strategy that creates value by some form of company-customer interaction at the fabrication and assembly stage of the operations level to create customized products with production cost and monetary price similar to those of mass-produced products”.

(Kaplan and Haenlein 2006, p. 176-177)

This literature review is carried out to find out how the past studies suggest that a startup company can utilize mass customization as a competitive strategy. More precisely the focus is on the design of the mass customization service and online tool that is at the services core of functionality. At the end of this review, the reader should understand the following key points. 1. What is mass customization 2. Why and how should Catchbox utilize mass customization. 3. How is a mass customization service designed and how should it be designed in the case of the startup company Catchbox.

In this literature review I aim to answer three development questions. By answering these questions I create essential value for understanding the mass customization concept and process of designing a mass customization service for a startup. By answering these questions with the theoretical works done around the topic, I can move forward to the empirical section of the thesis. The theoretical and empirical sections together provide us with a lot of knowledge around the topic of designing a mass customization service for a startup. With this knowledge and insights I will be able to form a design brief for the final service concept. Later in the thesis I will deliver this brief and execute the final design work according to it.
The development questions

1. The Mass Customization process; what sort of stages is the process divided into and what are the different stakeholders in each of these stages?
This question brings essential information to understanding the mass customization concept in general. To be able to design the service, I need to know basic mechanics and hierarchies behind the mass customization process and its functions.

2. What requirements are needed from a company that wishes to successfully implement a MC process?
It is essential to learn these requirements and see how they befit a startup company profile, in this case Catchbox.

3. How should a MC product configurator be designed in order for it to have a high decision value?
At the core of this thesis is the designing of the online tool (product configurator) for the mass customization service. The past studies might have important and practical inputs on this that I need to learn.

This literature review is divided into three sections, the concept section, the design section and the conclusions section. In the concept section I will dive into the written theories of mass customization (MC). Firstly I will take a look at the general concept of MC to understand it in detail. I will go thru the brief history of the topic to open up the evolution of the MC, so that later in the thesis I will have a better view on the choices to be made. I will explain why is MC getting more popular now in the current decade. I will also explore the success factors of mass customization. After the concept section I should be able to answer the development questions 1 and 2.

In the second section of the literature review the design section, I will go deeper into the actual field of interest regarding this thesis; the design of the mass customization process and the online tool. To understand the influence of design on MC I will open up the MC process for a closer inspection. I will explore the following questions

1. How does the MC process function in practice & what are the stages involved
2. what are the differences between the front-end and the back-end of the process
3. what are the different stakeholders involved in the process
4. what kind of tools can be designed to make the MC process better?

After reading the Design section the reader should be able to understand the MC process in practice and how it can be influenced by design.

In the Conclusions section of the literature review I will explain and point out the
key discoveries and conclusions of the chapter. In other words the answers to
the development questions that were presented in the beginning of the literature
review. During the presentation of the discoveries I will also bring up my own
personal thoughts and ideas that have emerged during the process. What are the
points that I have learned and in what areas I still need to learn more about before
being able to finally design a MC process for Catchbox.

The focus of the conclusions section will be the transfer from the literature review
chapter to the empirical chapter. At this stage I will have chosen a strict stream of
literature that I believe is the most relevant for this thesis. In other words when later
in the empirical section I have a need for a theoretical knowledge, I can reflect my
practical work on to this selection of literature.

**The concept of mass customization**

In this section I take a look at the main literature on the concept of mass
customization. What is MC and why is it a relevant strategy right now. I also take
a look at the main ways to utilize it and the reasoning why it is and isn’t suitable
for all businesses. For the source literature of this chapter I take a rather broad
angle, covering the concept of MC broadly rather than narrowly. However it is
mentionable that the majority of the literature roots back to the work of Joseph

Within its existence of the last three decades, mass customization as a
manufacturing strategy has risen from an impossible oxymoron to a prevalent
mainstream method. It is not anymore a new frontier for businesses to test out,
but an inevitable method to create value and to differentiate on the increasingly
fragmented markets. The real value and importance of mass customization is
only beginning to show recently as the required tools for both producers and
customers are improving exponentially every year. Mass customization has been
proven as a viable strategy from niche to mass-markets, from business-to-business
to business-to-consumer with a huge amount of success stories. Fogliatto et al.
(2012)

**Concept description**

Mass customization is the mass production of individually customized products
and services Pine II, (1993). For manufacturers MC is a competitive business
strategy offering value in a form of differentiation. As a method it is referred to as
an ability to provide personally designed products and services to meet the needs
of an individual customer with the cost close to mass production. Davis, (1989)

A common mistake when talking about mass customization is to think of it as a
way of trying to overwhelm the customer with choice. Hence being able to offer
the customer exactly what they want. When in fact the customer does not want
choice, “the customer wants exactly what the customer wants.” TED (2009) The
problem is that often times the customer does not know what they want before
they see it.

One of the keys to succeed in MC is to help the customer to find what they want
by including them into a certain part of the design process of the product. Design tools or “product configurators” (PC) enable the customers to visually experience the products before they are being produced. The PCs can visually render the product, displaying what it could look like once it has been produced and purchased by the customer.

For the customer the benefits of MC are twofold (1) the customer knows that they are getting exactly the product that they want before receiving it (2) the customer gets to experience the “creation” of the product. The “I designed it myself” experience has been proven to bring economic value for the customer as well. TED (2009) Franke N, Schreier M and Kaiser U (2009)

With a glimpse MC seems as a lucrative and almost an imperative model for all businesses to chase. After all MC provides competitive advantage and a possibility to stand out on saturated markets. Overall MC brings clear value for the businesses as well as the customers. In theory this is all true, but in reality MC is not for everyone, at least not just yet. Due to the still young nature of the concept, not all aspects and fields of the model have yet been studied, tested and approved working. There are many industries where MC has not been tested at all.

Jumping into the MC model without fully understanding the requirements and capabilities that are required from a company, has led into many high-profile flops in the past. Salvador (2009), Hart (1996) It should be recognized that there are clear success factors, requirements and enablers that a company wishing to utilize MC as a strategy, should understand and follow.

History of mass customization

According to Pine et al. (1993), “A company could pursue a strategy of providing large volumes of standardized goods or services at a low cost, or it could decide to make customized or highly differentiated products in smaller volumes at a high cost. In other words, companies had to choose between being efficient mass producers and being innovative specialty businesses. Quality and low cost and customization and low cost were assumed to be trade-offs”, (p. 111)

Until the late 80s before Stan Davis in Future perfect (1989) coined the term “mass customization” (MC), the core idea of MC was thought of as an oxymoron; an impossible equation. Businesses had to choose their production strategies between high volumes of standardized solutions or low volumes of tailored solutions. Merging high volumes and tailored solutions was seen to inevitably lead to high production cost and low production efficiency. Pine II et al. (1993).

The reasoning behind the difficulties of the concept of the MC were twofold. On one hand the manufacturing methods and tools were not yet qualified to work with the efficiency and the flexibility required by the MC process. This prevented most businesses from seeing the competitive potential of MC before the popularization of personal computers during the 1990s. The dawn of internet finalized the puzzle, making MC possible in practice.

The other reason was purely managerial and grounded on the way of “how
things had always been”. It was thought that the two opposite strategies “Mass-Production” (MP) and “Custom-Made” (CM) required a totally different ways of management and hence different organizational structures. MP strategy was ran by what was called the mechanistic organization that was based on maximizing efficiency and automation. A business following the CM strategy was on the contrast ran as an organic organization. This meant that the focus was on craftsmanship rather than machinery and on uniqueness of the outcome rather than the efficiency. The development of technologies meant that it was going to be possible to create unique products in mass quantities. Hence in time it was proven that these traditional trade-offs between MP and CM were not anymore viable. 

Mass customization was possible. Pine et al. (1993)

Twofold thinking

When talking about the theories of mass customization it is mentionable to recognize the twofold thinking of how different researchers define the concept. The views are divided into a “visionary” and the “practical” definitions. The visionary definition is a rather ideological way of defining the concept; “the ability to provide your customers with anything they want profitably, any time they want it, anywhere they want it, and way they want it.” Hart (1996) page 36. The practical definition by Hart (1996) entails a more realistic way of turning MC process into a selection of choice for the customer. This way the customer has a way of influencing on the to-be-produced product/service and hence being customizing it. According to Hart (1996), “Use of flexible processes and organizational structures to produce varied and often individually customized products and services at the low cost of a standardized, mass production system” (p. 36). The outcome of this thesis aims to be a very practical definition of a concept. More importantly the case company aims to execute the service based on this work. Because of this reason the theoretical weight on this thesis will be set more on the practical definition.

Why is mass customization happening now

Within the short existence of the whole concept of mass customization, it is turning into an imperative strategy for companies according to some researchers. The consensus for the reasoning of why is MC trending now is timing. There are two main reasons why; 1. technology and 2. demand. Fogliatto et al. (2012)

1. Technology: The rapid increase in the development and adoption of new technologies by both companies and customers. According to Davis (1989), “New technologies will permit customized manufacture on a mass basis. Rather than being limited by the paradox, they seem to embrace and transcend it.” (P. 16) Already before the popularization of the personal computers Pine (1993), Hart (1996) and Davis (1989) predicted how the emerging information and communication technologies will play a key role in the practicalities of making MC possible by delivering higher variety with lower cost. According to them speed, accuracy and efficiency of the required level were never possible until the emerging decades after the nineties.
An important point to make is also that the technology required for MC is now available for everybody. 20 years ago a company had to invest vast amounts of money and time to implement something as dramatic as a new manufacturing strategy. The risk profile for trying out new services has changed. Today even a company of a very small scale is able to implement something as technical as MC if they so wish.

2. Demand: There is a growing demand for variety in products and customization from the individual customer. This is because of the mass markets are evolving beyond niche markets towards the mass-customized-markets (figure 4).

![Figure 4. Markets have evolved from small local markets followed by mass markets, segmented markets to today's niche markets. According to Davis (1989) the final step of the market evolution will be the fragmentation of niche markets. Davis (1989) believes that the full adaptation of mass customization strategies will play an important role in this scheme.](image)

As according to Hart (1996), “The fragmentation of the mass market is an ongoing, inexorable phenomenon, breaking down with it the previously smoothly running production system that was based on efficiency, stability, and control. Not only are customers harder to generalize, with homogeneous markets increasingly a thing of the past, but the individual wants and needs of any one customer are more and more prone to changes and shifts” (p. 38).

Levels of mass customization

One of the most debated fields amongst the researchers of the mass customization, is the determination of the different levels of mass customization. In other words up to what stage does the individualization need to happen, in order for the process to be seen as MC. The agreed opinion is that it is very important to understand and define the level of customization that will take place in the process. An undefined level of customization may occur in huge amount of unnecessary complexity and cost. Gilmore et al. (1997)

Researchers have coined several different frameworks to measure the different levels of MC, the most established one by Gilmore et al. (1997) in the “four faces of mass customization”. Their framework consists of four different approaches to customization; adaptive, cosmetic, transparent and collaborative (figure 5). The framework is divided on to two parameters, product and representation. The different approaches are placed on the matrix according to their attributes with the parameters. The product parameter measures the amount of actual changes in
the product as it is being customized. The representation parameter measures the amount of how much of the customization is being represented or portrayed to the customer. In this thesis I will use the framework by Gilmore et al. (1997).

The four approaches to customization

![Diagram of the four approaches to customization](image)

**Adaptive approach**

An adaptive approach to MC is characterized by that the interaction with the customer is nonexistent and there is no customization involved in the production process. This level of MC is called adaptive approach and it is the lightest level. The product is always the same, but the technology or the modularity of the product makes it possible to automatically customize or adapt to the needs of the user. For example a bicycle helmet is a mass-produced product. The production process stays always exactly the same and the customer buys a random unit from a production batch. However people have different sized heads and the helmet needs to fit the users head perfectly for the maximum protection. The helmet comes with a set of different sized foam pads that the customers themselves install on the product to fit their head.

In the case of Catchbox an adaptive approach could be achieved for instance through including an additional set of peripherals that could be attached on to the product at will. A business card holder for instance that could be attached around the product with a strap. The customer could choose whether to use the additional component or not.

**Cosmetic approach**
A cosmetic approach to MC is characterized by that there is a small interaction between the manufacturer and the customer. Essentially the production process of the product stays essentially the same. Physically the product is not changing but the representation of it is, for instance the color of the product. Although the customized part is mainly cosmetic, the customer might still feel that they received an individualized product and service. Hence the customer gets value for getting an individualized product. A good example of a Cosmetic approach in MC is a credit card provider that allows for the customer to choose the background picture on the credit card. There is virtually no changes made to the production process except for the input of the customer created content, in this case the picture. With digital printing methods this type of process is extremely easy and cheap to operate.

In the case of Catchbox the cosmetic approach could be achieved for instance by allowing the customer to choose the color and the graphics of the cover part of the product.

**Transparent approach**

A transparent approach to MC is characterized by that there is a clear interaction between the customer and the manufacturer and the product is customized to a certain degree so that it fits the customers needs and preferences. The fact that it is being customized may not necessarily even be communicated to the customer. Transparent approach is typically used in a case of an insurance policy for instance. As the customer applies for an insurance policy, the providing company has to interact with the customer to gain enough information to base the insurance on. The insurance provider creates the insurance based on the information received. The customization is hence done by the producer of the service.

In the case of Catchbox the transparent approach could be achieved for instance by changing some of the elements of the product dependent on where in the world is the product being sold to. In practice this means changing the safety labels and manuals to match the languages spoken in the destination country.

**Collaborative approach**

A collaborative approach to MC is characterized by that it is based on fully customizing the production process and communicating this fully to the customer. Being part of the process brings a large value for the customer. The impact on the production is huge and may result in millions of variations of end products. For example an online clothing store where all the clothes are tailored according to the customers measures. The customer would have to insert his/hers personal measures and choices of the clothes. The manufacturer would already know the design of the clothes but they would still have to start the production of the clothes by cutting the fabric and so on. Collaborative approach is the most impactful level of MC for the manufacturer.
In the case of Catchbox the collaborative approach could be achieved for instance by allowing the customer to customize the size and shape of the product. As a process this would require a lot of communication and it would be heavily impacting the production process.

Success factors of mass customization

There is a lot of research done around the topic of success factors in mass customization strategies. In other words, to successfully implement a MC strategy, what is required from the implementer?

Risks

Researchers seem to agree on the following main points. MC is a complex process with a lot of risks. The process should be thoroughly studied and understood in different levels before implementing it. Gilmore et al. (1997) Salvador F, De Holan PM and Piller F (2009). One has to understand the different levels and ways of doing MC and to which one of those to follow (see levels of mass customization chapter) Gilmore et al. (1997). The implementer should also understand that the complexity and cost of the implementation of a MC process can be fairly high. Especially with transparent and collaborative approaches to MC. The MC concept and the research on the topic is still in its early days so the pure lack of experience and information can lead to unexpected results in experiments, be it a positive or a negative one. Salvador et al. (2009). Davis (1989) brings up a curious risk; a cultural one. An Italian fashion manufacturer provided a possibility for its retailers to mass customize suits for their clients. The service included a 10% additional price and a 15 day wait. The service turned out a huge flop because Italian customers valued fashion, instant service and a straight access to the purchased goods.

For startup companies the risks are all same. However there are additional risks and uncertainties that startups especially have to keep in mind. Time and money are typically the elements that are very scarce for startups. For this reason it is extremely important for startups to be able to control the risks that the MC process might bring. A good way to control the risks is to profile and minimize them. For instance a startup company could use a minimal viable product (MVP) approach when implementing a MC service. This means that the produced service includes only the key elements and features that it requires to function. This way the possible changes to the design are faster, easier and cheaper to implement. Preparing for the process, knowing what and how you want to mass customize, might still not be enough. To conclude, Mass customizing is not easy and it is not for every company.

The 6 success factors to MC

As mentioned previously, for a successful implementation of mass customization process, companies have to have certain internal and external factors in place. In the following section I will introduce these 6 most commonly approved factors synthesized previously by Fogliatto et al. (2012). These success factors
are essentially important for this thesis as they provide answers to some of the development questions that need to be addressed in developing a mass customization for a startup company. Factors 1-2 are external factors that are required from the targeted markets, factors 3-6 are internal factors required from the company.

1. **Customers should want differentiation**

The demand for customized product should exist amongst the customers. For example industries with commodity products like oil or gas simply have no need to differentiate in the market, hence there is no bottom-up demand for MC. Pine II (1993) Even if the demand is in place the customer still has to understand and agree the cost of MC service. The time of delivery will be longer than normal, and the price of the end product higher Da Silveira G, Borenstein D and Fogliatto FS (2001).

2. **Markets conditions & timing should be right**

To get the maximum return of investment (ROI) from implementing MC models the timing has to be right. More precisely in being the first in your field. According to Kotha (1996) there is a significant advantage with a “first mover” value of mass customizing. In other words who ever gets to the market first with a mass customization service, is bound to get high returns from it. Kothas (1996) example of a Japanese Bicycle company is a classic one. Three competing Japanese bicycle manufacturing companies all started doing mass customization. Although the competition was fierce and the products were very much the same, only the one that had done MC the first was recognized as the original MC provider by the customers. As they were celebrated as the fresh innovator, the competitors were seen as copy-cats and hence even suffered a slight hit to their brand. Kotha (1996)

3. **Value chain should be willing to adapt**

Above all, MC is a chain work. This means that all the collaborators should be involved deep into the process. Most times in a MC process a manufacturer needs to partner with subcontractors, retailers, transporters etc. They have to understand their individual importance in the system and be able to adapt into the MC process. Kotha (1996) In recent studies it is shown that the value chain is actually one of the most important aspects to a successful MC process Salvador et al. (2009) This is because the subcontractors have to learn new tools and skills, retailers should be educated to sell the new services. Overall it is a lot of work. The MC process is as weak as its weakest link. Kotha (1996), Magretta (1998)

4. **Technology has to be available**

MC is a process that is extremely dependent on modern technologies, both in communication and in manufacturing. Lack of sufficient and accessible technologies has been the reason why MC has not been fully possible before the popularization of the personal computer. For the MC process to work sufficiently between customer, producer and the manufacturer, the information communication should be highly automated, informative and easy to adapt and use. If it is not
so, the risk of misunderstandings and failures can be very high. For a full-scale MC process the access to internet-based systems is compulsory. Fogliatto et al. (2012) From the producers perspective the production technologies should also be suitable for the required level of customization with as little human interaction required as possible.

5. **Product should be customizable**

The product should have the characteristics that enable MC to take place. Although the purest way of doing MC requires that every product is individually made, this is not practically possible to meet the scale and cost of mass production. Instead the level and area of customization for the product has to be recognized. Whether it is building the product from modular components of choice or designing the printed graphics of the product. This is not possible nor is it feasible with every product. Pine II et al. (1993) Da Silveira et al. (2001)

6. **Communication is the key**

At the core of MC is the ability to provide exactly what the customer wants. In order to reach this stage the customer should fully understand what they can and cannot have. Vice versa the producer should understand what the customer would want to have before any product is even being produced. In order to manage this process a lot of information has to be transferred to both directions. If it is done only with human interaction it would require so much work that it could risk eating
up all the efficiency of the process. Therefore it would also risk the possibility of delivering what the customer actually wants. The key to manage this process is to share all the key information both ways using visual tools that help both parties educate and understand each other. Wind J, Rangaswamy A. (2001)

**Designing a mass customization process**

In the previous section of the literature review I have observed literature on the foundational characteristics of the mass customization as a concept. In other words what is MC, why is it trending today and how to utilize it. The following key points were discovered:

- *MC process can be a very challenging and risky strategy to implement.*
- *There are many different levels of MC and methods to implement it.*
- *Clear success factors that can be followed for a successful outcome.*
- *Mass customization is a suitable strategy for small startups*

In this section I take a closer look at the literature on the MC process itself. What kind of elements, stages and stakeholders are involved in the process and how do they correlate to one another. Most importantly how is a MC process and the product configurator tool designed and why.

**Mass customization process**

Mass customization process can be divided on to two separate fields: the front-end and the back-end. Front-end is everything that takes place in the field of experience of the customer; the service, the customization itself (product configurator), purchasing and obviously the experience with the final product. The back-end is everything that is not visible to the customer. This includes the order placements, production and manufacturing, logistics, delivery etc. Due to the importance of the user experience for the topic of this thesis, I will keep the front-end as the main focus in this section.

**The 4 stages of MC process**

There is surprisingly limited amount of research information available on the process steps of MC. The researchers seem to have consensus on the content of the stages but they differ mainly in the definition of the steps. In their own literature reviews on MC, researchers Fogliatto et al. (2012) synthesize the MC process into 4 steps. Their work is both established and up to date so I take their process (described below) and use in my thesis later on.

*Step 1 Product catalog*

The manufacturer defines the borders or options in which the customer can customize the product. These limits will define the level of customizability for the product. The options can vary from a very limited pre-determined choice models to a very high level of customizability with an extensive amount of options.
**Step 2 Order configuration**

The customer choice data is collected from the customer after they have made the decision on the customization. The data is then stored and saved in a standardized way, so that it can be used by the manufacturer to implement the product.

**Step 3 Order transfer**

The saved customer choice data is sent automatically from the store to the manufacturer. The manufacturer analyses the data and inserts it into a manufacturing process. The manufacturer also labels the project with an identification tag such as barcode so that they can track each project through the manufacturing process.

**Step 4 Manufacturing**

The manufacturer feeds the customer provided data to a computer system that automatically turns them into production instructions. Often the manufacturer uses CAD or CAM tools to automate the manufacturing process. A MC process is heavily dependent on a computerized manufacturing environment.

**In the case of Catchbox**

The 4 stages of MC process are very much dependent on one another. For instance the order configuration and order transfer can only be designed once the product catalog has been designed. The product catalog is one of the most important definitions to be made. Taking into account the extremely limited resources that a startup company has available, the product catalog has to be very focused and controlled. This way the risks are more easy to control.

As mentioned the order configuration process depends a lot on the product catalog. If the product catalog is simple for example a change in a color, and the amount of customer choice data is small the process will be simple and easy to implement. The challenge will be to design the product configurator in a way that the customer choice data is easily collectable.

With the order transfer communications and partnerships might be the biggest challenge. The manufacturing parties must be educated to be part of the process and the communication has to work flawlessly to avoid confusion and mistakes. The challenges with the manufacturing are technical and they require a lot of collaborative work together with the sub-contractors. The biggest risks are in scheduling as Catchbox does not have their own factory but rather they have to rely on third-party manufacturers.

**Communication**

As discovered in the concept section at the core of the functionality of a mass customization process is a fluent transfer of information between the manufacturer and the customer. Firstly the manufacturer should have the knowledge that the customer is willing to customize the product. Secondly the customer should be
educated on what is possible for them to customize on the product. The efficiency of this two-way communications chain largely determines the success of the whole MC strategy for a company.

Once the manufacturer has defined the level of customization and the way it may be materialized, they need to communicate it to the customer. The customer then makes the design decisions based on these pre-set guidelines. After the design decisions the customer makes the final purchasing decision. The customers design decisions are recorded and directed to the manufacturer as manufacturing instructions. The instructions are processed and checked that they are executable and not conflicting with any of the manufacturer’s guidelines. Once the instructions are checked they are handed to the party responsible for the actual manufacturing. The main communicating stakeholders in the process are the manufacturer and the customer. The selling party/product producer in this case Catchbox has a more passive role in the middle (figure 6) Da Silveira et al. (2001)

![Diagram showing the communication between the manufacturer, producer, and customer](image)

*Figure 6. This framework visualizes the volume of communication between the key stakeholders of the MC process. Most of the information during the process takes place between the manufacturer and the customer, as the actual producer has a more passive role as a supervisor to the process.*

This two-way communications phase of the process is called the decoupling point (DP). The communications interface between the manufacturer and the customer is called a product configurator (PC). PC is a design tool that lets the customer to experience and finally decide on the design work. PC is typically an online tool with a highly graphical interface.

**Product configurators**

In a traditional retail store environment the sales personnel guides the customer
thru the sales process. The personnel serves the customer by answering to all possible questions and doubts regarding a purchase. The personal interactivity with the staff provides the confidence and the sufficient amount of knowledge to make a purchasing decision. In a store the customer can also physically experience the product, try and test it. With a mass customizable product there might be millions of different options to choose from, and more information than any sales personnel can ever possess. In an online store the customer is not able to experience the product physically, nor can they interact with a sales personnel face to face. As result gaining the required level of confidence is not as easy as in a traditional store.

Because of the challenges that the online shopping environment creates with the shopping confidence, additional tools are required to make the MC process functional. These tools are called product configurators Vink (2003). Product configurators are online based systems that allow the customer to interact and influence on different parameters of the design of the product. When a consumer makes changes to the product with the configurator, they get the functionality and the visual appearance of the product in real time. Essentially the product configurators help the customers to increase the decision value thru the three points brought up by Vink (2003) (1) effort (2) uncertainty (3) evaluation (see next section). Often times the PC´s are made very graphical, making the customer to feel like they are in charge of the design process. This factor has a positive impact on increasing the ownership to the product or the I designed it myself-value (see page 30).

Customization choices

Although the approach to mass customization might vary from adaptive to cosmetic and from transparent to collaborative (see levels of MC) the 4 stages of mass customization stay the same. However the amount of information that needs to be communicated between the customer and the manufacturer might vary a lot. Da Silveira et al. (2001) According to Vink (2003) this information flow is the key for a functional MC process. He boils the information flow down into three points that the company willing to utilize MC should understand prior to implementing the processes:

1. How much product information should be offered in the MC environments?
2. What type of information should be offered in the MC environments?
3. How should product information be presented in the product configurators?

In his work “Customization Choices (2003), Vink executed a set of empirical studies where he analyzed the impact of design in the MC environments. More specifically how does design influence on the consumer decision making process in customizing the characteristics of a product. According to him the product configurators are the only way to influence on the decision making of a consumer in an MC environment. Hence the successful implementation of a product configurator can be said to be a very important part of the MC process.
Vink coins the term Decision value (DV). DV determines the overall value that the user gets from the MC process and the resulted end product. When the DV is high the customer gets a high return value from the MC process and can thus be satisfied. Hence the consumers using PCs try to maximize their DV. According to Vink there are three points that have the most influential effect on the DV.

1. **The effort**  
   How much effort in time, money, physical and cognitive ways does the user have to invest to the process. Vinks (2003) study on consumer decision making process in mass customization environments shows, that customers try to reduce the overall effort that they put in to the customization process. This being said, the customers still want to be in charge and feel like they can influence on the design, so the process should also not be fully automated. Hence the overall effort to the process should be minimal.
   
   *For the case of Catchbox Vinks study results in terms of the effort is good news. From the information gained up to this point it is safe to say that the overall aim is to create a simple yet impactful service.*

2. **The uncertainty**  
   Consumers can feel very uncertain about their decisions in the MC process. This might be caused by several different reasons. For example the customer might feel a lack of design skills and hence feel that the risk of making a “wrong choice” is too high. The customer might also feel that the amount of choices is too vast. This could also make the decision process harder. In essence the customer does not necessarily know if they are doing the best decision possible, or is their decision being accepted by the public. The results of Vinks (2003) study show that customers want to reduce the uncertainty as much as possible and gain the confidence to make the purchasing decision.

   *The Catchbox product configurator should not have the problem of having too many customizable features. The aim is to keep the flow of the service extremely simple, so that the user could not get “lost” and hence get the feeling of uncertainty.*

3. **Product evaluation**  
   When customers are able to evaluate the product that they are customizing they are also more likely have a high decision value on the purchase. Stating the obvious, that when a customer is able to design the product themselves, they are very likely to get the characteristics that they think are the best. Vinks (2003) study shows that when the customers can customize their product themselves the evaluation is also higher, leading to also higher decision value. Hence the PC should be created so that the evaluation of the product happens easily and visually.

   *The aim is to create a highly visual and interactive product configurator for Catchbox. Vinks (2003) study results on product evaluation supports this plan.*
The “I designed it myself” value

The decision value concept by Vink (2003) that was opened up in the previous section is a highly analytical analysis of three factors influencing on the quality of the outcome of the MC process. These factors are very practical and can be measured and hence also improved if needed. (Franke et al. 2010) coin yet another factor in to the soup, a much more abstractive one that they claim has an impactful effect for the economic value of the MC for the customer. They call it the “I designed it myself”-effect. I believe this value is also important to mention and this is why I describe it in the following. “I designed myself” factor is simply the feeling or awareness of being the creator of the product design. In other words feeling ownership for the design. In a series of tests Franke et al. (2010) came to the conclusion that this factor has a major role in the willingness to pay for the product. Franke (2010) references it to an example of an amateur artist who hangs his paintings on the wall. One can argue that the artistic value of the painting is non-existent, but for the painter himself it may be the most valuable piece of art ever. The sentimental value for the creator can make all the difference. Franke (2010) acknowledges the same factors as Vink (2003) and comes to the conclusion that the “I designed it myself value” is actually conflicting with the “Effort” factor. The design effort should not be as minimal as possible because this might limit the artistic freedom of the creator and make them feel less like the creator. He recommends an easy design process with a healthy openness to the options, a large enough canvas with few enough paints if one will.

How to design a Product configurator?

In his paper Customization Choices (2003), Vink takes a wide look at the whole MC process. He focuses closely on the following points:

1. The customer decision process (see customization choices)
2. The information presentation in the mass customization environments
3. The implementation of the product configurators (PC) themselves.

The essence of his work is to educate the reader on the ways and reasons of how and why to design the product configurators. In the end of his paper Vink gives a detailed guideline and do/do not points to design a PC. Vink describes three main challenges to the design process of the PCs. The first one is the amount of information that is being presented to the customer. There is a danger of information overload being offered to the customer. In such cases the customer often finds the selection process too difficult and ends up abandoning the process and declining to purchase the product. The solution is to present only a limited amount of information to the customer. The second challenge is to understand
what type of information should be presented to the customer. This is highly dependent on each case and the product at hand. In some cases the information should be about the characteristics of the product functionality i.e. when designing a computer. In other cases the information should be about the appearance i.e. when designing a Barbie doll. The solution is to have the right type of information presented for the customer.

The third challenge is to figure out how the information should be presented to the customer. This depends highly on the presented characteristics for instance if the customized product is a doll, the information should be visual rather than numeric. Often times these three challenges are answered with a combination of methods and as discussed earlier there is no one right way but rather it always depends on the case. The utilizer of a MC process should recognize these challenges and be able to answer to them before implementing the service.

Vink (2003) devotes a whole chapter on the results of how to answer the previously mentioned challenges in a way that leads to a high decision value. In order to reach that a high level of DV the MC process should lead to (1) **reliable evaluation of the product**, (2) **minimum uncertainty on the choices** and (3) **minimum effort to the customization task**. He boils the results down into a guideline of simple rules to follow. Here I will take a glimpse of these guides and bring up the relevant information to answer the development questions of my literature review.

**Create a vivid product configurator**

The more vivid the experience is I the PC, the more it feels like the customer is in a store making the decision. This makes the evaluation of the design much better and gives a much better confidence to make the purchase decision.

**Create interactive product configurators.**

Interactivity of a PC also enhances the evaluation process. For instance as the customer makes changes to the product attributes, the changes in the visualization should be immediate. This makes the process much more reliable, entertaining and immersive.

**Offer no more than 50 attribute levels.**

The amount of customizable characteristics should be kept below 50. If the amount of characteristics is too high the customer can get confused and tired of the process. The handicapped feeling of not being able to choose might be followed by uncertainty and eventually lead to declining to purchase.

**Provide customizable characteristics related to product appearance.**

Customizing the appearance characteristics reduces uncertainty about the choices. Customers want to know what the product will look like in real time before making the purchase.

**Make customization choices reversible.**

Being able to reverse their choices makes the evaluation of their decisions much
better. This way they can refer the different choices easily and play around with the design.

As discussed, these guidelines are very rough and guiding in the true meaning of the word. When implementing a product configurator each case should look as an individual every time.

**Conclusions**

In this section I acknowledge the theoretical information that was discovered in order to answer the development questions. The point of the results is not to repeat everything that was discussed in the literature review, but to bring up the main points and answers from the theoretical angle.

In the beginning of the Literature Review I brought up three development questions. From the source literature I was able to gain enough of relevant information to answer all of the appointed questions. It was discovered that there is a significant amount of research available on the concept of the MC process. Different levels, frameworks and success factors and even direct guidelines on how the process and its elements should be implemented. However it is worth mentioning that the amount of information on the practicalities of the steps of the MC process was lacking or significantly smaller. This might be due to the fact that the implementation of a MC process turns out to be a highly individual case for every company, hence the information stays rather on a higher conceptual level on this thesis. Also the amount of information on startup companies linking to mass customization was found to be rather small. This was compensated by defining the special requirements that startup companies might have. This definition is based on the authors experience with startups and Catchbox.

Although the theoretical information gained in this review is conceptual it has given us a clear direction and enough knowledge to move forward with the thesis work. After the literature review and the theoretical part I will start the empirical or practical part. The empirical will give me a more practical point of view to the thesis. Together with the theory and the empirical I can later form a design brief and start to work on the actual design work, the product configurator for Catchbox.

In the following I give answers to the development questions that were formed in the beginning of the literature review.

1. **The mass customization process; what kind of stages is the process divided into and what are the different stakeholders in each of these stages?**
As discussed the process of the MC has been researched on a fairly high-level. Fogliatto et al. (2012) and Da Silveira et al. (2001) have however boiled down the MC process down into 4 main steps that seem to satisfy most of the researchers on the topic. The steps are: Product Catalog, Order Configuration, Order Transfer and Manufacturing. This topic is discussed in the beginning of the section “designing a mass customization process”.

2. What requirements are needed from a company that wishes to successfully implement a MC process?

There is a lot of debate around this topic amongst the researchers. The consensus however seems to be that implementing a MC process can be extremely hard and it is by no means a strategy that every company should pursue by default. It requires a certain kind of abilities and qualities from both the company and the product to be possible to implement it successfully. Fogliatto et al. (2012) and Silveira et al. (2001) have boiled the different success factors down to a list of 6 guides to follow in order to implement it with success. This topic is discussed in the “Success factors of mass customization section”.

3. How should a MC product configurator be designed in order for it to have a high decision value?

Probably the most relevant question for the goal of the thesis. To answer this question I follow strictly the paper Customization Choices (2003), by Niels Y. Vink and “I Designed It Myself” Effect in Mass Customization by Franke et al. (2010). Vink (2003) carefully analyzes the challenges in customer decision making in the mass customization environments and boils down the results into actionable guidelines.

According to both papers the PC should be designed simple enough with few enough choices for the customer to be able to make the right choices, but rich enough for them to feel like they are in charge and have the power to influence on the end result. The PC should be a highly visual and interactive experience that mimics the real-life shopping experience in a store. This immersion has a positive effect on the conversion to purchase the customized product. Also the high visual level of the PC decreases the uncertainty of the decision value and is hence a positive thing.
Empirical

As I have now answered all the development questions from a theoretical point of view, it is good to understand that implementing something as complex and unique as a mass customization process should not depend alone on theory. Where theory may enrich our understanding of the reasons behind a process, its evolution and such, it still lacks in practical and executable actions.

Product configurator analysis

How to should the PCs be implemented in practice. Research can be very dry and homogeneous source of ideas and inspiration. This is why I will take the information from the research and literature and shift my focus to a more practical field of examples. In the following section I will present different product configurators made by other companies and analyze them from different angles to gain the more practical wisdom.

Why

In the later phase of this paper I will compose a series of interviews of potential customers. The idea of the interviews is to gain their perspective on a MC process and tool to be designed for Catchbox. I need to gain understanding of important factors as an example who will actually do the design in the customers end, how much resources can the customer allocate on the process and what exactly are the characteristics that they want to customize. To able to compose the interviews I need to know about the practicalities and existing tools. These might be of great help during the interviews. These are the main reasons why the following analysis of the PCs is being composed.

How & Goal

In this analysis I will go thru a selected set of different product configurators made by other companies for a variety of different products. The selected products vary from shoes to cars to even groceries. The products themselves do not matter much for the analysis, since I will keep the focus on the PCs themselves. I will also take a close look at the experience of the process. However I have mostly chosen cases that do resemble somewhat with the customizable characteristics.
To analyze the configurators I placed myself in the position of the customer. I created an artificial need that I wanted to fulfill with the service. For example as I was using Nike’s service, I was looking for basketball shoes that whereas a certain size and was made of certain materials. I did not prepare for the experience by reading reviews or precise instructions, so I would not be too biased.

In the end of each of the analysis I consolidate my thoughts into “takeaways”. Quick and rough yet informative and important points that emerged strongly in the experience. At the end of the section I use these takeaways to form the final goal of this exercise, practical design guidelines. A list of features, components, elements or guides that the to-be-designed PC should include. As discussed earlier the Literature review gave us the theoretical base knowledge hence this section will educate us on the same points but in the more practical world. Later on in the thesis I will still reflect both the theoretical and the practical knowledge for the real users, as I compose and execute the interviews.

Influencing factors

From the theory, I have taken the most relevant factors that I will be reflecting to the cases. This way I will be able to see how did they implement each of the factors and if yes, how well did they manage. In the end of the analysis I will compile a table where it is easy to compare the different cases. The factors that I will be focusing in this analysis are:

1. **Vividness / immersiveness**
   Was the experience of the product vivid? How well was the PC able to render the real feeling of the product and communicate it? Was the experience immersive enough to achieve the sufficient shopping experience to make the purchase decision?

2. **Interactiveness / inspirational**
   Was the design experience of the PC interactive or static? Did it support the users thinking to go experimental by inspiration?

3. **Easiness / Effortlessness**
   Was the design experience with the PC easy? Was there additional instructions available and were they needed, hence was the experience intuitive? How much of effort did the user need to put into the design process? Is there any sign of the information overload, or did the user have the energy to go thru the whole process?
4. Design ownership / “I designed it myself”-effect
Was the user able to feel the freedom of designing, or was it a too closed of a process? Did the user feel ownership of the outcome and hence gained more confidence of the design and willingness to make the purchase decision?

The analysis
In the following table (figure 7) I briefly present all of the product configurators that were involved in the analysis. On the left side of the table is the name and web domain of the service, on the right side a short description of the product.

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyMuesli</td>
<td>Customize muesli from a combination of different organic ingredients.</td>
</tr>
<tr>
<td><a href="http://www.mymuesli.com">www.mymuesli.com</a></td>
<td></td>
</tr>
<tr>
<td>NikeID</td>
<td>Customize different Nike shoes by changing colors and patterns.</td>
</tr>
<tr>
<td><a href="http://www.nikeid.com">www.nikeid.com</a></td>
<td></td>
</tr>
<tr>
<td>Stala ‘Designer’</td>
<td>Customize kitchen sink tables by dimensions and the placement of the sink.</td>
</tr>
<tr>
<td><a href="http://www.stala-designer.emedia.fi">www.stala-designer.emedia.fi</a></td>
<td></td>
</tr>
<tr>
<td>My M&amp;M’s</td>
<td>Customize M&amp;M candies by changing the color or the printed texture.</td>
</tr>
<tr>
<td><a href="http://www.mymms.com">www.mymms.com</a></td>
<td></td>
</tr>
<tr>
<td>ArtBag</td>
<td>Customize different handbags by changing the colors of the materials.</td>
</tr>
<tr>
<td><a href="http://www.artbagdesign.com">www.artbagdesign.com</a></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 7. All of the product configurators that are involved in the analysis*

Case 1 MyMuesli
**Background:** My muesli is an online service where you can customize breakfast muesli according to your own taste and then have it delivered to your home. The customization consists of different content variables that go in to the package such as different grains, fruit and other edible ingredients. The package itself stays always the same excluding the name of the product which the customer can decide themselves.
First encounters: The MyMuesli PC is simple yet very effective. The final product is easy to understand and hence the configurator does not require that many steps (figure 8). However the complicating factor seems to be the amount of information or attributes. There are more than 70 different ingredients to choose from to build your product. This causes a lot of confusion and distraction. All the ingredients are interesting and supported with additional information on the nutrition, source countries etc. but when all this is added up it ends up in a huge amount of data to digest.

The good: MyMuesli PC is very easy and intuitive to use. No instructions are really needed. Also after playing around with the configurator it makes me want to
buy the product. Hence I would say it makes me feel like the product owner.

**The bad:** The customer might get the feeling of unawareness if they do not go thru all 100+ ingredients, they might feel like they are missing something. All the ingredients have pictures, but they are sadly very small (figure 9). This makes the differentiation process with some attributes/changes very hard. I find myself missing examples of what other customers have been designing. If I could see some examples it would not only be inspiring but also it would verify the authenticity of the business, “I can see that it works”.

**Takeaways**

- There should not be too many customizable attributes
- The user-interface can be simple, yet inspirational at the same time

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**Case 2 NikeID**

**Background:** The NikeID shoe customization service allows customers to customize their Nike shoes. The service is enabled with some of the shoe models but not all. Customers can choose from different colors, materials and even printed content.

*Figure 10. The main view of the NikeID. The shoe that is being customized is shown in the middle of the screen, tool palette on the left.*
Figure 11. NikeID inspires the user with reference material. Shoes designed by others.

Figure 12. Big part of the NikeID experience is the idea of sharing or validation by others. It is very easy to share ones design on social media or email it to a friend.

Figure 13. With NikeID the user can also take the design with them as a picture.

**First encounter:** The quality of the visual content is very good and hence you
can really feel confident about the design; you know precisely what the product will look like. Despite the vast amount of different attributes the customer does not feel like getting lost in the information. It is easy to see which decision affects on which part of the shoe. Also despite the amount of choices, no matter what the customer chooses it feels like you can always find a good looking result, this is very inspirational and motivating to keep on creating. It is hard to avoid feeling pride in your choices and hence feel skillful and convinced.

The good: The NikeID customization service is one of the best product configurator that I have ever seen. The service is not only very easy and effortless to use, it is also inspirational and enjoyable. This PC excels in all four levels that I previously defined as the success defining features. The service is very interactive, whatever choices you make you get the visual feedback instantly and qualitatively (figure 10). The NikeID has a whole section for inspiration, displaying shoes that other people have designed with the same options (figure 11). This is very inspiring. If the customer wants they can also save a picture of the shoes that designed for later. This may be very useful for getting even more confidence on the design by showing the pictures to other people. (figure 12 & figure 13)

The bad: The only real negative feeling from the NikeID is the amount of time that one can spend using this tool. It is easy to get carried away, save projects for later and maybe come back later. I think this might lead into a lot of abandoned carts.

Takeaways
- Seeing what others have created is very inspirational
- Being able to save the result as a picture works as a reminder
- The interactive interface creates a lot of confidence on the design decisions

Case 3 Stala *Designer

Background: Stala *Designer is a product configurator that allows you to design kitchen tabletops and kitchen islands for people who are refurbishing or renovating their homes. The customer can choose between different sized tables and the accessories, they can also influence on the placements of different elements on the table such as sinks and cooking stoves.
Figure 14. The designer view of the Stala *Designer

Figure 15. The numeric values can be hard to validate and grasp
First encounter: I repeatedly fail to finish the product that I'm trying to design. Either the configurator is incapable or I am trying to create a design that is not possible, either way not knowing which one is the reason is very confusing. I'm also having problems with trusting the service, the changes that I make in the parameters do not show in the rendering.

The good: The Stala *Designer is a robust and a very technical configurator with a limited amount of options. The interface is interactive. As the user makes changes in the choice menu the price and the visual rendering of the end product change almost accordingly (figure 14). The best part of the tool seems to be the output of the process. Once the user is done with the design they can choose to take the technical drawings of the table with them on a .pdf file (figure 16). This is definitely a required perk in such a service.

The bad: However as the point of view to the final product stays always static it is hard to point out some of these differences i.e. detailing on the product. This kind of lacking makes the validation of the final product hard, as the customer makes more choices and the price goes up, but nothing seems to happen. The use of the tool also seems surprisingly complicated at first. A lot of the information is being displayed in numeric values that the user has to input by hand (figure 15). This gives a very technical, cold and clunky feeling to the interface. Maybe this is intentional, but I personally do not like the feeling. Also, since there is not too much information available on the different choice options one starts to look for extra guidance. This is available but also can be hard to find. It is also worth mentioning that there is no inspirational input to the design process. No gallery etc. where the user can see what is possible, or what the designed solutions look in real life. The uncanny feeling of the rendered picture might not be sufficient enough to confide the decision of purchase.

Takeaways
Customizable parameters should be visual rather than numeric
- It is hard to trust the service when it is not interactive enough

Case 4 My M&M´s

**Background:** My M&M´s is a customization service that allows customers to personalize M&M candies according to their own designs. M&M´s are small and colorful chocolate candies that are very popular around the world. The user can have an affect on the colors of the candies by choosing from a preselected portfolio of colors. Additionally they can also have custom content printed on the candies in form of pictures, text and clip art. Finally the customer can also influence on the packaging of the candies.

*Figure 17. Different ideas on the main page can give ideas for the user.*

*Figure 18. Customer is inspired by different use cases and ideas for instance weddings*
First encounter: My M&M’s is a very interesting service for Catchbox as they allow the customers strictly influence on the printed content on the product and not just on the predefined choices such as colors etc. Not too many of such configurators seem to exist, in fact My M&M’s was one of the few that I was able to find. The reasons are not certain but my hypothesis is that the “full freedom” in the design process may easily lead to problems in the process. As users can basically choose what ever material they want, what happens if they choose content that is conflicting with the values of M&M’s or against their brand? A quick test shows that by inserting inappropriate words on the candies results to a message that tells you that this message can not be printed. As pictures and illustrations are not a type of “numeric” data that can be predefined as foul or
questionable material, it remains as a guesswork that how they solve the same problem with pictures. Perhaps there is a human factor behind each and every customized M&M that filters out the ones that are not suitable. This however sounds like a lot of work and hence not that likely to be the case.

In the printing stage the user has three choices of which they can choose none (if they just want a certain color) or all three. The choices are a picture, a clip-art and a text. The content will be equally divided with the candies creating a nice combination of colors and different content. The user can upload a picture from their own computer that falls under the technical requirements set by the configurator. These technical requirements come in an understandable form and can be easily found within the process. It is mentionable that all the print work; picture, text or a clip-art are all printed in only one color, black. The user can not influence on this. Again the reason might be the quality control of the designs. By limiting the choice to a single color the manufacturer makes sure that the customized products maintain a certain level of consistency, also the manufacturability becomes a lot more simple with only one color. The software renders a version of the customers picture that resembles to the final outcome of the print work on a candy. This improves the immersion and gives a sense of confidence for ones design. The clip-art is exactly the same service as the custom photo from the customer, except the clip-art illustrations are pre-selected by the manufacturer minimizing the selection again.

In the final stage the user can choose a package for the product. This is a simple choice between a variety of packages from different themes and holds no further stage of customizability.

**The good:** The My M&M’s product configurator is a highly graphical experience.
The website itself gives a nice inspirational beginning (figure 17) with a lot of different ideas and use cases for customizing candies i.e. weddings, birthdays, sports events etc. (figure 18). There is also a whole separate “inspiration gallery” for getting ideas, this seems to be a nice way to start the process. The design process is divided into three stages: Choosing color (figure 19), choosing print (figure 20) and choosing package (figure 21). The color stage is a simple process of choosing 1, 2 or 3 different colors from a preselected portfolio of colors. The user cannot choose which ever color. This makes the selection process more simple and easy. By having a certain range of colors also makes the quality control process a lot easier for the company. Which ever colors the user chooses the combination will still look good and fitting with the M&M brand. In overall the product configurator of My M&M´s is well done.

**The bad:** The experience is simple yet informative, perhaps even a bit too informative from time to time. There can be a little bit too much of small text content that can be distracting and hence cause abandoned carts. This is perhaps the only major flaw in the design itself. As mentioned the process is simple and fast enough for the user to feel “in control” and creative as well.

**Takeaways**

- Seeing what possibilities there are is inspirational
- Having clear stages in the design process creates confidence and clarity
- Too much of informative text can be distracting

**Case 5 ArtBag**

**Background:** ArtBag is a company that specializes on different types of bags. They provide bags for both men and women alike. Styles of the bags ranging from small handbags to bigger tote, bicycle and carry-all bags. The company provides ready-to-order bags as well as customize-your-own section, where naturally you can customize a bag of your own.
Figure 22. The entry view to ArtBag

Figure 23. The opening video with instructional material

Figure 24. The main view of the configurator
**First encounter:** Although the ArtBag web store sells normal un-customized bags as well, the design-your-own-bag is clearly an important selling point for the company. From the very beginning of the website there are clear guides on how to start the custom process. The process consists from three to five steps ranging on the design of your bag. The configurator itself is simple, effective and quite sophisticated, it is equipped with a simple animated tutorial that helps you during the design process. All the time during the process there is large 3D rendering of the bag in the center of the website (figure 22). The rendering changes according to every click and change that the user does. The picture however is always still, so it can not be rotated or zoomed in to. This gives a bit of a static feeling of the final outcome.

The sections of the process are; Designs, Handles, Textiles, Accessories and Finish. In the Designs section the user must choose the design of the bag from a variety of options. The Handles section only appears on some of the designs, here the user may choose a handle for the bag. In the Textiles section they can affect on the fabric colors as well as textures and in the Accessories section the user can add an additional accessories to the bags such as ribbons and bowties.

**The good:** As mentioned the process is clear and easy to understand. It is made visually pleasing and simple enough. In the beginning there is a nice tutorial animations as well as a video to lower the threshold to start the process (figure 23). Once done with the design in ArtBag the user can also save the design for later or very easily share it on to friend and family thru email or social media (figure 25). Interestingly there is also a possibility to “ask a designer” a section where the user can send their design to be valuated by a professional designer. This is very interesting feature in terms of validation. The price of the project is also visible all the time during the process, this gives an honest and transparent impression.
The bad: Some of the executions in the configurator are not too intuitive. Simple yet important features such as changing a texture of the bag should happen by clicking the fabric color button (figure 24). This however is not enough but the user must drag the new color on top of the old. In changing the linen of a bag is also implemented badly, you do not see visually the difference of the change because you cant see inside the bag. The user should definitely be able to rotate, zoom and observe the product from different angles.

Take aways
• Instructional video is a very good way to get the process started
• Being able to share the work is a good way to gain confidence in the design

Product configurator analysis results

At this point I have had a close examination and analysis of five different online product configurators executed and used by different companies. As result I can now judge their qualities based on the judgment criteria that I set earlier in this section of the thesis.

In this section I present the analyzed PC´s on a comparable checklist (figure 26). I have given a value (between 1-5) for each of the different factors, based on how well was each factor implemented on the PC. The judging is based on my personal experience with each service. I will than take a look at the final rankings and try to find patterns on what reasons made the top rated ones the best. In contrast I will also point out the most important reasons that made the lowest ranked ones the worst.

In the end of the results section I synthesize a list of all the take-away of the PC´s. With the focus on these takeaways I will compose design guidelines that will help me in the design process later in this thesis. As for the most important part of this analysis the guidelines are the key knowledge that I learned from this practical exercise. The guidelines are simple points or actions that I should implement in one way or another in the PC that I will design for Catchbox later in this thesis. It is mentionable however that these design guidelines again are the essence of this exact analysis, not the whole thesis.

After judging the configurators ranking them by points I can see clear ranks between the Pc´s. The best performing PC´s in my ranking were NikeID, My M&M´s and Artbag. The lowest performers were MyMuesli and the Stala*Designer. NikeID is a great example of a product configurator. There are several reasons for why excels, for one the NikeID is extremely easy and intuitive to use. The user does not have to go thru any instructional information to be able to use the configurator. The tool is graphically very pleasing and professional and again very simple, nothing extra is being displayed.
Product Configurator analysis ranking checklist

<table>
<thead>
<tr>
<th>Product</th>
<th>Vividness &amp; Immersiveness</th>
<th>Interactive &amp; Inspirational</th>
<th>Ease of Use &amp; Effortless</th>
<th>Design ownership</th>
<th>Total score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyMuesli</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Nike iD</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Stala *Designer</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>My M&amp;M’s</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>ArtBag</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>15</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 26. The comparison table of all the analyzed product configurators.

NikeID has around 20 attributes to choose from. This is plenty but it has been implemented in a way that it does not feel like too much. There is very little text in the tool, this makes the information flow feel like a good amount. My M&M’s is also an excellent example of a configurator. It is easy and simple to use after a few minutes of usage. The experience is very inspirational and even fun. There are a lot of example cases and ideas displayed for the user making the implementation of ideas very effortless. Graphically My M&Ms is quite rich a bit too much even, but this does not ruin the experience as the stages are so simple. What makes the My M&M’s PC so clear is the “funnel” model that the process progresses in. The user goes through clear phases in the process, in order to move forward they have to fill an action for instance choose colors. This funnel process keeps the user on the track and prevents them from getting lost.

The worst part about Stala*Designer is that it is not easy to use or follow. There is a lot of information being displayed all the time in different formats, pictures, text and numbers. It is hard to understand which attribute controls what part of the final product. The visualization of the product is not very interactive. The user can display the product only from one view and some of the changes in attributes do not seem to make any difference in the picture. This creates a lot of confusion for the user experience. Despite the fact that there is around the same amount of attributes than in the NikeID, with Stala*Designer it is harder to get the feeling of an ownership to the product. Although MyMuesli is not the hardest experience amongst PC’s it is far from being the best ones either. The problems emerge with the amount of attributes and the product information tied to the attributes, there is simply too much. This simple reason results to a low ranking for MyMuesli in the comparison. Next I will synthesize the takeaways from this analysis into actionable guidelines.
The actionable takeaways from the PC analysis

In this section I take a look at all of the take aways from the product configurator analysis and synthesize them into practical design guidelines. Although all of the take aways are focusing on individual PC´s, they can still be synthesized into unified guidelines by merging some of them. All of the take aways are listed below.

• There should not be too many customizable attributes
• The user-interface can be simple, yet inspirational at the same time
• Seeing what others have created is very inspirational
• Being able to save the result as a picture works as a reminder
• The interactive interface creates a lot of confidence on the design decisions
• Seeing what possibilities there are is inspirational
• Having clear stages in the design process creates confidence and clarity
• Too much of informative text can be distracting
• Instructional video is a very good way to get the process started
• Being able to share the work is a good way to gain confidence in the design

Practical Design Guidelines

1. Source of inspiration (gallery of examples etc.)

The product configurator should inspire its user to experiment and explore different choices in the design. In other words it should encourage the user to act straight from the beginning of the process, instead of starting off with a “blank canvas”. In some of the PC´s this is done by showing examples what other users have created. These samples might then have been compiled in to a gallery. In other cases as the user is starting the design process, they can choose to start the design from a pre-made design. As result the user again does not have to start from a completely empty canvas. The source of inspiration is an important part of the PC experience and should be included.

2. Interactiveness (different angles of the design)

The product configurator should be interactive. In other words the user should get instant feedback from their actions with the PC. The changes should be visualized clearly always on the main visualization of the product. Incase the change is not a visual one, it should still be presented visually somewhere. The user should be able to inspect the product that they are designing from multiple angles. This gives a significant improvement to the immersion of the product.

3. Saving the process. In a good quality picture format (download & email)
It should be possible for the user to save the design in some format in the product configurator. In a case where the user can not finish the design in one session they should be able to come back to it later. In some of the PCs the saving the design is not an option but the user can download the design in visual formats such as .jpg or .pdf pictures. This is a very good way for the user to remember their design. Some of the PC’s such as NikeID even offers for the user to create computer wallpapers and other promotional materials out of the users designs. This is a great way to create reminders and ownership for the users own design. Some of the PC’s have made it very easy for the users to share their design on social media such as Facebook and Twitter. This is a very powerful way to create peer evaluation for the designs. In other words when the users might be in doubt about their design they can ask for peer reviews. This is a powerful feature but works mainly on consumer products rather than b2b cases.

4. Undoing or starting over has to be easy / possibility to compare
The user should always have an easy way to go back in their design choices. As the user might make mistakes or choices that they are not sure of, they have to be able to undo the commands fast. In a case where it is not possible they might have to start the design work from the beginning. As result this might easily lead into frustration and abandoning the project.

5. The customizable characteristics must be easy and not too many!
The amount of customizable characteristics must be decent. In his guidelines Vink (2003) says there should not be more than 50 attributes to choose from, in my opinion and based on my analysis even 50 is rather high amount. One really can not define a strict amount of attributes to have because it is very dependent on the product. However my take is that there should be as few as possible as long as the user can get the feeling of creativity in the process.

Idea generation workshop
At this point of the thesis, I have covered the required knowledge about mass customization on two levels. Theoretical knowledge thru the literature review and a more practical knowledge gained thru by analyzing the existing solutions. These two paths have given me a lot of design knowledge and requirements that go into a designing a mass customization process. However, pure practical knowledge on the idea level is still lacking. Individual ideas or features that will be insert into the final service are not clear. Neither are the different aspects of how the Catchbox product should actually be customized. More specifically what are the different ways that the product could be customized?

This practical knowledge is essential information for the design process of the service. Hence in order to move forward with my concept this information needs to be generated. One way of approaching the previously presented questions is by practice. Ideating around the topic and generating the content is a valid method. To avoid a biased vision to the topic, I need to share this task with other people. Since the topic at hand is highly design driven, other designers should be included in the ideation process.
Workshop planning

I facilitated an idea generation workshop with two other designers at the Aalto University Design Factory in Espoo. The other designers also had a background in industrial design. They were both also a bit familiar with the Catchbox product. The Workshop was to least only 3 hours and would hence be very intensive in pace. The overall focus of the workshop was more on the general coverage of the entity of the questions, not on individual details.

The goal of the workshop was defined as two separate points.

1. To understand what are the different categories and ways that one can customize a Catchbox.

2. To find different practical and executable ideas on how to customize the Catchbox.

To facilitate the workshop I chose a very simple diamond method (figure 27) to be used as the framework. The idea of the diamond method is to divide the workshop into two main parts, 1. Generate ideas in quantity 2. Distill and compress the ideas and discover emerging patterns. Thru the patterns I might be able to define the different categories of the customization. Finding these categories would mean that I reached the workshop goal number 1. From the quantitative pile of ideas I could sort out the different executable ideas for later. Finding these ideas would mean that I reached the goal number 2 in the workshop.

In the workshop we followed the typical rules of brainstorming, for instance we tried not to criticize the ideas too heavily, being visual and fast about the ideas and also go a bit over the top, even outside the topic a bit. These are all methods and ways that have been proven to work very well in the past. The rules were also very familiar for the other designers so we were able to maintain a professional pace and quality during the process.

![Figure 27. The diamond framework that was used to facilitate the workshop. The first phase was about gathering the ideas and the second phase consolidating the ideas into results.](image-url)
Workshop

In the beginning of the brainstorming session we emptied our heads of all the current ideas about the customization on to a piece of paper. These ideas were not bad but we simply wanted to clear our minds to be able to start the thinking process with a “clean slate” (figure 28).

Figure 28. Brainstorming away with the boys. We started by emptying our heads to mind maps.

During the ideation phase we used a few different ways to widen our perspectives to the issue. It would not be ideal to simply just throw random ideas to the table and walk away. Although the point was to get a quantity of ideas, they should still be smart and executable. During the ideation, I would facilitate the discussion by coining new perspectives and questions. These questions might then point us to new directions and open up new ideas. The questions were very general, like “What is the value proposition of a customized product for a customer”? We also tried to get into the users perspective to understand the question from their point. In other words what kind of use cases would the users use the product and why would they want to customize it in the first place. And if they would how would they want to do this. If we could think like the customer we should also be able to “know what they want” and hence come up with good ideas. We observed a set of customer profiles that I had created before the workshop (figure 29). The profiles were based on the insights that the Catchbox team had gained thru by working with the real customers. For each customer we defined the following key points:

- What is the use case for the Catchbox?
- Why do they want to use a Catchbox?
- Why would they want to customize a Catchbox?
- How would they want to customize a Catchbox?
An example of the customer profiles was elementary schools.

<table>
<thead>
<tr>
<th>Elementary &amp; Middle Schools</th>
</tr>
</thead>
</table>
| What would be the use case for CB? | • Gym-hall events, get-to-gethers & games  
• Classrooms for engagement |
| Why would they want to use a CB? | • To engage students and activate them  
• For the playfulness and fun! |
| Why would they customize a CB? | • To gain ownership for the product  
• To increase social togetherness  
• To increase the school brand awareness |
| How would they customize a CB? | • School brand, colors, symbols & logos  
• Have the class to design their own CB |

Figure 29. An example of the customer profiles that we used to get into the mindset of users. In this case an elementary & middle school. On the left side is the question for instance “What would be the use Cases for a CB?” and on the right side our hypothesis.

After getting into the mindsets of the users we started to put down ideas on how to customize the Catchbox. We came up with a wide set of ideas ranging from very basic ones to some wild and even extreme ideas. For example a basic one was to change the graphics and colors of the product. As a wild one was a using smart technical fabrics that emit light and could hence illuminate different messages thru the surface of the product.

Figure 30. Documenting the emerging patterns.
Eventually patterns started to emerge amongst the ideas and we were able to form three main categories for the customization methods (figure 30). In the following I will briefly present the discovered categories.

**Graphical customization**
The printing capabilities for customizing a Catchbox are similar to printing on paper, in other words very limitless in terms of graphics. Unlike with traditional printing methods i.e. silk-screen, the digital printing allows for virtually any 2D material to be printed on the surface. The printing process requires no extra tooling. There are also no changes required to the printing process depending on the printed content.

Many of the ideas that we came up with were to do with changing the printed content on the Catchbox. From changing colors and patterns, this is by far the most easy and executable way to customize a Catchbox (figure 31).

![Figure 31. Graphical customization is all about changing the color or the graphics on the cover.](image)

**Physical customization**
Many of our ideas revolved around changing the physical output of the product. By changing the shape and size of the Catchbox cover, one could come up with numerous ways to change the feel of the Catchbox (figure 32). Also by changing the materials and the haptic feel of the product for instance the fabric, the product would have a very different feel if the fabric was for example fur or leather instead of the woven polyester.

![Figure 32. The physical customization is all about changing the physical appearance of the product. For instance size and shape.](image)
Additive customization
Customizing the Catchbox by adding external elements, parts, features and other physical objects to it (figure 33). One could change the physical output of the product but also retain the original shape and size of the product. These ideas would allow for a rich end result but at the same time would be hard to control as a manufacturing process.

Figure 33. Additive customization is all about adding components to the products.

Results of the workshop
The goal of the workshop was two folded: 1. To understand what are the different categories and ways that one can customize a Catchbox. 2. To find different practical and executable ideas on how to customize the Catchbox. We were able to reach both of these goals.

The first outcome of the workshop was a set of three very different categories of customizing a Catchbox; Graphic customization, physical customization and the additive customization. All of the categories emerged many times thru out the process and none of them turned out as an absolute favorite. All of the categories carry a lot of potential and could be taken forward for the next development phases of turning them into executable features. The second outcome of the workshop was a number of different practical ideas on how the product could be customized. These ideas were documented as lists and mind maps, they can be found in the appendix.

Although all of the categories were interesting and appealing in their own ways, narrowing them down to only one was a compulsory task. Limiting the categories took place for two reasons: 1. Focus. Within the working boundaries of a masters thesis, it was not feasible to include all of the categories to the final concept. 2. Executability. As mentioned, the goal of the workshop was to gain creative, yet realistic and executable material. The next phase of the thesis is to create a concept of the MC service that can realistically serve a purpose for Catchbox Oy in the near future. This again underlines the importance of a realistic outcome of the project. The results of the workshop need to be observed with this perspective in mind.
To make the selection easier I have created a framework (figure 34) that separates the short- and long-term plans for each of the categories. In the framework I briefly validate the benefits and dis-benefits of each category. The main focus is on the executability of the ideas.

Short-term / Long-term execution framework

<table>
<thead>
<tr>
<th>Additive customization</th>
<th>Short-term execution</th>
<th>Long-term execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Very expensive and complex to manufacture and manage</td>
<td>• An interesting way to widen the portfolio and to keep innovating the product</td>
<td></td>
</tr>
<tr>
<td>• Too much choice for customer</td>
<td>• Still very complex and expensive process</td>
<td></td>
</tr>
<tr>
<td>• Customer might not need this option at first</td>
<td>• Hard to maintain the brand consistency</td>
<td></td>
</tr>
<tr>
<td>= Not viable in short-term plan</td>
<td>= Possibly viable in long-term plan</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical customization</th>
<th>Short-term execution</th>
<th>Long-term execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Very expensive to manufacture and produce due to production, logistical and sourcing reasons.</td>
<td>• Very hard to control the brand and customer choice</td>
<td></td>
</tr>
<tr>
<td>• Risk of giving too much choice for customer</td>
<td>• Possibly to have different sized Catchboxes</td>
<td></td>
</tr>
<tr>
<td>• Brand recognition suffers</td>
<td>• Possibly have different haptic (fabric) choice for customers</td>
<td></td>
</tr>
<tr>
<td>= Not viable in short-term plan</td>
<td>= Possibly viable in long-term plan</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graphical customization</th>
<th>Short-term execution</th>
<th>Long-term execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cheap and easy to manufacture</td>
<td>• Expandable for instance adding more printable area and choice</td>
<td></td>
</tr>
<tr>
<td>• No changes to process</td>
<td>• Possibility to add more options to printing (technical inks etc.)</td>
<td></td>
</tr>
<tr>
<td>• No changes to logistics</td>
<td>• Very flexible for creativity</td>
<td></td>
</tr>
<tr>
<td>• Very flexible for creativity</td>
<td>• Caters to most of the customer needs</td>
<td></td>
</tr>
<tr>
<td>• Caters to most of the customer needs</td>
<td>• Focused and simple solution</td>
<td></td>
</tr>
<tr>
<td>• Focused and simple solution</td>
<td>• Could be too simple for some customers</td>
<td></td>
</tr>
<tr>
<td>• Could be too simple for some customers</td>
<td>= Viable in short-term plan</td>
<td></td>
</tr>
<tr>
<td>= Viable in long-term plan</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 34. The framework where I validate the capability of executing the discovered customization methods in short-term plan and in long-term plan.

With the framework I seek to validate which of the three customization categories is realistic and valid. Obviously some of the categories might not be valid in the near future could still be very valuable and executable in the future. This is why I have divided the framework into two columns: short-term execution and long-term execution. In the framework I briefly describe the main benefits and dis-benefits.
of each category and synthesize the points into a “viable” or “non-viable” status. The outcome of this selection plays a very important and influential role for the remaining phases of the thesis. The selection will define largely what the customizable features are and how the service will be structured.

We were able to come up with a lot of ideas with the additive customization. The user could customize the product characteristic by adding and removing external components from it. By changing the components, the product feel and to some extent also its function could be changed dramatically. For the short-term execution additive customization is a non-viable option. It would require additional products to be added to the portfolio and would hence be adding cost to the production. Managing several products is also incrementally more complex than just having one. However for the long-term execution the additional customization might be viable to some extent. Once the production operations are more stable and the customers are familiar with the portfolio, it could be possible to introduce some accessories-like components for the product. The production management and costs would still be a major disadvantage, but given the better financial situation that the company might have in the future, this should be viable.

We generated a lot of ideas that were based on the physical customization of the product. By changing the physical output of the product the user could change especially the look and feel of the device. Same as with the additive customization, the physical customization is not viable in the short-term execution. The risks are very similar with the cost and the portfolio management. Allowing for the users to change the shape of the product would also risk the brand recognition value of the product. This risk is present especially in the short-term as the brand is not yet familiar. In the long-term execution the physical customization could possibly be viable. There might be simple ways of executing this, for example introducing different size Catchboxes. This would not conflict with the cube-shape which is likely to be important for the brand.

From the three categories, the Graphical Customization stands out as the one that can be viable both in short-term and in long-term executions. In practice the user can customize the product by changing the printed content, colors, textures and so forth. Compared to the other categories it may seem like limiting the customization options a lot but the graphical customization is actually very broad in terms of choice and creativity. As mentioned, the printing technology applied in the production of the Catchbox allows for almost a limitless selection of options in terms of the design. One can think of other print customizable mediums for a reference, an A4 paper for example. In how many ways can a blank A4 paper be customized in? And what if the canvas was 3-dimensional, how about then? There is also no added costs or changes needed to the current production methods. Also controlling the Catchbox brand awareness will be easier than with the additional or physical customizations.

I decided to move forward with the Graphical Customization as the main method of how a customer can customize the Catchbox. In the following part of my thesis I will take a closer look at this method and the ideas that were generated around it during the workshop. With those ideas I will draft out a first rough-sketch of the
final concept for the service.

Putting pieces together

At this point of the thesis I am ready to start the actual design process. I will take necessary knowledge and learnings that I have gained from the three main parts of the thesis so far; the Literature review, the product configurator analysis and the idea generation workshop. These sections provide a wide enough perspective to be able to begin to define what the configurator should be like for Catchbox (figure 35).

This draft of the first concept focuses more on the functions, features and other basic pillars of the service instead of going too deep into details. Later on in the process as I have verified the basics, I will start to define the form factors, aesthetics and other more detailed points. The first concept neither focuses on the usability of the service. The first concept could hence be defined as the practical design requirements for the product configurator for Catchbox.

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**Figure 35. A framework displaying how I take the knowledge from the different sections of the thesis and use them to create the first concept.**

The first concept is mainly a personal hypothesis based on the separating studies and exercises that I have performed thru out this thesis. It is lacking the real contact with a customer and is hence still vulnerable for missing something important or perhaps underlining the wrong factors. For this reason, I will later display the first concept to real customers and host four sessions where we discuss it together. The goal is to validate the concept features on a big level together with the customers. Finally once I have the validated data from the customers I am able to define the final design brief for myself.
The first concept

At this point it is sufficient to clarify the product portfolio of the Catchbox web-store. The awareness of the different products in the store will most definitely have an affect on the customization choices made by the customer.

As a customer enters the Catchbox web-store, they will be offered several different types of products. There are two separate Catchbox products that are differentiated by the technology. The other technology is more sufficient for smaller events and other one more suitable for larger events. The products are called Catchbox “Basic” and Catchbox “Pro”. To the outside the products look identical. A third product in the web-store is the of the Catchbox, the soft cube shaped pillow, the cover. The cover is the part that makes both Basic and Pro look identical. It is also interchangeable between the two products. The cover is obviously also the product where the mass customization can be applied if wanted. Customizing the cover is by no means compulsory and hence the customer is also offered with a selection of regular “blanco” covers (figure 36).

![Diagram showing product options and customization features](image)

*Figure 36. As the customer enters the Catchbox web store they can choose between a regular cover and a custom cover.*
**Regular Cover**

The Regular cover is a product that comes in 4 different colors; Orange, Magenta, Cyan and Green. The customer can choose a color freely, they are all priced the same. The Regular cover is a product that is being produced constantly, so it is always in stock and hence can be shipped to the customer very fast.

**Custom cover**

The custom cover is physically the same product as the regular cover. It is manufactured the same way, except for the preselected set of customizable features. As the product is mostly produced only after the customization choices have been made, the delivery time is significantly longer than compared to the Regular cover. Also the price point is significantly higher.

**The Customizable features**

As mentioned in the previous section, the most viable way to execute a mass customization for a Catchbox at this stage, is a graphical approach. There are several ways to utilize the full potential of the printing technology used in the production of the product (figure 38). By changing the color scheme or by adding printable elements or patterns one can change the looks of the product very dramatically. In figure 37, I present the different customizable features of the product: top color, custom logo, label color, bottom color, side color

In this section I will present the customizable features, their potential and the reasoning why they were chosen for the concept.

![Customizable features diagram](image)

*Figure 37. The customizable features are; Top Color, Custom Logo, Label Color, Bottom Color, Side Color*
The customer may choose a solid color from a color palette set by Catchbox.

The customer may choose a specific color from the color wheel using CMYK or RGB values.

The customer may upload a specific picture as the printed material. This may be anything from color to patterns to picture elements to text.

Customer may choose between black and white colors.
Figure 39. The top color feature allows for the user to customize the top part of the Catchbox by changing the color or adding some graphics.

Figure 40. The side color feature allows for the user to customize the side part of the Catchbox by changing the color or adding some graphics.

Figure 41. The bottom color feature allows for the user to customize the bottom part of the Catchbox by changing the color or adding some graphics.
With the top, bottom and the side colors, it is important that the customer has a diverse variety of options regarding the design. These are big surfaces that are very visible and play an important role for the aesthetics of the product. Because of this reason the customer has options to simply choose a solid background color from the palette or choose a specific color from the color wheel. Additionally they can also choose to design a specific picture material and upload it to the configurator. Uploading a picture replaces the function of choosing a color.

![Diagram of Catchbox with custom logo and label color options](image)

**Figure 42.** The custom logo feature allows for the user to upload their logo, symbol etc. on the side of the Catchbox.

![Diagram of Catchbox with label color options](image)

**Figure 43.** The label color feature allows for the user to change the label color of the catchbox between black and white.

I have a strong hypothesis that the customers will value the ability to have their own logo printed on the Catchbox cover instead of the Catchbox logo. This is why I have chosen to include a feature where the customer can upload their own logo to the service and have it placed on the box. The customer can also choose the color of the brand label from black to white. This is a small feature but I want to see if the customer has any interest towards this kind of details.
With the given features the customer can design a wide variety of Catchboxes the figure 44 displays a few examples what would be possible. At this point the first concept is finished and with it I can move forward to the customer interviews.

![Catchbox Examples](image)

With the given features the customer can design a wide variety of Catchboxes here are just a few examples what would be possible. The first concept draft is now finished and with it I can move forward to the customer interviews.

**Customer interviews**

In this section of the thesis I compose a set of customer interviews and analyze the results. The work done so far in this thesis is based on two key methods:
1. Researching the theoretical literature on the topic of mass customization. 2. Analytical observation of the existing services by yours truly. I could write a design brief based on the current level of knowledge and succeed with it. However without customer validation there is still a large risk that the brief itself could be wrong from the beginning. By talking to the customers I can minimize this risk, turn the hypothesis into facts and move forward confidently.

**Method & goal of interviews**

The method to the customer interviews is qualitative. The goal of the interviews is to validate the knowledge and hypothesis that have been gained so far during the thesis process. The best way to do the validation is by talking to the real future customers of the Catchbox customization service. In the following table are the most important questions and hypothesis that I set off to clarify and validate in the interviews (figure 45).
I composed four separate interviews. The interviews were executed with a diverse set of customers to ensure that the opinions originated from different angles. All the interviewees were familiar with the Catchbox as a product in some way (figure 46). They had rented the Catchbox in the past and hence used it at events, or they had placed a pre-order of the product thru the Catchbox web-store (getcatchbox.com). The idea of mass customizing the product had not been introduced to the customers prior to the interviews.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Position</th>
<th>Experience with Catchbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jussi</td>
<td>Event producer at an event</td>
<td>Has rented Catchbox many times</td>
</tr>
<tr>
<td></td>
<td>organizing company</td>
<td></td>
</tr>
<tr>
<td>Juha</td>
<td>Innovation Manager in a</td>
<td>Has pre-ordered the product, but yet used it</td>
</tr>
<tr>
<td></td>
<td>pharmaceutical company</td>
<td></td>
</tr>
<tr>
<td>Aija</td>
<td>Event coordinator in a expo</td>
<td>Has rented the product previously</td>
</tr>
<tr>
<td></td>
<td>organization</td>
<td></td>
</tr>
<tr>
<td>Hannele</td>
<td>Marketing communications for a</td>
<td>Has rented and pre-ordered the product</td>
</tr>
<tr>
<td></td>
<td>city office</td>
<td></td>
</tr>
</tbody>
</table>

In all the cases the interviews took place at the interviewees workplace. The sessions lasted approximately one hour each and they were recorded for documentation by permission of the attendees.

Overall the interviews succeeded well. The interviewees were easy to reach and they were generally eager to help. They were also very interested to hear about the future of the company and without exception they of themselves as the future users of the customization service. I was able to validate most of the information, and I also gained a lot of new ideas for the final concept.
In the first part of the interview I gathered the basic information of the interviewee and asked about their relationship and experience with Catchbox. I then moved to talk about the product in more detail, the use cases, usability and value proposition of the product in general. Thirdly I presented the main part of the interview, the customization idea. Before showing the concept or illustrations of the customized product, we ideated together around the topic. This way the customer would not be biased to the idea or limited by practicalities. Emphasis on the customers needs we generated ideas that would benefit them in real life. After the ideation I presented the service concept and visualizations of a Catchbox that was customized with their company identity. This typically caused a reaction of large excitement amongst the interviewees. I had each phase of the user flow printed on a separate A4 and I asked the interviewee to place them into order of importance. This way I was able to see which of the features they valued the most and what would they consider to be a natural order of things.

Finally we discussed practical matters, such as how would the design & purchase process be executed in their company, who is in charge of the design and so forth.

Interview frame
A rough structure of the interview frame, the complete frame can be found in the appendix.

Part 1. Personal information
- Who is the interviewee?
- What is their position in their company?
- What is their relationship to Catchbox?

Part 2. Catchbox as a product
- Experience with CB?
- Value propositions that CB brings?
- How to use CB?
- How does the purchase process go for them?

Part 3. Custom Catchbox
- Value proposition of Custom cover?
- How would use Custom cover?
- Customizable features? (printouts)
- Design process?

After the interviews were done I compiled a synthesis were all the gained information was transformed into answers for the hypothesis that I presented in the beginning of this chapter. The answers can be found at the end of this chapter.
Interview cases

Interview #1
Jussi, Lataamo

Jussi is a managing producer for events at an event organizing company called Lataamo. He is in charge of producing and managing events for customers. He has a 5 years of work experience at his current position. Apart from producers work he also sells events, which means that he is largely part of the planning and ideation of the events as well as producing them.

The first time he heard of the Catchbox was through a customer. Up until today he has had Catchbox being used at his events for 5-6 times. His experiences have been very positive despite a few technical issues. He thinks that the product requires a certain kind of target audience, probably not best for too serious events such as political meetings and similar. As I asked what would he improve in the product Jussi replied: “make it so that I can have a logo on it”.

Jussi thinks that the custom cover has a very clear value proposition for their customer. It adds ownership to the product as well as visibility. This makes the customer look cool and innovative, as they are being connected to the Catchbox brand. Branding products is easy to sell and can be thought as a default service these days. On the other hand Jussi seems to think that not everybody would want to customize. Catchbox is cool as it is, without the customer brand. Also in this current economic situation the customers are very weary of solid costs such as the customizing a product. Jussi thinks that the custom cover could be priced 100-150€ on top of the normal cover price. In a case of customization the content would be created by their graphic department or the customers advertising agency. The design work would be taken seriously and it would be done by a professional. Some customers might also be interested in selling the cover as sponsorship space. He thinks that by far the most important features to customize are the color and the logo, with those they would get very far.

Interview #2
Juha, Abbvie

Juha is working at a global pharmaceutical company Abbvie, as an innovation manager. He is not innovating on the medical products but on the everyday working methods inside the multidisciplinary company. He first saw Catchbox being used at an event and instantly came to realize that they need to get these products for tier own company sessions and events. Catchbox seemed to change the way how people communicated in the audience, it made the Q&A´s seem much “safer” than with a normal mic, also the playfulness factor was amazing!

Juha thinks that the customization service has a huge additional value for them.
Customizing the product would create a totally different type of ownership for the product, “this is our Catchbox”. Juha would be interested in the physical customization options, he asks if he could make it into a pill shaped microphone. However by simply adding their identity to the box would work as a branding platform that would increase the visibility of their message.

Juha would be interested in purchasing 5-10 custom covers if they could get different product identities printed on them. He thinks that the value of the custom cover would be at least 1.5 times the value of the regular cover.

In Juha’s case the cover content would be designed by the professional graphic designer in their company under the communications department. They would definitely use a browser based tool if it will be simple and easy to use. Juha also thinks that the most important features by far are the colors and the logo. Being able to use two separate colors on the same product would be very good for bringing out the brand colors.

Interview #3
Aija, Helsinki Expo

Aija works as an event planner/ producer for the Helsinki Expo center. In more detail she is in charge of the sales and planning of events that take place in a smaller expo center “Wanha Satama” in Helsinki city center. She heard about Catchbox the first time through her colleagues. She has had it used only once in her own events. Her experience with Catchbox has been very positive, very easy to set-up and use and the additional value is very clear for the audience; easy, activating, fun and playful.

Custom cover would be a very clear and a necessary value for their customers. Aija thinks that the best way to customize the product would be with colors and customer logos. Especially for larger clients to whom the visibility and brand awareness are more important. Another value proposition would be to sell the cover space as for the event sponsors. Customers could easily sell the cover space for around 500€. She thinks that the customization should be rather less than more, meaning that there should not be too many features to customize. Most likely logo and color would be enough. She would not like to spend more than 30 minutes to make the design and hence the process should be simple.

In Aija’s case the design content would be created by a professional graphic designer either from their customer or straight from them. The online tool would be great, it is fast and flexible and supposedly easy. It might also work as a great communications tool as they are changing ideas between with the customer. However a human contact is very important for the service. For example there should be a phone number that can be reached anytime if any problems occur with the process. Also being able to review sketches of the design before placing the order would be very valuable.
**Interview #4**

*Hannele, The City of Espoo*

Hannele works as a communications & brand manager for the development team of the city of Espoo. Her work contains the planning and ideating events for the city council and other organs of the institution. First time she heard about Catchbox was in an event. As the product was being used the audience went “wild” and that was when she knew that they had to get these products for the city as well. She feels that the value of the product comes from activating the people. It makes people to communicate and encourages them to get together.

Hannele thinks that the customization is not only an added value, but she thinks of it as a necessary requirement for the product. The customization would create ownership of the product for the users. It would make the customer to look innovative, fresh and cool, because of this the customers would love to customize. She thinks that the color is the most important feature to be able to customize. After the color comes other print material and messages, be it in visual of textual content. She thinks that Catchbox is a great platform to go creative, so they would not necessary use their most common graphic style.

To create a custom cover they would use a professional creative agency to come up with the content, once done they would deliver it to us for production. She thought that if the browser based online tool would exist and it was easy, they would definitely use it for the process.

**Results of interviews**

The results of the customer interviews were surprisingly similar to one another. All of the interviewees liked the service concept a lot and it seemed like they were genuinely interested to hear more about it. They all saw the service as a clear additional value and themselves as its future customers. In the end I was able
to validate all of the hypothesis, and I also gained a lot of new ideas for the final concept.

Although I covered only four cases and all the customers represented a different profile, I was able to point out emerging patterns. Many of these repetitive comments and points brought up by the interviewees were answering to the questions that I had defined before the interview.

In the interviews I set to validate the following points:

• **Is there a clear value in the mass customization of the Catchbox?**
  All of the customers said that the custom cover is a very clear additional value. The service would work especially for customers who have a high valuation of their brand and message. The Catchbox custom cover would be a great platform to convey these messages as it is a very visible product when it is being used. The custom cover also creates ownership towards the device and in this way unifies the people around the product.

• **Does the concept have the right features?**
  • **Is there too many features or too few features?**
    For most of the customers the possibility to choose the colors and the custom logo would be the most important features. The main message was that too few rather than too many, with color or print patterns the customer is able to be very creative already. Simple means easy and fast.

• **What kind of resources would they invest into the custom product?**
  All of the interviewees said that they would use a professional graphic designer to create the content for the custom covers. Whether it was their own department or an advertisement agency but the work would be taken seriously. Approximately the value of the custom cover seemed to land between 1.5-2.5 times the value of a normal cover. A waiting time of 3-4 weeks was fine.

• **Does the product configurator bring added value to the product?**
  Most of the customers would like to be able to order the cover from online. Either from the website or thru email. The browser based online tool was seen as a very good idea, but not as a necessity. Most of the customers would still probably use it as long as it is easy. A human contact was seen as important as well, for example a phone hotline that can be used for assistance during the design process.

From the customer interviews I was able to gain some real-world validation to some of my previous assumptions about the concept. These validations together with the other parts of the thesis give me a strong base to start the work with the final concept. In the next chapter I will create the final design for the mass customization product configurator for Catchbox.
Design process

This section of the thesis compiles all the knowledge gained so far, and turns them into concrete ideas and designs. At first I will present a design brief that will clarify the goals of the final concept. With the brief in mind I will generate sketches and ideas of the final concept. Finally the best ideas are boiled down into the final concept draft (figure 47).

Figure 47. This framework displays how I took the knowledge from the theory and the empirical sections of the thesis and use them to create the concept#1. Then composed the customer interviews. Next I will form a design brief and start the actual design process. First by a ideating and sketching and finally by illustrating and presenting the final concept.
Design brief

The task is to design a product configurator. A tool that allows for an easy and effortless way to mass customize a Catchbox cover. The thesis studies done so far display that a very clear need for such a service exists amongst the customers. The potential for adding value for the company as a result of executing this service is very big. The typical user of the service is a person with basic or professional graphical skills. It can be expected that the user has access to other graphical tool such as image manipulation software.

The product configurator should be an internet based service with a graphical user interface. It should be accessible from all the market countries with a typical computer or a tablet-device.

The service has to be very easy and simple to operate and the overall process should not take longer than 20-30 minutes to complete. The user experience of the tool should be a highly visual and interactive process. The amount of informative content in text format should be kept minimal. The graphical user interface (GUI) should graphically follow the design language of the Catchbox brand. The message should be professional, trustworthy yet inspirational. Functionally It should be streamlined and intuitive to use, excess functions should be avoided. The tool should inspire and nourish the creativity of the user for instance in form of examples.

The Catchbox cover can be customized only graphically. The customizable areas are the outside parts of the box that are covered by the fabric. The results of the final concept have to be realistic and executable so that the service can be implemented within the next 12 months.
Ideating and sketching

During the customer interviews it was discovered that my original concept was rather accurate to what the customers actually valued. Clearly it was not detailed enough to be executed, nor was it covering all the different phases of the process. However the overall flow of the process as well as most of the features were actually correct. The final concept of the product configurator will be based on the work done with concept#1. During the ideating/sketching phase, I will explore options of expanding the process and adding the necessary details. Once this is done I can move on to a more refined and executable “final concept.

Figure 48. To start the sketching of the service I need to define the final service path. The overall service path for the customer can be divided into four sections; Starting-up, Designing, Finishing and Endorsing. The starting-up section is everything that happens in the beginning of the service, before the actual designing. For instance learning about the possibilities of the service. The designing is the section, where the product is designed with the help of the product configurator. The finishing is the section where the customer adds the product to cart and makes the purchase. The final stage endorsing is where the customer can optionally share and save the results of the design session.

I will base the design of the service on these steps. Each step will require certain functions and actions that make the overall process to work.

When designing an online service, it is important to note that there are physical requirements that will shape the service. The different devices from PC’s to laptops to mobile phones, all require a certain level of adaptation to happen in order for the service to function. I recognize this fact but due to the level of implementation in this thesis I will only focus the work on the most commonly used 4:3 screen size.
I will leave a small margin to the borders of the screen for a few reasons. As working with a graphical user interface the top and the bottom parts of the screen are taken by functions of the browser and the operating system.
First sketches and ideas of the process and the service flow. Originally I had ideas to make the whole process animated, so that all the different phases would happen on the same screen without any transitions. The idea was to make the flow seamless. This idea turned out to be technically too complex to implement for the final product as well as requiring too heavy processing power from the average devices.
Some ideas of the beginning phase of the process and how the tools could be laid out. Here I also ideated on the possibility to make the whole page a one long vertical page, that the user could scroll thru even during the design process. This would allow the user to discover more information and inspiration during the design process. This idea was inspired by the structure of the NikeID service.
More detailed sketches about the actual configurator. What kind of tools should be visible at all times and why. Most of the main functions of the tools can be already here on the toolbox. To get the required level of immersion happen, I wanted to make the product rendering completely interactive, so that the user can rotate it during the design process as they will. This way they can truly see the results of their work in real time.

Using symbols instead of text in the buttons is a straight result from the product configurator analysis as I found out that to avoid confusion I keep the design simple.
More ideas on the process and the flow. At this point I started to get a more clear idea of how the flow should run, what was the order of phases and which screen led to which. It turned out to be rather challenging to design the process so that there were no dead-ends.
Phase#1: Starting-up
The first phase of the process “starting-up” consists of several elements that aim to increase the awareness of the service and lower the threshold of taking part.

The main landing page (A1) displays the name and purpose of the service as well as a visually catchy picture of a Catchbox. From the landing page the user can very easily navigate to the other elements. In the Gallery (A1.1) the user can see what other users have created with the service and hence gain inspiration. The sharing of your work for the gallery is optional. From the key-features (A1.4) they can learn more about the product and the customization possibilities. Reviews section (A1.2) displays customer stories and reviews of the service. Lastly there is a short informational video (A1.3), that explains the service in a fast and effortless way. Most importantly once the user is ready to start the customization process they can do so from the landing page. (A2..B1)
Phase#2: Designing

The design phase consists of a set of customizable features and the required set of tools to make the design happen. Each of the features have their own “stage” (B1), (B2), (B3) etc. These stages can be navigated thru freely in whatever order the user feels like. Each stage can also be accessed again later and changes to the design can be made at will. This is important for the free flow of the process and not limiting the users ideas or driving them into a “corner”. As the user progresses thru the process the required tools for each stage will adapt automatically to the needs of the stage. For example when choosing a color for the top part of the fabric the choices are limitless, but for the brand label there are only a few choices available. The navigation has been made easy by giving several different intuitive ways to do so. The limited amount of customizable features also makes the whole experience simple to memorize and hence secures the easy flow.

The most visible object in the design phase is the rendered product in the center of the screen. This 3-dimensional picture of the Catchbox is interactive, so all the changes that the user makes to the design are automatically displayed on the rendering. As the picture is a 3D cad model, it is also possible for the user to rotate the product in different angles at will. This improves the immersion significantly. Anytime during the process the user can save the progress and continue the session later. They can also take snapshot pictures of their design from the different angles and save them as .jpeg pictures on their hard drive.

Once the user is ready with the design they can move on to the next phase by adding the product to the cart. (C1)
(B1.2) The product visualization tools. These tools allow the user to interact with the visualization of the product. Each customizable feature have their own “tab” on the bottom of this area. The tabs are one way to navigate between the features. The rotate buttons allow to turn the product in different angles, and the camera symbol can take the snapshots.

(B1.1) The product customizing tools allow for different features of the product to be customized in different ways. This toolbox is always located in the same place and it automatically adapts to the different needs of each of the stages.
Phase#3 & Phase#4: Finishing and Endorsing. After the user is done with the design they can move on to the most important phase, finishing the design and purchasing the product. Once done with the design the user simply needs to add the product to the cart (C2) and proceed with the normal purchasing process including online bank transfers etc. Before purchasing however the user is offered a set of choices where they can optionally do one or more of the following. Submit their work to the gallery (A1.1) or download a compilation of pictures of their design in .pdf format. The compilation is created automatically by the service and it displays the product design from different angles. In this process they can also share their design thru social media and email if they wish to do so. Finally in the purchasing process the user also have to agree to the terms and rules of the service. This simple agreement will notify that all designs will be processes by a human and before manufacturing it the content is checked for possible IPR infringes, unsuitable content etc. (C3).
(C2.1) A sketch for the completion toolbox. It is important that at all times there is an international phone number that the user can call in a case of a problem. Also the price and the “add to cart” as well as the save functions are very important to be displayed at all times.

A1.1 The landing page navigation bar with an idea of how the different functions could be layed out.
Final concept

In this chapter I will present the final concept of my thesis, the mass customization product configurator for Catchbox. The purpose of the final concept is to function as a detailed functional prototype that can be used as a guideline when implementing the functional product.

I will present the concept by going thru each of the main elements and the different steps of the process. The emphasis is on the flow of the process, the content of the different stages and most importantly the design of the service. With the design I refer to the visual and aesthetical presentation of this content, as well as the simple, easy and intuitive interface interaction.

I will present all the materials in still pictures instead of a functional and interactive prototype. This method has some limitations as displaying the different functions, transitions and animations have to be explained in other methods. For understanding the system I have created a set of aid tools that will help me to illustrate my ideas more clearly. The aid tools are as displayed below (figure 49).

The notation for the flow

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>Screen name and ID number</td>
</tr>
<tr>
<td>Go to the screen</td>
<td></td>
</tr>
<tr>
<td>The id of action</td>
<td></td>
</tr>
<tr>
<td>Touch point</td>
<td></td>
</tr>
<tr>
<td>Comment</td>
<td></td>
</tr>
<tr>
<td>Links between the screens</td>
<td></td>
</tr>
<tr>
<td>Area specifier</td>
<td></td>
</tr>
</tbody>
</table>

Figure 49: I will present all the materials in still pictures instead of a functional and interactive prototype. This method has some limitations as displaying the different functions, transitions and animations have to be explained in other methods. For understanding the system I have created a set of aid tools that will help me to illustrate my ideas more clearly. The aid tools are as displayed above.

Figure 50: The navigation bar that will display at which stage of the process does each of the illustrations belong to.
(A0) The main landing page of the website is a tall vertical page that can be scrolled down for more information. On the top of the page on the right side is the main navigation box for the key functions: Start, Play the Video and Learn More. “Start” begins the designing process and takes you forward (A1). “Play the video” opens an informative video and “Learn More” automatically scrolls you down to (A0.2).
(A0.1) The gallery. Below to the landing pages main area, is the gallery. The gallery is a section, where previous customers can put their designs on display at will. This is an important section as the new users are able to see realistic results that the service can produce. The gallery can be navigated horizontally as shown in the illustration above. The navigation happens either by clicking on the navigation buttons below the pictures, or by clicking on the pictures that are partially visible on the sides of the screen area. Specific pictures can be opened up for a closer inspection as shown above.
(A0.2) & (A0.3) On the Key Features the user can find more detailed information about the customization. What is possible, what are the methods and materials used, how long is the production lead time etc. On the reviews section the user can find peer reviews by fellow users who have experienced the service and received the product. Both of these sections are purely informative with the aim to increase the purchasing conversion, they do not contain any special features etc.
A1) When a user clicks “start” on (A0) The above illustrated happens. A table pops up displaying the main rules and terms of the service. The user does not have to agree to the terms yet, but they are informed about them. The two functions that are available are “Lets go!” takes the user forward to (A3) and Tutorials. The “tutorials” button is a link that directs the user straight to Catchbox´s Youtube site, which contains several tutorial videos.
(A2) On (A0) if the user opens the video, the above illustrated will happen. A video screen pops up to the front and automatically starts to play a short informative video about the service. The video contains a brief introduction of the service and demonstrates different ways to use the service. The video is embedded from the Catchbox’s Youtube site that has more video content available.
(A3) This is the first actual customization stage. On the top left of the page is the product customization toolbox (B1). On the center of the page is the 3D product rendering that displays all the changes made to the product during the session. The “+” signs on top of the product rendering are indicators for the different customizable features. They display which feature is being customized right now. By clicking such indicator the process moves to that stage, so they can also be used for navigation. On the right side of the screen is the completion toolbox. This box shows all the necessary product information such as the price, hotline telephone number and the checkout function “Add to cart”. On the bottom center of the page is the product visualization tools that allow the user to take snapshots of the product as well as rotate the model around.
(A3.1) The top fabric. To customize the top fabric the user can do one of the three options: 1. choose from a pre-selected set of matching colors “Solid Color” 2. Choose which ever color they want to choose from the color wheel “free color. For this option the user can also use the standard CMYK or RGB color codes. 3. The user can also use the area as a canvas and upload an “image” that they have created for this purpose.
(A4) The side fabric. The customization properties for the side fabric are the same as they are for the top and the bottom fabric.

If the user wants to save the progress, they can do so at any point. As displayed above the user only has to click on the save button on the customization toolbox and the progress will be saved to the browser memory.
(A5) The bottom fabric. The customization properties for the bottom fabric are the same as they are for the top and the bottom fabric.
(A6) The brand label. The user can choose between a black and a white brand label.
(A7) Custom Logo. In a case when the user decides to use solid colors instead of images for the fabrics, they might still want to use their own logo or symbol on the product. In this case they can simply upload the image of the logo on top of the color. This is done with a similar process than the pattern image uploading.
Once the user is done with the design process and they want to finish, all they need to do is to add the product to the “cart” and proceed to checkout.
(A9) Purchase is the final stage of the process before the bank transfer process. In this phase the user can simply purchase the product, share the results via social media or email or save the results as .pdf compilation. Optionally they can also submit the results for the gallery. Importantly at this phase the user has to agree on the terms of the service. The point is to guarantee that the user owns all the rights to the possible print material that has been sent to production. Also to be sure that the user understands that Catchbox Oy will not produce material that they might consider inappropriate, illegal, provocative or otherwise unfit for the spirit of the brand.
(B1) Tools#1. One of the most important elements of the configurator is the customization toolbox. All the design decisions are made thru this element. As mentioned earlier the toolbox adapts between the different stages of the customization process. On the top of the toolbox is the name of the current design stage, for example “top fabric”. Below the name are the different customization tools for the current stage. The tools occur first as dropdown menus that can be brought down by clicking them (Act B1.1). Underneath each of the design options is a “+” sign which by clicking opens up more info on the tool at hand. (Act B1.2). Under the tools there are two familiar functions; Save and Next step.
(B1.1) Patterns. In a case when the user wants to import their own picture material such as logos, patterns etc. They have to use the “image” tool in the customization toolbox. The user has to download the pattern template files from the toolbox. With the help of the templates it is very easy for them to do design and the layout for their Catchbox. Once the templates have been filled the user will upload each of the templates back to the toolbox and the design will be updated to the product rendering automatically. This process requires the basic knowledge and skills to use image manipulation softwares such as Photoshop or Illustrator.
(B3) The product visualization tools make it possible for the user to observe the product from other angles and take snapshots of the design. Below the buttons are the navigation points that can be used to navigate thru the customization stages.
(B3.1) By clicking on the camera symbol on the product visualization tools the configurator automatically creates a compilation of pictures of the current design. One of the pictures is the exact angle that the product rendering is at that stage. This compilation can be saved as a .jpeg on to the hard drive of the user.
Figure 51: A more detailed illustration of the final service in its real user environment.
Discussion

Understanding the difference between designing something yourself and influencing on a design is the pinnacle notation of this thesis boiled down into one sentence. Amongst all the different findings and takeaways found during this process, this one surfaced systematically. In other words, mass customization does not mean that the customer has free hands to design whatever they want. Instead it means that the customer has just the right amount of space to move around, so that they can achieve the feeling of ownership for their “creation”. Once this point has been reached, everything on top of that is extra clutter that will affect the experience neutrally or negatively, but most likely not positively. It is also at this stage that the costs of the process and the complexity of the manufacturing start to add up into unbearable amounts. With this point in mind it is safe to state that the designing of a mass customization service is a delicate selection process, rather than the creation of a sandbox where the player is the king.

My original hypothesis was that clear limits would have to be defined for the process. No customer could be allowed to go completely free on the design due to several reasons. What made the case even more so, was the fact that Catchbox is an early stage startup company with extremely limited resources available. Surely, if brands like Nike did not allow for complete freedom, could not do it either. The results agree with my hypothesis to a certain level. My hypothesis was even a bit too open minded about how the MC process could be designed. In fact, as a company implementing a MC process, you want to give as little freedom to your customer as possible, but just the right amount to make them feel like they are in charge. This theme of simplicity is a good starting point to answer the two main questions that were posed in the Introduction of this thesis.

How should the Catchbox product be customizable?
The customizable features should be limited to a handful of options that make the experience feel creative for the customer. Too many features will complicate the process and confuse the customer. Too few again will not necessary satisfy the customers needs. During the idea generation workshop it was discovered that the graphical customization is the only viable way to implement the MC process for Catchbox in the short term. However even if there were a lot more resources available, I do not think that expanding the customization options to physical or additive ones, would be smart at least not yet. The reason is simple, the customer is satisfied with graphical customization. After all that is the most important validation.

How should the customization process be presented to the users of the service?
The customization process, in other words the Product Configurator should be an easy, simple, fairly short and highly visual experience. Again the simplicity is
a keyword, as a complex configurator decreases the purchase conversion and hence serves no one. As was heard from one of the interviewees, the maximum time that they want to spend with the service is 20 minutes. The configurator experience has to be interactive and immersive so that the user gets constant feedback from their actions and achieve a better working flow.

This thesis succeeds to deliver what it aims to, a mass customization service Concept for the Startup company Catchbox. There is a very important difference between the background work including the theoretical and empirical research work and the formation of the final concept in the end of the thesis. No matter what, one can always claim that the final design work is always highly subjective and personal, and therefore more difficult to criticize. I personally share this opinion and hence point my self critique mostly towards the research work done in the first part of the thesis. I think that the research work was qualitative and broad in both perspective and in methods. There was a very clear learning curve that I followed thru the process and I was able to gain knowledge and insights in large amounts. These takeaways were later used by a regular basis when creating the final concept. The research could have taken a slightly larger part in the “back-end” of the mass customization process. This might have shed more light into some of the larger decisions made in the final concept. On the other hand the focus of this work was meant to be on the front-end. For this reason I suggest that in the future more research is done with the back-end of the process in mind. This subject could easily spur another masters thesis work from a more technical perspective. Another as equally important field to research would be the economics of the mass customization. I refer to both of the following fields; the monetization of mass customization in terms of the value proposition of the service and the cost structures of mass customization for a Startup company. For these topics this thesis could lead the way and be a great starting point into the world of mass customization. What is still missing from the final validation of the service, is a working prototype and testing it with customers. This is an excellent next step for Catchbox Oy to do. My second suggestion as a next step for Catchbox is to start the implementation of the product configurator as soon as possible, the faster they can get it to market the better. Meanwhile they should start the mass customization business even before the product configurator exists. It is important to remember that the product configurator brings value to the process but it is not what the customers pay for.

Mass customization is not very typical amongst Startups: most likely due to its resource requirements. It is complex, expensive, risky and a long-term committing strategy that may bring even biggest companies to their knees if done wrong. However it is exactly for those reasons why I believe that it is a suitable strategy for some Startups. Startups are small, nimble, lean and committing organisms that have no extra money to spent. There is also something that startups can do more easy than the big companies, experiment. With the right attitude a startup can quickly make a minimum viable product of almost anything and try it out. If it does not work, a startup will not fall from very high unlike the big players. With this kind of attitude, and the concept created in this thesis work I am ready to take this project forward to the next level.
References


Appendix

The interview frame:

Part 1. Personal information
- Who is the interviewee?
- What kind of business do they do?
- What is their position in their company?
- What is their relationship to Catchbox?

Part 2. Catchbox as a product
- Experience with CB?
- Where did you hear about the product?
- Where have used?
- How has the experience been?
- Value propositions that CB brings? WHY??
- How to use CB in the future?
- Who is in charge of the product in the company?
- How does the purchase process go for them?
- Who decides if it is bought?
- Who pays?
- Who chooses color? Are the colors good? How much would you pay for custom color?
- If you could improve/change the product how would you do it?

Part 3. Custom Catchbox
- Would you be interested in customizing it and why?
- How would you customize it?
- If you are free to customize it however, who would do it?
- Who makes rollups etc? for your company
- Value proposition of Custom Cover?
- How would use Custom cover in your business? What would you put there?
- Value of Custom cover?
- Preferred channel, where to get it?
- Re-sell price?
- Would you be interested in sponsorship space for events?

Part 4. Configurator
- Customizable features?
- Design process? (printouts)