How Virtual Avatars can be used in E-commerce

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How Virtual Avatars can be used in E-commerce

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Abstract

E-commerce is a rapidly growing phenomenon that constantly attracts new target audiences and finds new fields of application. Some products are popular in the E-commerce and others are considered hard to sell over the web. Even the products that are considered a hard sell over the web are getting more popular, and the E-commerce web sites are evolving to increase customer satisfaction. The E-commerce market for clothes and accessories is already major, yet there are a lot of potential customers who won't take part because of reasons like: you don't know how the clothes will fit, or how they will translate into a bigger format, or how they will match other clothes, or your skin tone. These reasons show there is potential for improvement in the E-commerce. With the use of virtual avatars, it's possible to close the gap between E-commerce and conventional shopping.

The avatar concept was developed as a result of the original vision, studies of the market, and the feedback from various test subjects. The concept is an overall solution for testing apparel online, which brings the Omni channel vision of E-commerce closer to reality. By integrating techniques as Character modeling and garment making into the E-commerce, the avatar concept will be realized. There are endless possibilities to further this concept, by changing its flexible structure or enriching it with other techniques.

Keywords: E-commerce, virtual, avatar, online shopping, apparel, interaction design.

Sammanfattning

E-handel är ett fenomen som växer enormt och ständigt attraherar nya målgrupper och hittar nya användningsområden. Vissa produkter är populära att handla via internet och andra produkter anses svårare. Även produkter som de flesta kunder tycker är svåra att handla över internet blir mer populära och e-handel-sajterna förbättras ständigt för att underlätta för kunderna. Kläder och accessoarer har en enorm marknad på e-handeln redan idag. Ändå är det idag många som drar sig för att handla kläder via internet p.g.a anledningar som: att man inte vet om passformen är bra, eller hur de ser ut i större format, eller hur de passar ihop med andra kläder, eller mot sin hudton. Dessa anledningar visar på en förbättringspotential i e-handeln, och genom att kunna skapa sin egna virtuella avatar, och testa produkter i sitt virtuella provrum, finns möjlighet att minska gapet mellan E-handel och konventionell shopping.

Avatar-konceptet utvecklades som ett resultat av ursprungsvisionen, marknadsstudier och feedback från diverse testpersoner. Konceptet är en övergripande lösning för att testa kläder online, vilket leder Omni-Channel-begreppet närmre verkligheten. Genom att integrera tekniker som Character modulering och Garment making till E-handel kommer Avatar-konceptet att realiseras. Möjligheterna att utveckla konceptet är oändliga, och kan ske genom att förändra konceptets flexibla struktur eller genom att berika konceptet med nya tekniker.

Nyckelord: E-handel, virtuell, avatar, online, shopping, kläder, interaktionsdesign.

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1 Introduction

This chapter presents an introduction to the area to be examined, as well as the purpose and restrictions of the project.

1.1 Background

E-commerce is a rapidly growing phenomenon that constantly attracts new target audiences and finds new fields of application. Some products are popular in the E-commerce and others are considered hard to sell over the web. Even the products that are considered a hard sell over the web are getting more popular, and the E-commerce web sites are evolving to increase customer satisfaction. The E-commerce market for clothes and accessories is already major, yet there are a lot of potential customers who won't take part because of reasons like: you don't know how the clothes will fit, or how they will translate into a bigger format, or how they will match other clothes, or your skin tone. These reasons show there is potential for improvement in the E-commerce. With the use of virtual avatars, this Master Thesis will explore the possibility to close the gap between E-commerce and conventional shopping.

This Thesis will be carried out at Åhléns AB in Stockholm. The main business of Åhléns is fashion, beauty and interior design.

1.2 Goal

The main goal of this Master Thesis is to find out whether the use of a virtual avatar can improve customer experience in the E-commerce. The goal is also to make this concept applicable for existing E-commerce sites.

1.3 Vision

The vision for this project is to create a concept, for which a user can try on apparel with a virtual avatar in a satisfying fashion. The concept should be visually appealing, perspicuous and exiting to use. It should be applicable on an existing web site and the avatar should be able to create with only a few measurements of the body.

The process of the virtual avatar concept should be a step to step process that can be initiated from several locations. The function should be accessible from the product cards, with a “try it on” tag. There should also be a menu where the function can be accessed separately and managed. The only input data needed should be such as can be measured on the body with a tape measure and a scale. It should be possible to save a session based avatar and to save it connected to a membership on a web site.

1.4 Research questions

To reach the goal of this Master Thesis the following questions will be answered:

- RQ1: Is a virtual avatar a desired concept in the E-commerce? What functionality would a user expect from it?
- RQ2: How would different target audiences react to a virtual avatar? Does it differ between frequent E-commerce users and people who have never been shopping online?
- RQ3: Have there been any similar concepts on the market? And how are they used?
- RQ4: Can the avatar replicate the customer in a satisfying fashion?
- RQ5: Is the concept possible to implement on an actual E-commerce site (ahlnes.se)?

1.5 Constraints

The most obvious constraint with the concept is the resemblance between a user and its avatar. The scale will obviously not be 1:1 and the personal features of an avatar can resemble a person but not be identical. Depending on the apparel, the

garment making function also might have a problem totally resembling the item, as it would look viewed in a store.

The concept of a virtual avatar will be designed for ahlens.se and might be constrained for other E-commerce sites, but should be applicable on most sites with small modifications. Since the concept will leave some functions unimplemented there will probably be some practical restraints when implementing the concept fully.

2 The market today

This section treats subjects to consider in the process of fulfilling the project goals. Is there interest in a virtual avatar and is there a market for it? Which obstacles must to be overcome to design and implement such a solution?

2.1 Why a virtual avatar?

This chapter investigates the interest for a virtual avatar concept.

2.1.1 **Virtual avatar interest research**

A survey was created to research the general attitude towards E-commerce, and how different target audiences are willing to change their shopping patterns. This survey was made for a Swedish speaking audience. The original survey can be found in Appendix A, along with answers, comments and metadata. The following is a version translated into English. There were 43 respondents to this survey and since a respondent represents more than two percentage units in the following answers, the conclusions should be treated carefully. This is merely an interest research with the purpose of investigating if there is a market for a virtual avatar in E-commerce.

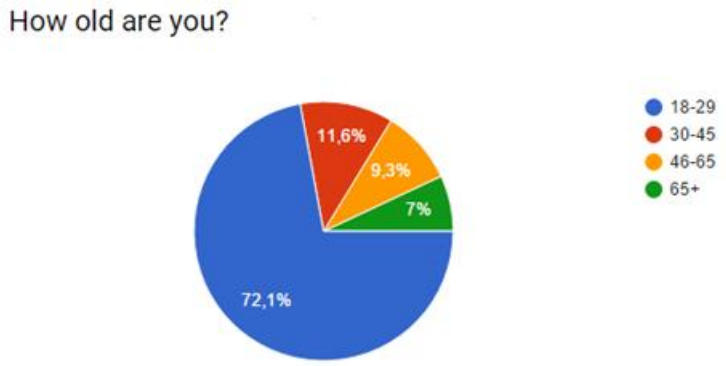

Figure 2.1.1 Pie-chart answers from survey

As the pie chart suggests, the majority of the respondents was aged 18-29. The rest is fairly even split, descending with age.

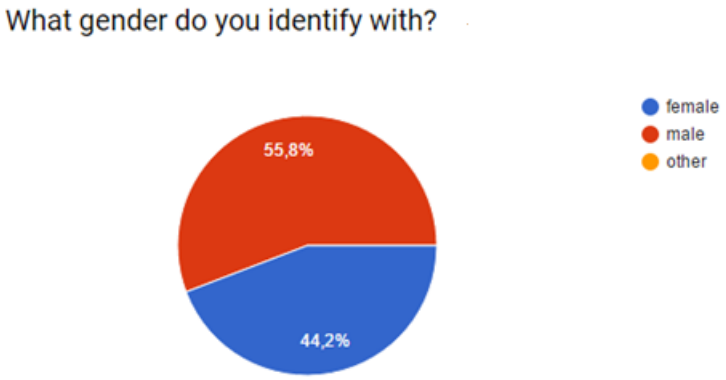

Figure 2.1.2 Pie-chart answers from survey

The gender split was relatively equal with slightly more males than females answering.

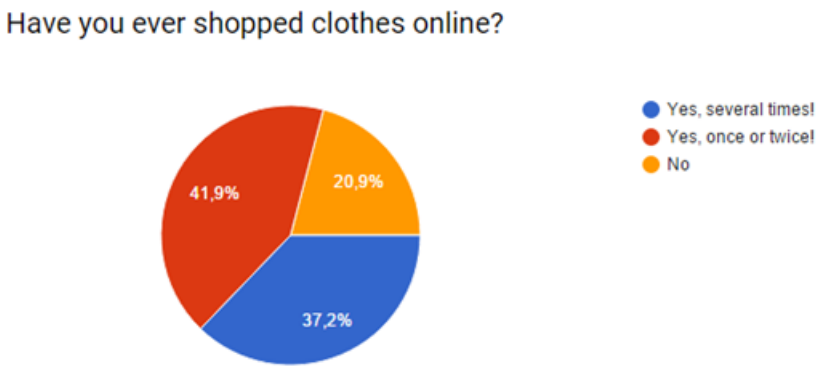

Figure 2.1.3 Pie-chart answers from survey

The overall statistics in the pie-chart shows that about 4 out of 5 people are E-commerce users and half of those are frequent customers respectively less frequent customers. When applying filters, it's possible to see certain trends. 17 of 19

(88%) women answered yes to this question and the two who answered no was in age groups 46-65 and 65+. Giving that all women under 46 answered yes suggests that this target audience, which makes the largest revenue in the fashion industry*, is the easiest to reach via E-commerce. Comparing this to men where 7 of 24 (29%) answered no and there was no trend within age groups.

If you answered yes to the previous question, how do you think shopping online compares to shopping in store?

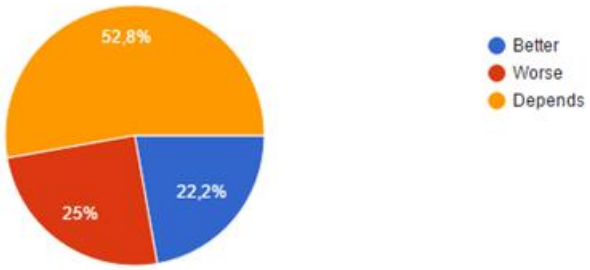

Figure 2.1.4 Pie-chart answers from survey

The pie-chart reveals that there is a lot of mixed emotion towards E-commerce. A majority of the asked think that it depends whether E-commerce or shopping in store is the better alternative. This uncertainty can be interpreted as many customers stands on a middle ground, and therefore potential for more customers. Those who prefer to shop online are pretty evenly split with those who prefer shopping in stores. This strengthens the thesis about the majority of customers standing on a middle ground. When looking into age groups and gender trends some conclusions can be made. Women and the younger age groups are more positive towards E-commerce in general. No one over the age of 45 answered 'better' on this question.

If you answered depends on the previous question, what does it depend on?

The following list contains answers to the question above translated from Swedish to English.

- *The image doesn't always correspond with reality, afraid to be disappointed, but otherwise very smooth.*
- *Hard to know what size to choose and what kind of fabric / quality of the material the item has.*

- *If the delivery is fast and cheap and if the images are distinct enough to actually see how the item looks.*
- *Sometimes you just want to test a lot of items.*
- *It's hard to get the right size when shopping online.*
- *It's really annoying to return items. Reverse Deliveroo pls!*
- *If the clothes fits it's great. Otherwise not so great.*
- *Smooth shopping from home, but negative that you can't test clothes*
- *No possibility to try on items.*
- *What you are buying!*
- *Equal*
- *Sometimes it's hard to know what size to buy since you can't try it on, otherwise good.*
- *Depends on how good the site is, how easy it is to find products, and how good the images are.*
- *Can't test on items. Annoying to have to return most of the items ordered.*
- *Sometimes the image of an item doesn't compare to the real item. On some sites you have to pay for returning of items, even though you weren't satisfied with the item.*

The answers to this question points to some common problems with E-commerce today. The main issue seems to be the inability to try on clothes, and more specific, how they look, how the material feels and how they fit. Some answers also points out that it depends on what items you are buying and how good the site is. Another common problem seems to be the returning of unwanted items. Both the process and the risk of loosing money seems to be an issue.

The avatar concept could help reduce some doubt about the looks and the fit of clothes with a size comparing visual effect. This would hopefully lead to the customers feeling more secure about their choice and less returns of items. The feel of materials and an assessment of the quality are problems that the avatar concept can't help with, since its tactile information.

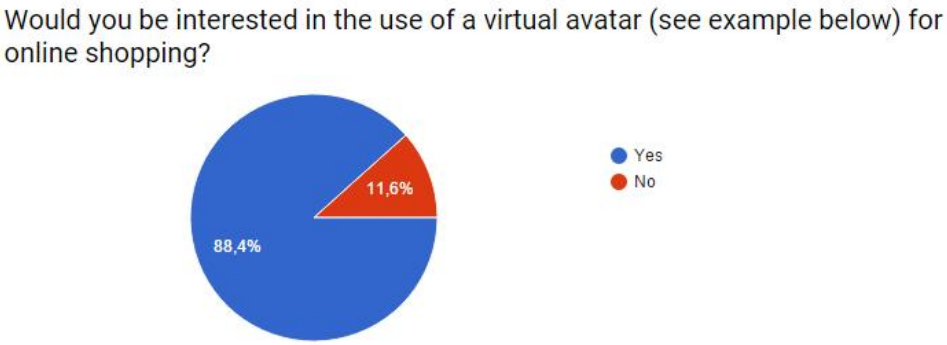

Figure 2.1.5 Pie-chart answers from survey. Example image, showing an existing avatar [1].

The interest or curiosity about a virtual avatar seems to be very high since an overwhelming majority answered yes to the question above. Because the naysayers are so few, it is hard to make any conclusions about specific groups. Although, the result shows that they are from all age groups and four out of five are men. These results show, even though there were few respondents, that most people are recipient to try this concept.

If you answered no on the previous question, why not?

- *Answered yes. Would have been annoyed if it fitted the avatar but not me.*
- *Better on a real human being, for example because you know height. You can also see how clothes fit and how different materials apply to the body.*
- *No interest in clothes. Don't care about the looks*
- *Images are enough.*

From these answers, it is obvious that some does not like shopping enough to spend time using an avatar. Another interesting remark is the first comment, which is referring to high expectations. If the avatar resembles the customer well, the expectations on the fit will probably be higher, leaving customers dissatisfied if the item does not fit as good on their bodies as on the avatar.

2.1.2 **Margin of error**

The largest margin of error concerns the subjective projection on the avatar concept. Since the respondents only had the Tesco example image as reference for the avatar, the visions of functionality and quality of the avatar is different for each person.

Another big margin of error is the number of test subjects, especially when it comes to people older than 29. Giving the time span of this interest survey it was not possible to collect more answers.

2.2 The E-commerce market and apparel

With the E-commerce growing rapidly and customers getting easier access to a broader selection of items, the competition tightens between E-commerce sites.

This chapter investigates the current markets for E-commerce in general and specific for apparel.

The E-commerce is rapidly growing in revenue and every fifth purchase in total is made online today [2]. The Swedish E-commerce turned over 4,9 billion SEK 2003. Since then, the curve has been heading one way and 2015 the Swedish E-commerce was estimated to turn over 50 billion SEK. As shown in Fig. x1 the revenue has increased constantly from year to year and showing no sign of change. This is all according to a research called "E-barometern" made by PostNord, Svensk Digital Handel and HUI Research AB.

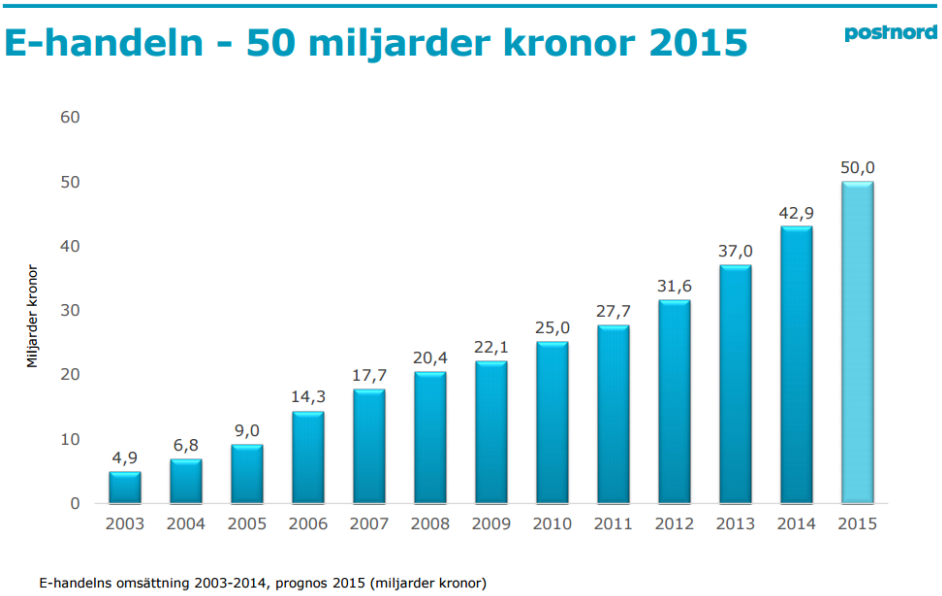

Figure 2.2.1 The total revenue for Swedish E-Commerce, Billion SEK year for year [2].

When comparing E-commerce retail revenue with the total retail revenue, the results points to a continuous increase. The total growth of the retail industry was 4% for Q3 (third quarter, 1 July – 30 September) 2015. For E-commerce the growth was 10% in Q3 2015. In Q3 2014 the total growth for retail was -4% (decrease) and for E-commerce it was 7%.

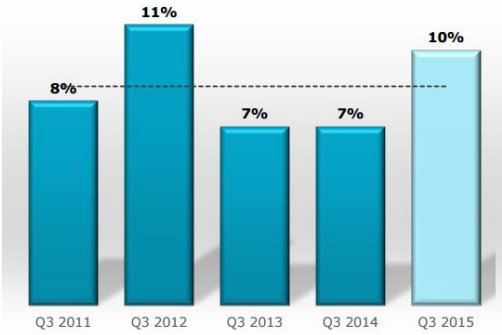

Figure 2.2.2 The increased revenue from previous year, measured in Q3 from 2011-2015 [2].

Figure 2.2.2 Shows the growth of retail (Clothes & Shoes) in E-commerce in Q3 (third quarter of the year) from 2011 to 2015. Comparing to figure 2.2.1, the retail industry trend follows the general trend for E-commerce.

According to [ref] a survey was made to examine which categories of E-commerce products that was purchased the most during Q3 in 2015. Clothes & shoes was placed second with 40%, of the respondents purchasing such products. Only media products had more purchases with 42%. Most purchases were made by women between the age of 18 and 29 and every other woman had bought clothes or shoes online in Q3 2015.

When looking at the E-commerce products bought abroad from Sweden, Apparel was the most popular purchase. 31% of the respondents had bought such products from abroad with E-commerce. The items were foremost shipped from USA, China, Great Britain and Germany.

Looking into reasons why people choose to buy certain items online and others in physical stores, certain conclusions can be made. The participants of the survey were asked about their last purchase in a physical store and why they didn't buy that item online? The most common answer was that they wanted to touch it or try it on. Almost the same amount of people answered that they didn't want to wait for delivery or because it was a spontaneous purchase.

The question was asked the other way around, what is the main reason you bought the last item online? The most popular answer was because of accessibility and comfort; it was easy to purchase. Other popular reasons were because it was cheaper on the internet and the stores nearby didn't have that item.

There was clearly more research done by those who bought items on the internet than in physical stores. When looking at the online buyers 40% had done research on the web and 15% in a physical store. Off the customers who shopped in a physical store only 25% did research on the internet and 13% did research in a

physical store. The customers who bought items online used different devices. Fig.x3 shows the response for the question: From what unit(s) did you purchase item(s) on the internet during the last three months (Q3)?

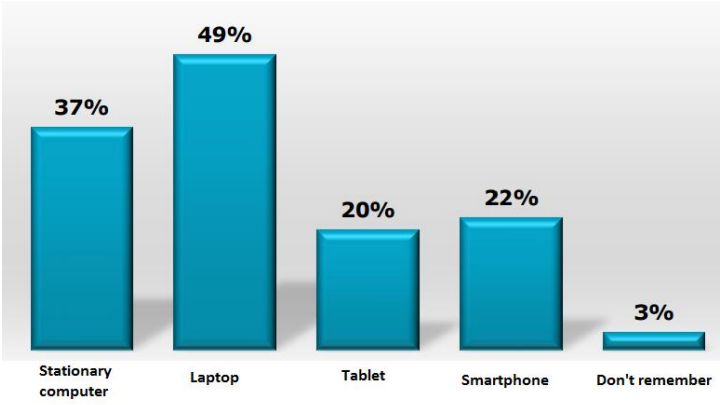

Figure 2.2.3 Units from where online purchases were made [2].

The younger generation did shop a lot more via smartphone, and one of three had made a purchase in the last quarter. Compared to the age group of 50+ it was less than one out of ten. The most common purchase via smartphone was Apparel.

2.3 Conclusions

The growth of the E-commerce in general and the online shopping fashion industry in particular shows promising signs of an expanding range of customers for the future. Another sign that points to this is that E-commerce for retail was increasing independent of the retail industry in total and even when there was a decrease in the total retail revenue.

Apparel was the second most popular category in online purchases, which confirms that the market is huge already and has an established customer basis. The most frequent users were women 18-29 years of age which confirms the results from the interest survey.

The statistics regarding Apparel bought abroad via E-commerce shows, that since a much larger target audience can be reached compare to physical stores, there is a large market. In this research 31% had purchased at least one item abroad the last quarter and the most popular item category was Apparel. The fact that this item

category was more popular in E-commerce shipped from abroad than in Sweden shows that the shipping doesn't need to be a big obstacle.

When reviewing the reasons why people preferred to buy certain items online and others in physical stores, there was a lot of parables with the interest survey. The disadvantages with online shopping correlated very clearly. Spontaneously trying items, touch and feel factors, and delivery factors was common factors.

The advantages with online shopping correlated as well and accessibility was the main reason. Price was also an important factor in the "E-barometern"-research but not named as a main reason in the interest survey. Although, if the question was asked differently price would have probably been revealed as an important factor, since the price is always of interest in a transaction. The respondents of the survey might as well have presumed that the online price always is cheaper, as is usually the case.

2.4 What solutions are available today?

There is a lot of different ways to buy apparel on the internet and new online stores are emerging every day. Many different solutions have been tried, and some are more successful than others. This section will present and discuss successfully established solutions and ideas under development.

2.4.1 **Fit Analytics**

Fit Analytics is a company that works with size guides and fitting profiles [3]. They collaborate with big brands as The North Face, Puma, Tommy Hilfiger and many more. Their solution is divided into a size chart and a fit profile. The size chart translates sizes into more precise measurements, see table 2.1 from Puma and table 2.2 from The North Face.

Table 2.1 Size chart from Puma [4].

DAMEN	BEKLEIDUNGSGRÖSSEN				
	DEU	UK	FRA	ITA	SP
XXS	32	6	34	36	36
XS	34	8	36	38	38
S	36	10	38	40	40
M	38	12	40	42	42
L	40	14	42	44	44
XL	42	16	44	46	46
XXL	44	18	46	48	48

Table 2.2 Size chart from The North Face [5].

	CHEST	WAIST	HIP	SLEEVE LENGTH
XS	33-34 in 84-86 cm	26-28 in 66-71 cm	32-33 in 81-86 cm	33 in 84 cm
S	36-38 in 91-96 cm	29-31 in 74-79 cm	35-37 in 89-94 cm	33.5 in 85 cm
M	39-41 in 99-104 cm	32-34 in 81-86 cm	38-40 in 97-102 cm	34 in 86 cm
L	42-44 in 107-112 cm	35-37 in 89-89 cm	41-43 in 104-109 cm	34.75 in 88 cm
XL	45-48 in 114-122 cm	38-42 in 96-104 cm	44-46 in 112-117 cm	35.5 in 90 cm
XXL	49-53 in 124-135 cm	42-45 in 107-114 cm	47-49 in 119-124 cm	36.25 in 92 cm
3XL	54-58 in 137-147 cm	46-49 in 117-124 cm	50-52 in 127-132 cm	37.5 in 95 cm

The fit profile is divided into a three step process, and currently only available for women. First, the customer specifies her length, weight and preferred fit, see figure 2.4.1. The next step is to specify an estimate of body type, shown in the same figure.

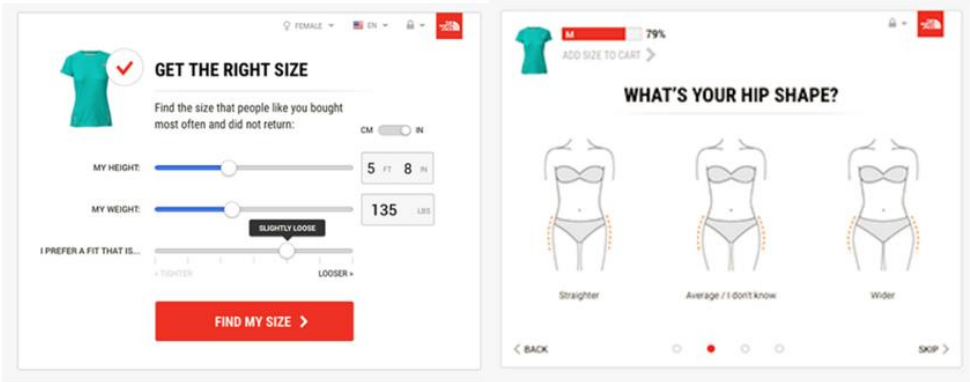

Figure 2.4.1 Measurements estimate by Fit Analytics [3].

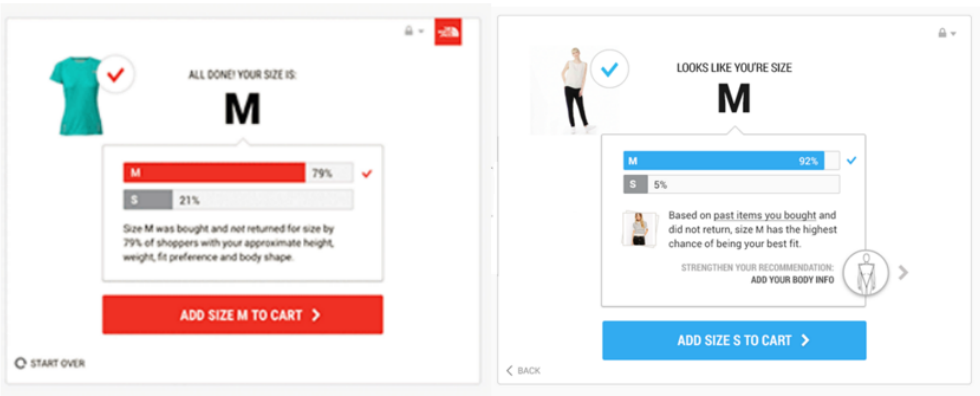

Figure 2.4.2 Size comparison tool by Fit Analytics [3].

Finally, a size suggestion is presented to the customer along with the information of how many customers that was satisfied with this size and how many changed who size, and to what size. See figure 2.4.2.

The system has a large database of users and their size statistics. The information about which body types have what sizes is used to calculate an appropriate size. The function also takes personal preference into consideration. If a user hasn't returned items of size M but others with similar body types have, M will still be recommended size.

2.4.2 **Metail**

Metail is a company that focuses on virtual fitting profiles [6]. The company was founded in 2008 and have partners as IBM, Upscale and Nubizz. Their business model is suppling E-commerce-sites with a virtual fitting room. The solution is available for tablet, smartphone and desktop.

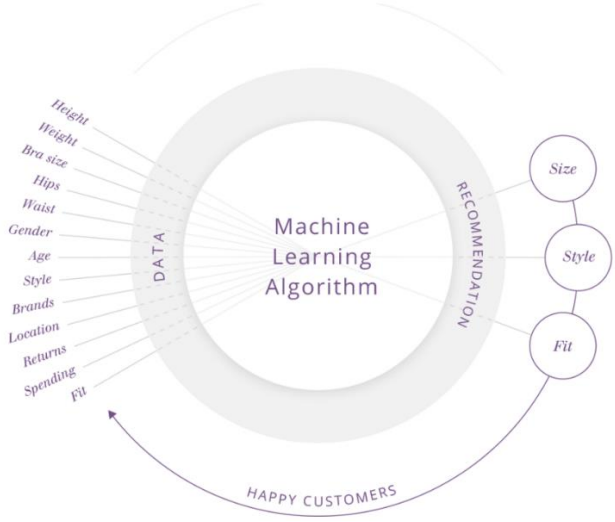

Figure 2.4.3 Metail concept model [6].

Figure 2.4.3 shows the recommendation engine model, which describes what data is needed for input and what recommendations can be made. From a user perspective figure 2.4.4 – 2.4.6 describes the process of trying on apparel.

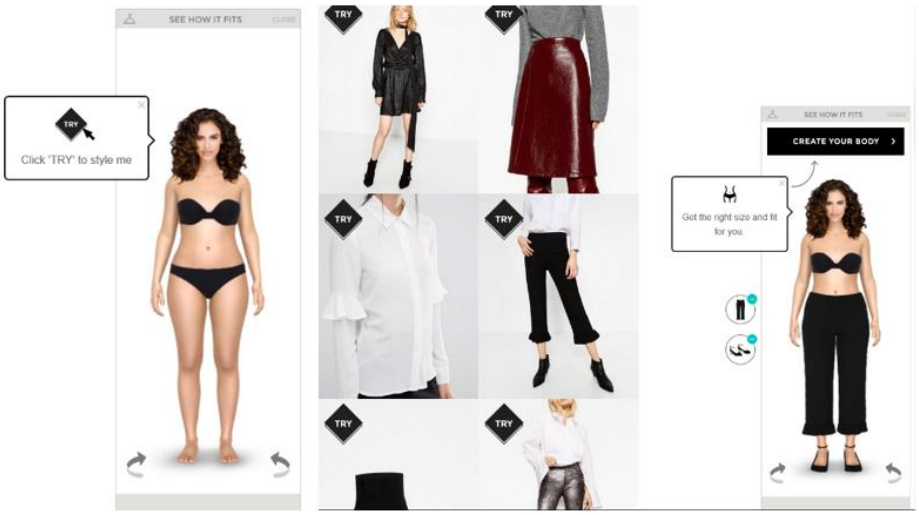

Figure 2.4.4 Start screen and fitting room by Metail [6].

The left part of figure 2.4.4 is displayed in the lower right corneron the site and is the start screen of the virtual fitting proces. To initiate the virtual fitting process the user clicks on any item for the avatar to try it on, as in middle of figure 2.4.4. Clicking on “Create your body” leads the user to figure 2.4.5.

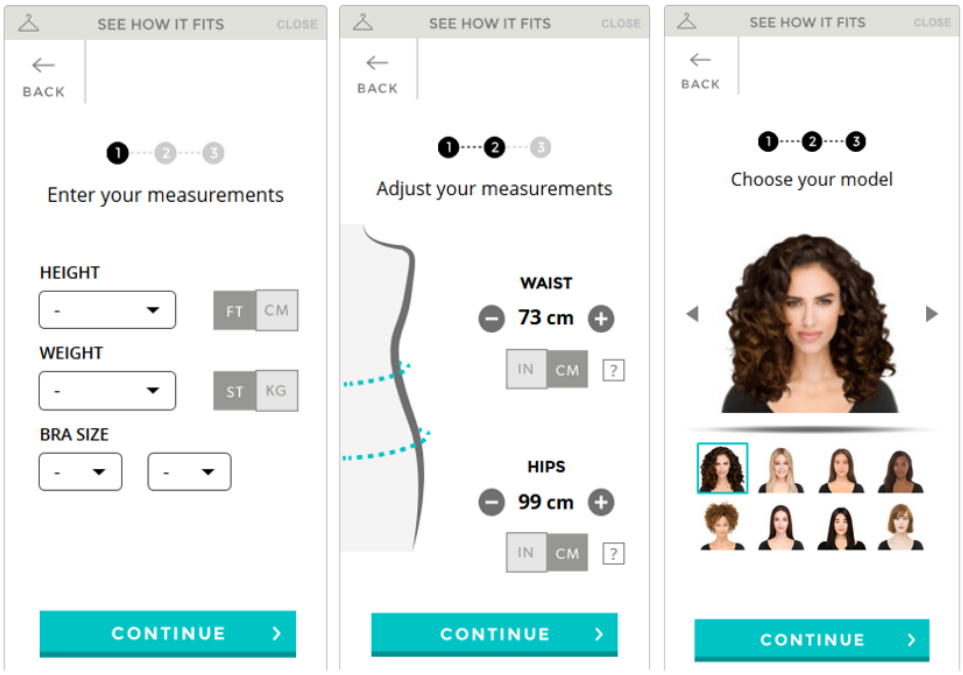

Figure 2.4.5 Customizing process by Metail [6].

When the user has entered the personal information and chosen a model, the customized avatar is presented, see left of figure 2.4.5. An instruction box is attached, explaining how to try on / remove items. Shoes have no presumed size and needs to be manually selected. Figure 2.4.6 shows how it looks when trying on an outfit. The white items on the left side of the avatar indicates what items the avatar is wearing. The grey items will be put on the avatar if the user was to remove the currently worn item on that slot. The menu in the figure appears when clicking continue and displays the suggested sizes of the items worn. The fit is also described for bust, waist, and hips. Suggested fit indicates it is the fit the user has chosen for his or her avatar.

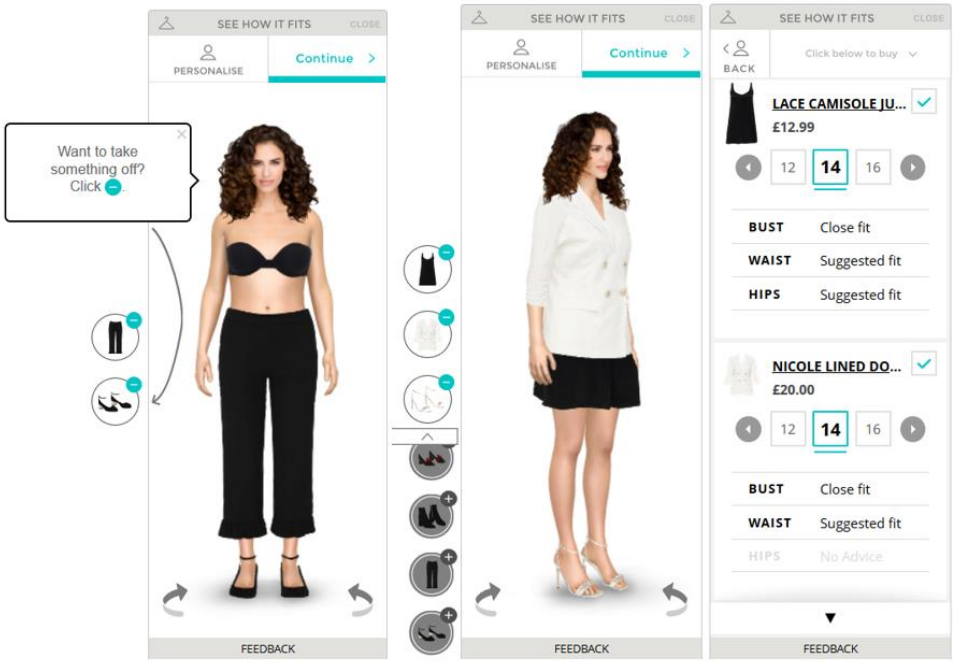

Figure 2.4.6 Model with outfits and size recommendation tool [6].

For a retailer to be able to use this application, a photo session must take place. With portable hubs, the Metail crew set up this setting at any location. The hubs consist of lightings, photo screens and a 360 degree spinning platform with a manikin attached. The manikin is photographed in different angles wearing one item at a time. From these photographs a 3D model of the item is created with a garment making tool.

To improve the experience, data is gathered about what items are tried on and the retention rate. Together with measurements of the body this makes a solid base for size recommendation. Metail claims they have increased sales by 22% and decreased return rate by 5% for the companies that they have worked with. They also claim that they have increased engagement and adaptation rates of up to 76%, and that customers spends 3,5 times as much time in average on the sites. These statistics are according to case studies without a source.

2.4.3 **Analysis**

Both Fit Analytics and Metail base their virtual fitting room solutions on size charts. A size chart is a very good tool when it comes to estimating sizes. Although, apparel looks different on different bodies with different fit and some

items looks better with a loose fit and others with a tight fit. It's all a matter of opinion. The feel of the fabric and freedom of movement are other factors in play. These factors can be hard to estimate with only visual feedback but with the apparel attached to an avatar the customers could make a more accurate estimate of how tight the material would feel. Previous experience of certain materials in combination with tighter and looser fits come into play as well.

Looking at the fit profile from Fit Analytics there is limited input data. To begin with, this service is only available for women. The body type is constructed of four different data; age, length, height and a very rough estimate of body shape. This information alone is too unprecise to make a good model of the body. The weight can be distributed in different ways, muscle/fat. The preferred fit option is a good feature but should be unique for each item, instead of setting a default value for all items.

What makes the fit profile a good tool is the database, and the comparison algorithm. The possibility to compare to similar profiles and to retrieve statistics about their satisfaction is valuable. Since there is a feature for customers who changed to another size, the user can see what size most of them changed to instead, like the example in Figure 2.4.3. This feature might decrease returns since customers might not buy several sizes if the acceptance rate of suggested size is high. If the acceptance rate is lower the customer will probably order the recommended size and the size that most customers changed to. This will create more returns but keep more customers satisfied. This is because it prevents customers from feeling cheated as they feel that their choice is their own, and they are less likely to blame the E-commerce store.

The function that allows users to see how often they kept the suggested size of a certain brand is a very nice complement to the function that compares with similar profiles. This enables the user to create an image of their own about how well a certain brand is suggested in size. As described before it makes the user feel more in control and less likely to blame the E-commerce store.

For all the partners of both Fit analytics and Metail, I couldn't find any site that had these features implemented, which points to a certain level of uncertainty regarding these concepts. With the virtual avatar concept comes big change. Many companies are probably afraid to apply the avatar concept in risk of customer dissatisfaction.

Metail's model MeModel is also available for women only but features a virtual avatar with visual feedback. The data input is more extensive and precise than from the fit model from Fit Analytics, as can be seen in figure 2.4.3. The initiation to the process of making an avatar is easy to follow and comes with good visibility, affordance and feedback. The input measurements in the process such as bra size, waist, hips, is more detailed than the fit profile. Although, it's hard to know how precise their algorithm is and it also might give the user a false sense of security. When giving more precis measurements it's likely one expects more

precise results. When it comes to facial features, skin tone and hair color, there is more to wish for. The idea of using eight different models with different looks to choose from is not a bad idea. It's important that the avatar looks appealing and it's easier to focus on eight premade models than an avatar generator, that could produce many unwanted results. As mentioned before in this thesis, expectation is often key. If a customer expects to get a models face on the avatar they might not be disappointed over the weak resemblance. There is a feature that makes the model wear her hair up, which is a nice feature since it adds flexibility and provides a more basic hair style since many people don't identify with the default chosen hair styles.

The disadvantage with this choice is that it excludes many groups of people. For example, there is no redheaded model, or very dark skinned, or a model with thicker face. Also, all models are around thirty years of age, so there is no representation for teenagers or older people.

To test the difference in appearance between avatars depending on the input data, three different body types was created. One was created as short and heavy as possible according to the limits in the interface. This avatar was also made with the maximal waist and hip size and the largest bra size possible. To make a contrast another avatar was created with opposite measurements. The height was as tall as possible and all other measurements set on the minimal value. These avatars were two sides of extreme. To make a realistic model for comparison an "average" model was created as well. The measurements for this avatar were made by looking up the average height for Swedish women and choosing weight as close to an average BMI (Body Mass Index) is possible. The bra size was chosen on account of the several stores reporting what size sold the most. When entering these measurements, the suggested waist and hip measurements was chosen by MeModel, since they have their own way of calculating an average. Below is a table with the different avatars and input data, as well as images of how they look in the MeModel.

Table 2.3 Data for different body types created in the MeModel.

Type	Height (cm)	Weight (kg)	Bra Size	Waist (cm)	Hips (cm)
Short&Heavy	132	124	44F	157	178
Average	167	63	34B	76	101
Tall&Skinny	189	40	30AA	41	77

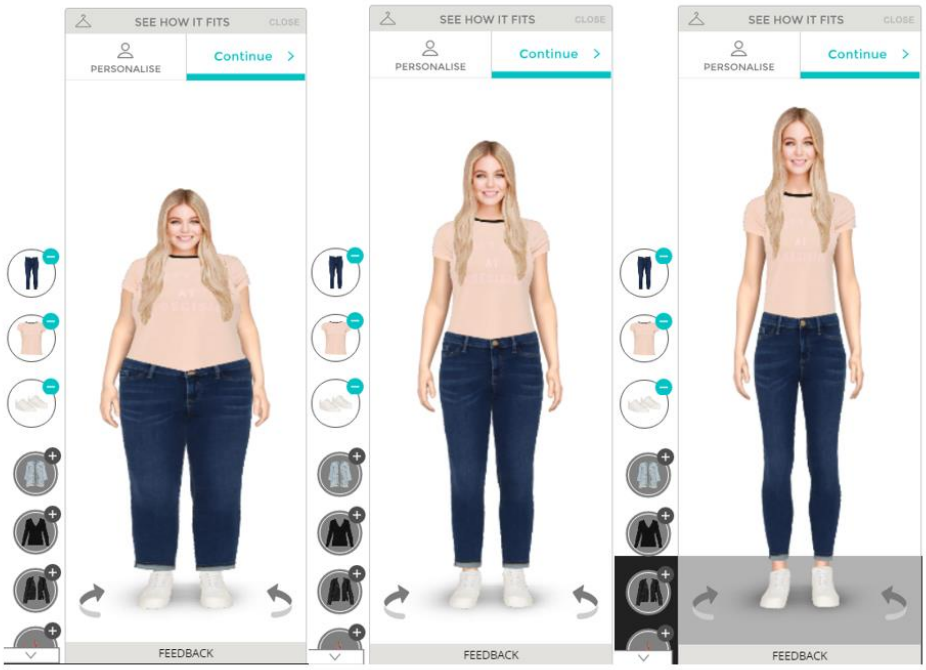

Figure 2.4.7 Visuals of models. From left to right: Short&Heavy, Average, Tall&Skinny [6]

Image XA-C shows how the MeModel avatar scale with changes in measurements. Overall, the model looks descent, except for the *Short&Heavy* model, that clearly scales the worst. The measurements for the *Short&Heavy* and the *Tall&Skinny* models are not realistic but shows two extremes. For the *Short&Heavy* model, it looks like the pants are poorly Photo Shopped onto the avatar. This is probably because the arms, neck and ankles does not scale with the other measurements. The head seems to have some sort of compressing effect when lowering height and adding more weight to the avatar. When trying other measurements on the avatar the arms, neck, head and ankles definitely looks better on the skinnier models. Plausibly it is a prioritization by the Metail crew.

When analyzing the claimed business statistics, the numbers looks good enough for other parties to be interested. Although, time spent on the site could be explained by the relatively time consuming avatar process.

To summarize the evaluation of these tools and to help create user stories and requirements for a concept, a list of pros and cons was created.

Table 2.4 Pros and cons of existing solutions.

Pros	Cons
The MeModel follows the design principals in a satisfying fashion.	Not available for men.
Limitations can lower expectations higher performance and keep curiosity.	Limited choice in facial features.
Engaging the virtual avatar process from the rack.	Measurements not precise enough.
Size chart based models.	Arms, neck and ankles scaling poorly with weight.
Limited information per screen and a visually appealing display.	The preferred fit option being general and not for each item.
The perspicuous interfaces of both models.	No ability to try on miscellaneous items such as necklaces, rings and jewelry.
The statistics comparison and presentation to the user by Fit Analytics.	Shoe size chosen manually and not configured by size chart.
The preferred fit option.	

2.5 Integrating the concept in an existing E-commerce environment

To be able to integrate the virtual avatar from a concept into the existing E-commerce environment used by ahlens.se; all components used in the existing solution needs to be considered [7]. This is an overview of the Åhléns comprehensive E-commerce solution [8].

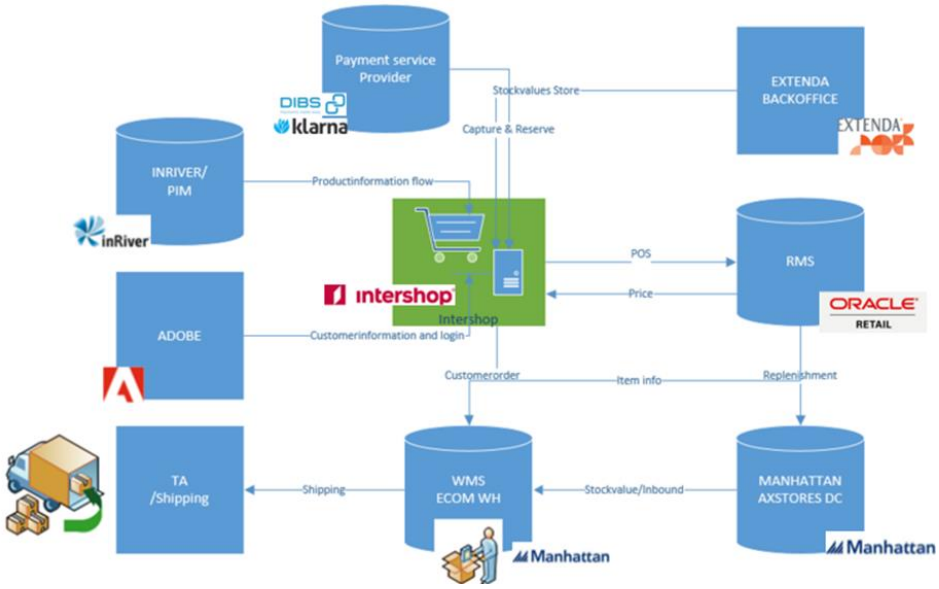

Figure 2.5.1 Åhléns E-Commerce solution [8].

The solution is integrating Intershop Ecom (E-commerce platform) and INRIVER PIM (product enrichment) with existing Åhléns / Axstore systems. This solution is also including E-commerce (Ecom) into the same process and solutions as physical stores. The concept of a virtual avatar needs to consider several of the systems included in the Åhléns Ecom environment.

The foundation area, which is controlled by INRIVER/PIM, contains product information, images, prices and promotions, brand info, store information, store stock on hand (SOH). These are values and attributes that affect the avatar concept both visually and functionally. The product images need to be able to convert to 3D with garment maker or another tool. The attributes for product info, prices,

promotions and SOH will need to be displayed with linking functionality in the avatar GUI.

The CRM area, which is controlled by Adobe, is handling customer and member information. This area controls functions as profile updating, viewing membership points / purchase history, customer communication such as SMS and email and RFM analysis. RFM is a method for analyzing customer value and stands for: Recency – how recently did the customer purchase? Frequency -how frequent did the customer purchase? Monetary Value – how much did they spend?

The avatar GUI will be dependent on these functions as the avatar itself will have to be connected to Adobe systems. Profile update will be connected with the avatar and should update dynamically. The purchase history would preferably be accessible from the avatar GUI to try on recently bought items. The avatar concept should provide data for RFM-analysis, such as, what items has been applied on the avatar, which was bought and so on. The communication channels could be used for saving auto generated lists of items, like an outfit for example.

The customer orders are handled by the Manhattan system, containing information about stock value, like SOH (stock on hand). The item price is an attribute from Oracle retail. These attributes and other attributes from EXTENDA Back Office system will be displayed in the PDP (product detail page) of the item, and the avatar GUI does not need to consider these attributes directly. The same goes for other order information and payment information since the GUI will link to already existing functionality on the E-commerce page.

3 Designing and Prototyping

This section describes the method and different techniques used when creating, testing and integrating the prototype. The development process is divided into iterations.

3.1 Method

A design process can look very different from the next one because of the number of variables. What is being designed? In what scale? For whom? Are there any existing parts that needs to be considered? Etc. In interaction design, a few established methods usually are used.

In “Sketching User Experiences”, Buxton writes about visual storytelling and sequencing images [9]. How sketching the process and which alternatives sequences that can be generated, can help with the overview perspective and make sure the main objective is not lost between words.

Buxton believes that many projects fails because they go straight from the idea phase into an engineering phase. Between the idea phase and the engineering phase there should be a design phase, see figure 3.1.1.

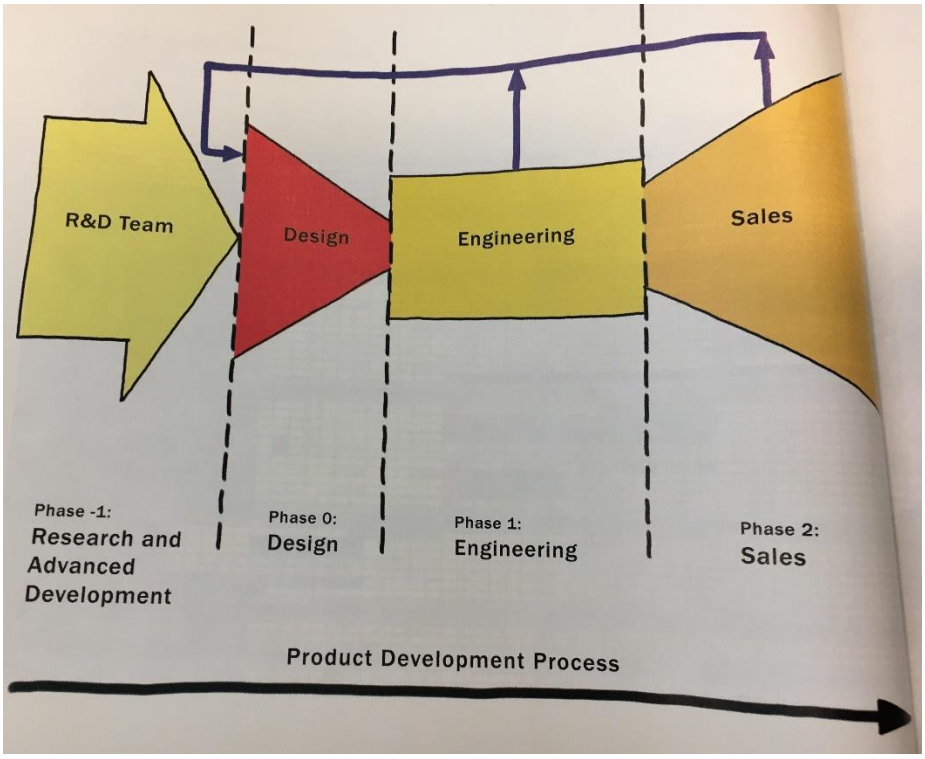

Figure 3.1.1 Product development process by [9].

Arvola describes the “human in center driven design process” in figure 3.1.2 [10]. The reason for a human-in-center-driven process is that the value of the product is created in the user experience. Requirements and design goals change throughout the process. The use of prototyping design solutions is because it is impossible to predict every single requirements of the system. The purpose of a prototype is to limit the solution for a clearer objective. This leads to an agile process.

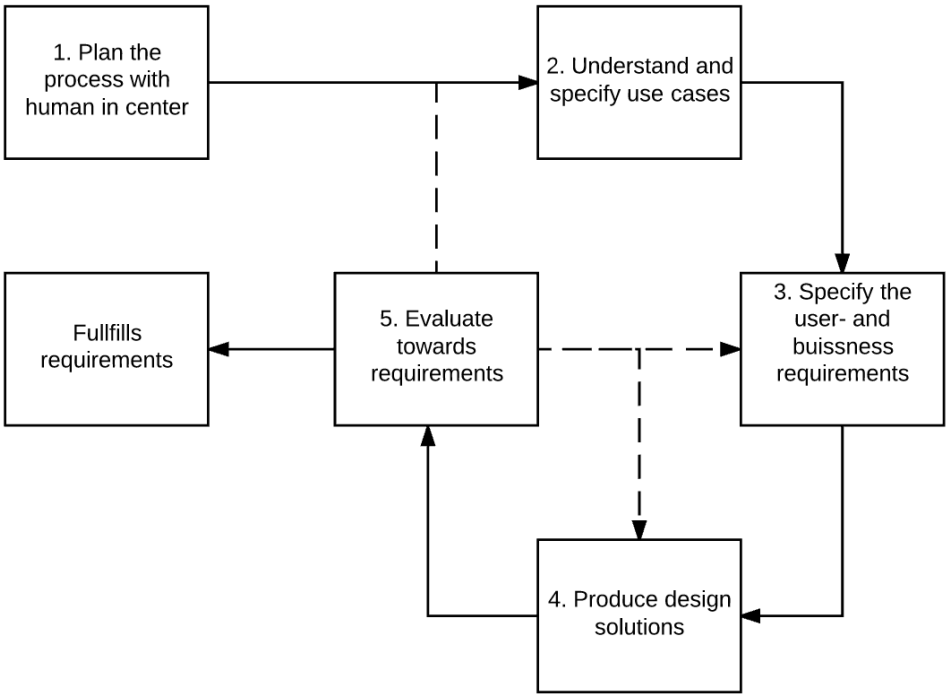

Figure 3.1.2 Human in center driven process by [10].

In [11] we can see that Interaction design process involves four fundamental activities that should inform each other and be repeated.

1. Identify requirements
2. Create alternatives
3. Create prototypes
4. Evaluate

According to [12] the user-centered design process normally contains stages shown in figure 3.1.3.

Figure 3.1.3 The user-centered design process by [12].

Applying the strategies from these different sources lead to the design process being an iterative and agile process. This process is also based on previous experience of projects in usability testing, requirement specification and software testing.

The development of the first iteration is based on multiple factors. The fundament of the concept is the vision. Then the results from the interest survey are considered. In the next step the analytics from existing solutions (table 2.4.3), are considered and applied to the prototype, to further the process. These factors together with the established design principals makes a solid ground for use case scenarios and requirements in iteration 1.

When iteration 1 is complete, the test plan comes into action. The test process is measured by the System Usability Scale (SUS) [13]. The feedback from the test subjects are then used to change the requirements and to create another iteration of the prototype. This loop continues until the test results are satisfying enough. Then a final prototype of the concept is launched.

The final prototype is reviewed from an integration perspective. Is it possible to applicate the solution on an existing E-commerce web site? The prototype is also compared to similar concepts that have been implemented previously.

Together the different factors mentioned in this chapter made the final outline of the design process:

Design process

- Iteration 1
  - ✓ Vision
  - ✓ Mapping of target audiences
  - ✓ Analyzing interest survey
  - ✓ Analyzing existing methods
  - ✓ References for design choices

- Requirements
  1. User stories
  2. Functional Requirements (integration)

- Implementation
  1. Design – development of the concept and avatars into a prototype.
  2. Assessment – user tests of the prototype.
  3. Feedback – renew requirements according to user feedback.
  4. Repeat cycle 1 to 3 until satisfaction.
  5. Integration – manual for integration at ahlens.se

3.2 Design Process

Creating use case stories involved many different methods as described in chapter 3.1. Together these factors raised the questions in the following three chapters, which made a base for the use case stories.

3.2.1 **The avatar & Functionality**

- How should the avatar be created?
- How should the facial features be structured?
- How should the avatar body scale with the given measurements?
- Should the fitting room be available for men and/or children?
- Should there be a preferred fit option?
- Should there be statistics based functions in the size recommendation?

The avatars were created with the character generator from Autodesk [14]. Autodesk has a various selection of characters with different features that can be used or combined to create your own character. The characteristics to choose from includes both male and female. The user can manipulate a character to look a certain age by choosing skin, facial features and body type. Although, very young people and very old people can be hard to resemble realistically. The height of a character could also help resemble a still growing person. This make it possible to include men and children in the fitting room. Figure 3.2.1 shows the interface of the character generator, and how to customize your own character.

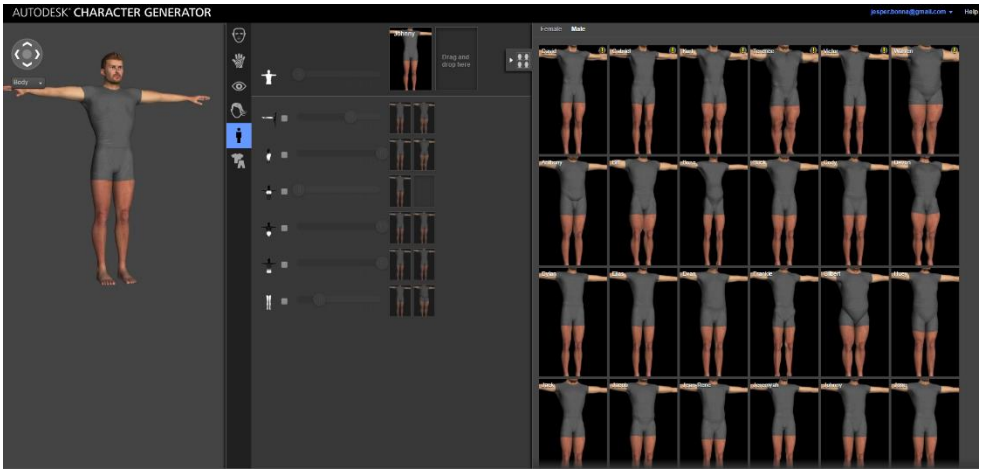

Figure 3.2.1 Character generator from Autodesk [14]

To the left in the figure is the generated character, which shows different views of the body depending on what option is chosen in the slim panel next to the right. The current chosen option is full body view. Other options are facial features, skin type, eye color, and hairstyle. The panel to the right of the slim panel is where features are mixed from the already existing characters, which can be dragged from the panel furthest to the right. Figure 3.2.2 shows a more detailed view of how the body is constructed.

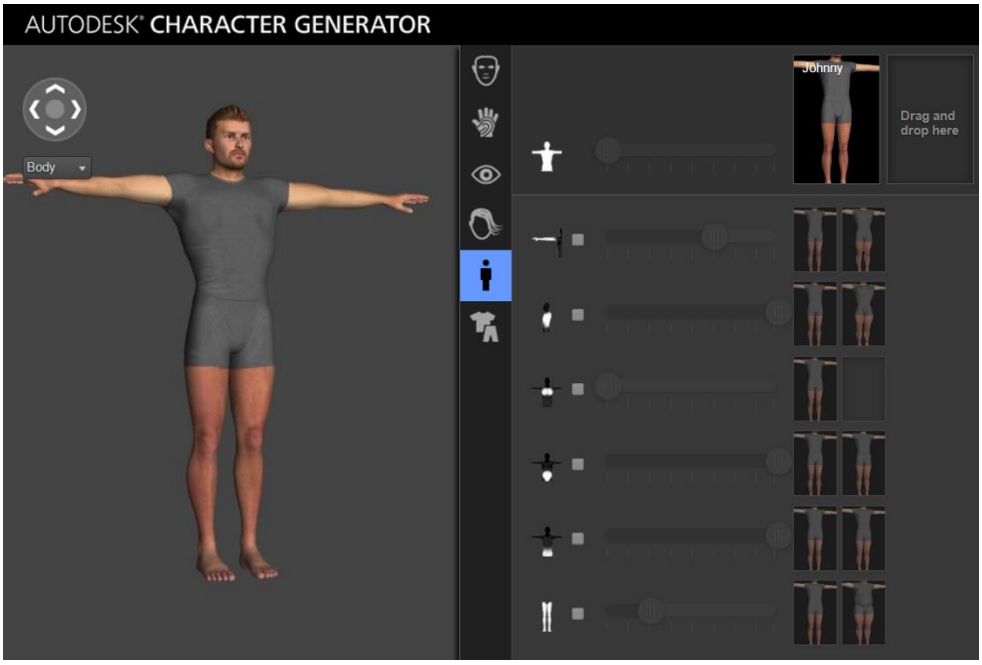

Figure 3.2.2 Autodesk Full Body View [14]

In the top of the right panel, there is a white marked full torso. This menu indicates that if you drag and drop two characters there and use the slide function bar you will mix all characteristics between those two characters. Often you want to be more specific, and that is why the menus below are there. The white marked area marks which body part the characteristics will change. The options are arms, back, chest, abdominal, hips and legs. Figure 3.2.3 shows the equivalent for facial features.

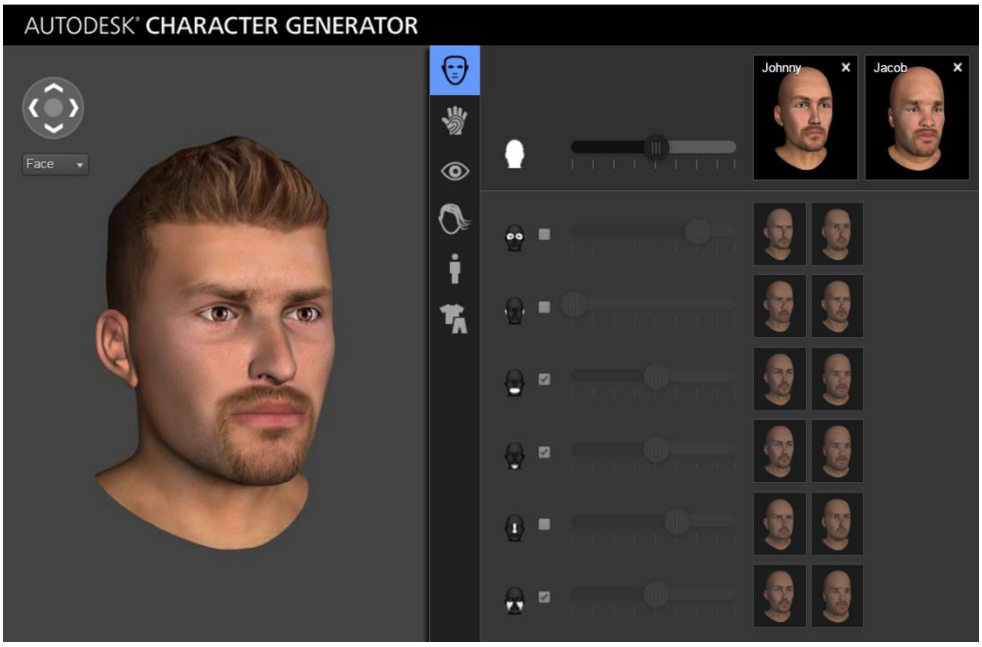

Figure 3.2.3 Autodesk Facial Features [14]

As mentioned earlier, the white marked area indicates what facial features that can be merged from other characters. The possible options are eyes, ears, mouth, chin, nose and cheeks. The hand symbol below the blue marked face symbol represents skin type, and this option dictates whether your character will have facial hair or not. Below the hand is the eye color option, which has a various choice of different eye colors. Further down is the hairstyle option, which has several different styles, where you can apply certain colors to as well. The last options is clothing, which was not used because of the possibility to add clothes later on.

The characters created were modeled after real life persons, and when exporting the characters there is an option for entering height. This boost the feeling of reality in the characters since a taller or larger character will take up more space in the fitting room. This becomes important when a user switches between characters, as the credibility would be questioned if all characters were the same height.

The characters were then imported into the game engine Unity [15]. This opens up options of creating different fitting rooms, different lightning, and can make the characters behave in certain ways. They can spin around and pose, which can help to advertise the clothes and be an intriguing gimmick for the users.

Since the images of the apparel are in 2D, and the avatar is a 3D model, a tool is needed to transform the images into 3D. Autodesk have a modifier called Garment Maker that can be combined with the Cloth modifier [16]. The basic concept is to make a 3D representation of several 2D images. Therefore, if the apparel is photographed from different angles you can combine the photos to a 3D garment. The more photos from different angles, the better the garment. Usually a spinning manikin is used to produce this, as the case with the Metail MeModel [6].

Regarding the preferred fit option and the statistics, there should be a variable that keeps track of what size is chosen each purchase. This is useful when the user want to shop at an online store that do not have good size charts. Let us say the user chose large in more than nine out of ten times, this size will probably fit as well. That information is enough to make statistics about personal preference, since the avatar is supposed to show how the item looks on the body. The preferred fit option is displayed when looking at the avatar, rather than saved in statistics.

The user should be able to have several avatars bound to an account. Being able to switch between avatars has several benefits. The user might have kids who they are buying clothes for, or wants to buy a gift for someone else. Perhaps a family share one account and can benefit from trying for anyone.

3.2.2 **Navigation & Design**

- From where should the virtual fitting room be accessible?
- How should the fitting room look?
- Should the fitting room look different in different modes?
- What should the limitations be, and how can the system exceeded the expectations?
- What information should be displayed in different modes and how can the system remain perspicuous throughout?

When a user enters the website of ahlens.se, the first page is a homepage with current campaigns and special offers. Centered in the top of the site is a menu, listing every category, and swiping over this menu will show sub-categories. There is also a top banner where members can log in. This banner also has options of customer service, “my favorites”, shopping basket, etc. The home page is displayed in figure 3.2.4.

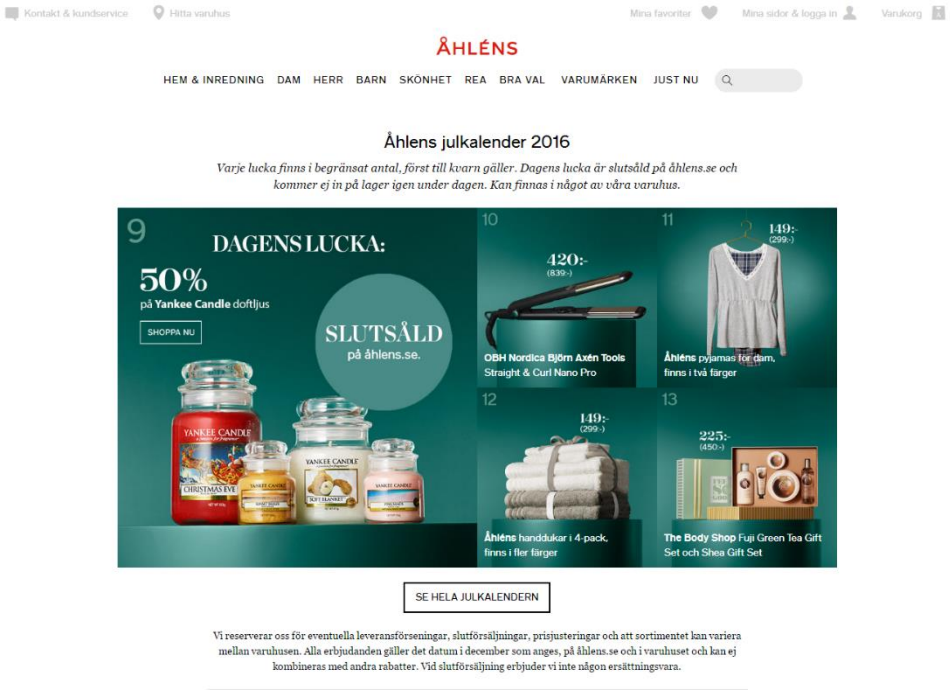

Figure 3.2.4 Home page of ahlens.se [7]

From the home page, the user should be able to enter the fitting room in different ways, as when entering “My favorites”. The fitting room should be connected to members, where members can save certain outfits, switch between characters, etc. Therefore a direct link in the members bar should give the user access to the fitting room. When looking at apparel on the site, the “prova” function should be directly linked with the items, so the user can be introduced to the function without going through the members bar.

Looking at the current structure at ahlens.se [7], there are two different levels from where items are displayed: category level and PDP (product detail page) level. The layout and functionality differ between these pages, but the purpose of the pages are the same. A similar concept to the fitting room, which was launched during the fall of 2016 is “Mina Favoriter”, or “My Favorites” in English. In figure 3.2.5. and figure 3.2.6 we can see the heart icon displayed in category level respectively PDP-level.

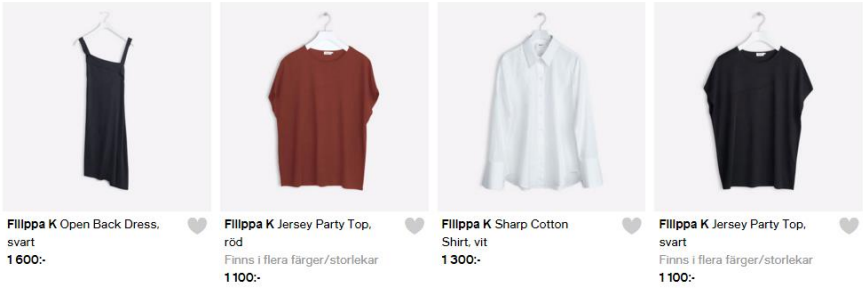

Figure 3.2.5 Category level [7]

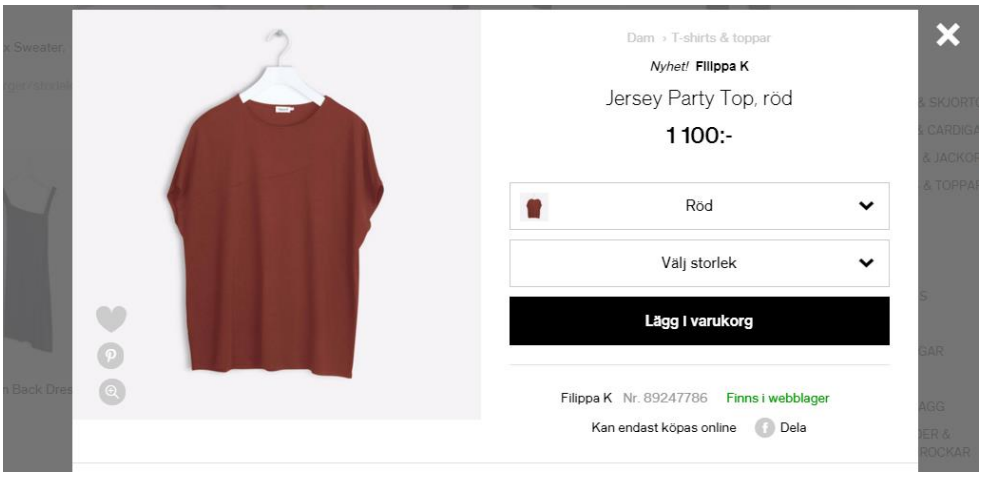

Figure 3.2.6 PDP level [7]

The fitting room should have similar accessibility as the favorite concept, with several reasons in mind. First, to ensure that the user experience (UX) is pleasing, and secondly with different design principals in mind [17, 18].

In “The design of everyday things” by Donald A. Norman [18], he lists six important design principals:

1. Visibility – Is all possible functions and options displayed?
2. Feedback – Is the user aware of what action has been taken and what the new options are? Feedback can be visual, tactile, auditory, etc., or a combination of these.
3. Affordance – What is clickable? Is the purpose of a function explained by the design?
4. Mapping – Does the design of a function suggest the functionality? The relationship between control and effect.

5. Constraints – Does the design explain the restrictions of how a user can interact with the system?
6. Consistency – Is similar operations used for achieving similar tasks?

These design principals are considered from the first iteration throughout the entire design process.

There are also some design principals specified for web design that should be considered. Melissa Mandelbaum is a product designer at the New York based Marketing Firm Percolate [17]. She has experience in front-end web design, and describes important design principals for a website. These design principals are axis, symmetry, hierarchy and rhythm.

Axis is the most basic and common organization principle. In diagrams, the axis is usually represented by a dashed line. Having elements sorted by an axis is good for several reasons. Creating a feeling of alignment and reinforcement can be done by sorting elements by axis and well-defined edges. A user will follow an axis until something happens or the user get tired. Therefor lines can be used to simulate movement, and an end point of the line can define a start or stop. To keep the user interested, so-called infinity-scrolls are popular to use. They create a feeling of a never-ending flow by loading new data when the scroll approaches the top or bottom.

Symmetry in web-design means that elements are sorted in the same way on both sides of an axis. This creates a harmonious feeling about the page. If the left side contains five elements and the right side contains three elements, the user will notice asymmetry. If the edges of the elements from the left sides does not match the edges of the elements from the right side, a feeling of asymmetry will take place, since the user cannot scan left-to right eye as easy as a linear order.

Hierarchy is used to rank the importance of elements on a certain web page. This can be done by the size, shape or placement of an element. An element can appear more important if it is larger, different in shape or has a highlighted position compared to other elements.

Rhythm is movement created by repetition. Mandelbaum describes rhythm as a song. “When listening to a song with good rhythm, we recognize the pattern and begin to expect beats”. The same goes for parts in a web page. If a certain orders of elements repeats occasionally a user can expect what is about to come.

Therefore, when creating a concept that should integrate well with ahlens.se, it is important to not break the pattern of design principals already used on the site.

The general idea for the icons is to melt in with the current design but draw attention enough to make the users are aware they exists. When creating the icon for the fitting room this was taken under consideration and the symbol was

inspired by looking at the items on the site. Most of them are on hangers, and therefore, a hanger seemed like a good representation of the fitting room.

Figure 3.2.7 “Prova” icon

Figure 3.2.7 and figure 3.2.8 are suggestions on how the “Prova” icon could be displayed in category level and PDP-level. Following the axis, symmetry and rhythm in the category level and using the size, text and position to highlight the “Prova” function in PDP-level.

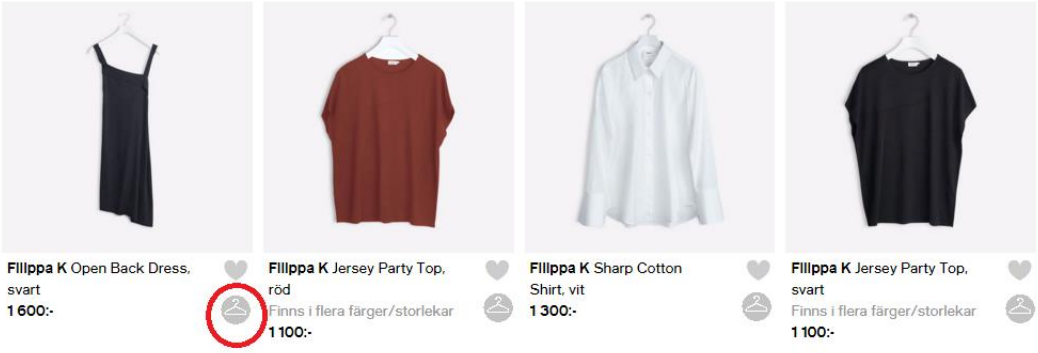

Figure 3.2.8 “Prova” icon in category level

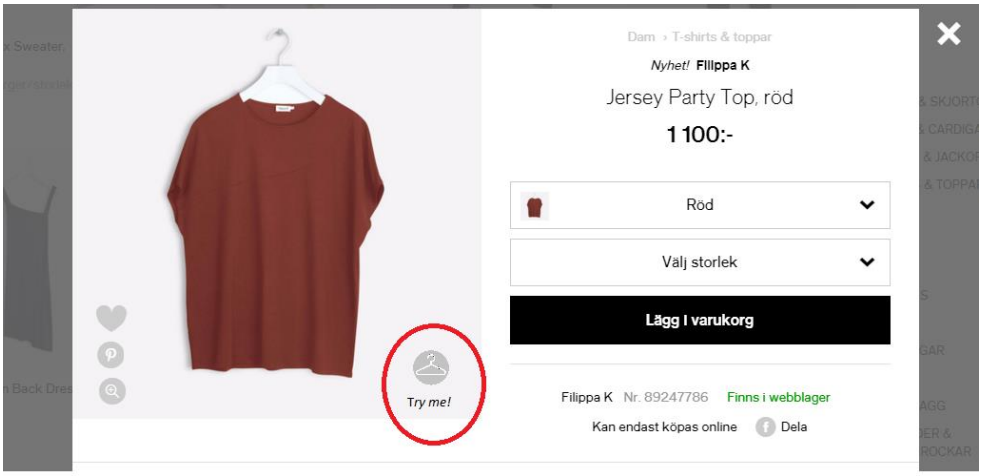

Figure 3.2.9 "Prova" icon in PDP level

Clicking on the "Prova" icon will redirect the user to the fitting room, or "Provrum". Another way to enter "Mina Favoriter" is through the member bar. Therefor it was decided to have the possibility of entering the fitting room from there as well, shown in figure 3.2.10. There is a fourth way to access "Mina Favoriter" by clicking the heart icon in the top banner on the home page. Although this is because the user is able to save favorites in cookies while not being logged in. It was decided that avatars should require log in and therefor there will not be a "Prova" icon on the home page.

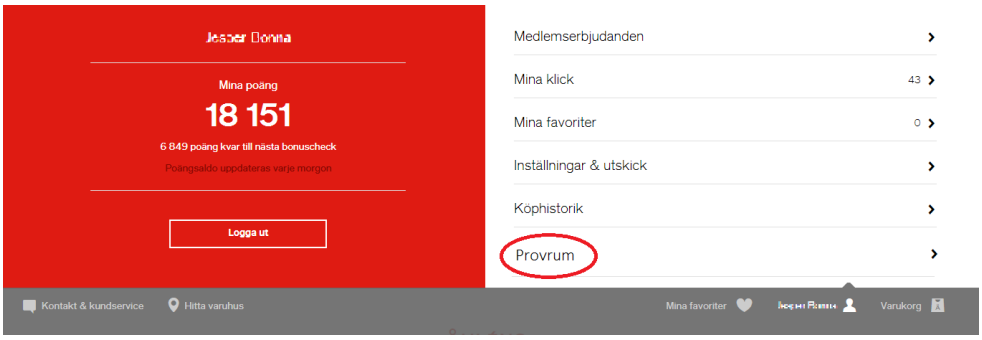

Figure 3.2.10 Member bar with "Provrum" fitting room

To summarize the navigation process from the home page to the fitting room, a flowchart diagram was created, and is displayed in figure 3.2.11. As shown in the flow chart, there are three different levels from where the fitting room can be accessed, and several paths leading there. A PDP level page is always entered from a Category level page. Entering the fitting room from either of these pages with the "Prova" icon, should send Stock Keeping Unit(s) (SKU(s)) for the item(s) to the fitting room page, depending on if it is a single item or an outfit.

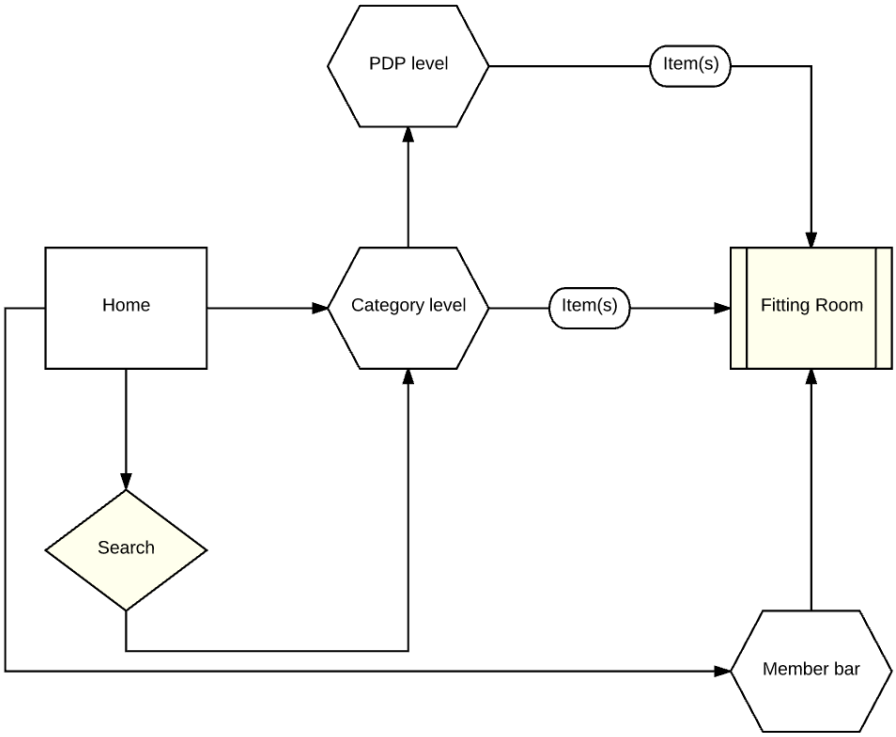

Figure 3.2.11 Flowchart diagram: Accessing the fitting room

The fitting room was created with the design principals from [17] and [18] in mind. The process was to create several lo-fi prototypes and discuss them with different people, adjusting each one after direct feedback to see what could come out of it. This is the method from [11]. When a first draft was made, a lot of valuable feedback was acquired in form of comments about functions and design. This can be seen in figure 3.2.12. Many comments was about being able to save outfits and / or items. Others was to put all applied items into the shopping cart. There was also questions about a welcome screen or how the screen would look

like when no avatars were created. Functionality of creating and deleting avatars was also discussed.

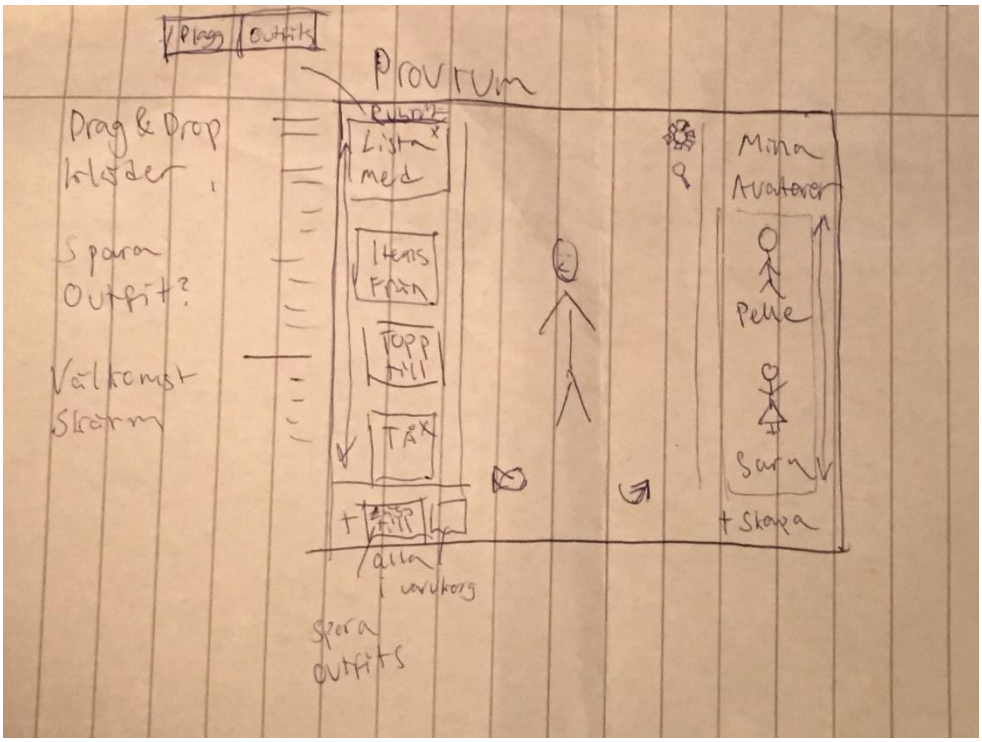

Figure 3.2.12 Lo-fi prototype with comments

From the comments on the lo-fi prototypes, a hi-fi prototype was created in Invision [19], which offers to create hi-fi prototypes with linking functionality etc. The prototype was built on modified screenshots from ahlens.se and guided the user from the home page to the fitting room via various paths. The fitting room is displayed in figure 3.2.13 and 3.2.14 with and without avatars created.

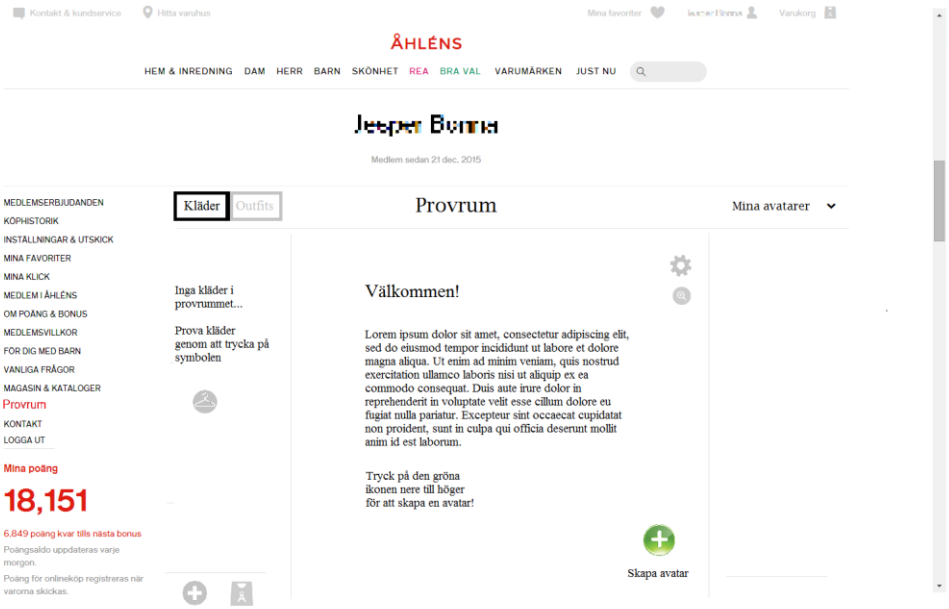

Figure 3.2.13 Fitting room welcome screen integrated in ahlens.se

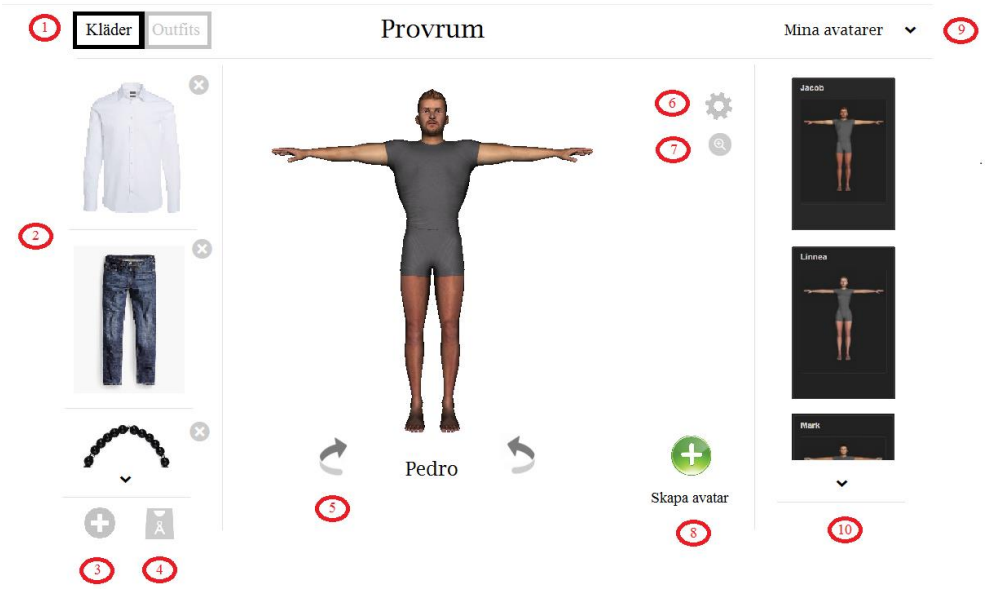

Figure 3.2.14 Fitting room with avatar and red marked numbers for functionality

Some icons were created with the customization of SmartIcons, which is a web site with a predefined tool set for creating icons [20]. The functions of the icons that are red marked are listed below:

1. Binary menu with choices “Kläder” or “Outfits”. If “Outfits” is chosen, the icon in 3 becomes unable to select. Instead of the clothes in the scroll menu 2, saved outfits are displayed. The images of clothes are switched to images of the outfit on the avatar, with a selectable name for the outfit.
2. Scroll menu with content depending on 1. Drag-and-drop possible onto the avatar.
3. This icon with a + sign will save items to an outfit with optional name.
4. This is the shopping cart icon of Åhlens, and pressing this icon will add all item worn to the chart.
5. These arrows makes the avatar spin around in different angles.
6. This is the settings icon. In settings, a user is able to adjust or delete the avatar.
7. Pressing this icon will turn the pointer to a magnifying glass. Pressing any part of the avatar while the pointer is in google-mode will zoom. Pressing the icon while in zooming mode will make the google zoom out.
8. This is the create button for making avatars. Pressing this will lead to a separate menu, referred to in figure 3.2.14 (Create avatar process)
9. This scroll down menu is for eventual customizations in the future.
10. This is the scrolling menu for switching between avatars. Clicking an avatar will make it appear in the center of the screen and load all metadata about it.

The hi-fi prototype was tested with the SUS-scale [13]. The test is built on the ten statements that are shown in figure 3.2.15. There is five positive statements and five negative statements. The user marks how much they agree with a statement from one to five.

To calculate the SUS score, first sum the score contributions from each item. Each item's score contribution will range from 0 to 4. For items 1,3,5,7,and 9 the score contribution is the scale position minus 1. For items 2,4,6,8 and 10, the contribution is 5 minus the scale position. Multiply the sum of the scores by 2.5 to obtain the overall value of SU. The scale is between 0-100.

The System Usability Scale

When a SUS is used, participants are asked to score the following 10 items with one of five responses that range from Strongly Agree to Strongly disagree:

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Figure 3.2.15 SUS-scale [13]

Before the test persons took action, a brief introduction was held, explaining the tasks and the purpose of the system. The test subjects were guided through the prototype with an instructor by their side, since it can be confusing operating in a model where most of the functionality is unimplemented.

The tasks were:

- Navigate to the fitting room from homepage.
- Find the two other ways to the fitting room.
- Create an avatar.

The test started on the modified version of ahlens.se homepage. The test persons were asked to find their way back to the fitting room. The instructor answered questions like “is this clickable?” and “can I do this?”, but did not guide the test persons. When they reached the fitting room, they were asked to go back to the homepage and find the two other ways. If they stumbled, they were lead in the right direction step by step. When clicking the “prova”-icon, they were lead to the right site and explained what functionality was missing. When all functionality was explained, the test persons were asked to create an avatar. They clicked the create avatar icon and were led to the four step process in chapter 3.2.2. The first three screens were tested as they are displayed in the report. The fourth page was first displayed, and redirected to the Autodesk page [14] when clicking on the customizing image. When the avatar was customized, the test subjects were redirected to the fitting room, now with an avatar in it. Further functionality was explained and viewed, as in figure 3.2.14.

After the test, each subject was handed a paper form with the SUS-statements [13], where they evaluated the system.

The number of participants doing the SUS-scale was nine. The average score was 87.5, which is considered high. Since the threshold value for an average systems is 68. Although, testing a prototype is not the same as testing a system, and if the system was fully implemented the score would have probably been lower. There was a lot of comments and questions about functionality, which is why the explanatory list to figure 3.2.14 includes unimplemented functionality.

3.2.3 **Applying items on the avatar**

The following questions addressed the functionality of dressing the avatar.

- How should items be tried on?
- Which items should be able to try?
- Which items are supposed to be worn at the same time?
- What measurements should be used and how precise should they be?
- Should a size chart be used?

A size chart is a good tool for giving reasonably precise measurements. Size are divided into gaps of more precise measurements which gives the customer trust in the fit but do not create expectations of a tailor made fit. There is most often size chart detailed information about apparel, meaning the measurements to be filled in when creating an avatar should require the standard size chart measurements.

When looking at how apparel should be tried on, and what items that are supposed to be worn simultaneously, the current structure at Åhléns is taken under consideration. There is currently an attribute to keep track of what genre the apparel belongs to. Although, today this attribute only has following four genres: *Hosiery & underwear, bottoms, tops & dresses, accessories & shoes*. *Hosiery & Underwear* includes underwear, socks, pantyhose, robes, nightgowns, soft pants, swimsuits and bikinis. *Bottoms* include pants, skirts, shorts and leggings. *Tops & dresses* includes shirts, T-shirts, sweaters, jackets, tops and coats. *Accessories & shoes* includes hats, necklaces, scarfs, rings and bracelets.

These attributes could be used to define what genre an item belongs to. Although, they need to be updated and divided into more distinct genres. As mentioned in table 2.3.2 there was currently no function for trying on items like jewelry, necklaces, hats and scarfs. This should be possible until some extent in the avatar concept.

The genre attribute should be ordered after which items that are <u>not</u> supposed to be worn at the same time. This means the avatar can only apply one item of each

genre. (If the genre is *Dress*, no items labeled Tops or Bottoms can be applied). The list below groups genres and labels on sub-genres:

- Footwear – shoes, sandals, socks, slippers
- Bottoms – pants, skirts, shorts, leggings, trunks, underwear, pantyhose, bikini bottoms
- Tops – tops, shirts, T-shirts, tank tops, bras, bikini tops
- Sweaters & Jackets - sweaters, jackets, coats,
- Dresses - dresses, gowns, robes, bathing suits
- Headwear – hats, caps, helmets, miscellaneous
- Accessories
    - Neckwear – scarfs, necklaces
    - Hands – gloves, bracelets, watches
    - Miscellaneous – purses, bags

Looking at the genres of apparel above, conclusions was made of what information input that was needed to be able to fit the apparel onto an avatar. For footwear, only shoe size was needed, since measurements that are more precise probably will leave the customer unsatisfied if the shoe was not to fit. For bottoms three measurements was decided to be required and two additional optional measurements for precise fit. The required measurement was hips, waist, and length. The optional measurements is around the thigh and around the calves. This is done with a measuring tape, and the length of the leg should be measured from ankle to hip. All measurements should be given in inches or centimeters. For tops, sweaters and jackets the measurements needed is chest and waist. Optional measurements is neck, shoulder width, arm length and circuit. The required measurements for dresses is chest, waist and hips. The optional measurements for that genre is the same ones as in tops and bottoms. For headwear the standard size variable is used, which is measured around the head. Since neckwear seldom has sizes, there is no point for neck measurements for those items. Another optional measurements is wrist, since that measurement is useful for bracelets and watches. Gloves are usually sized by measuring the hand according to figure 3.2.16, around the hand below the knuckles with thumb not included. This will be an optional measurement.

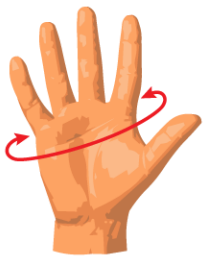

Figure 3.2.16 Image of measurement for glove size [22]

In conclusion, there are measurements required to fill in when creating an avatar and measurements that are optional. Table 3.1 shows these different measurements, for when creating an avatar.

Table 3.1

Required measurements (inches/centimeters)	**Optional measurements (inches/centimeters)**
Height	Head
Weight	Neck
Chest	Shoulder width
Waist	Arms (length and circuit)
Hips	Hands
Leg length	Thighs
Shoe size (US/UK/EU size)	Calves

For trying on accessories, a zoom function should be able on the hands and the neck. This zoom function should use the avatar as default and have an optional addition of adding photos that represents these areas of the body. Photographs could be used with the technology of photogrammetry [21]. For practical reasons rings was excluded from the fitting room, since it is too much detail for the avatar to handle.

The avatar creation process is initiated by clicking the create avatar icon ( ) in the fitting room. What follows is a four-step process where the user fills in personal information about measurements, age, and customizes his or her avatar. Figure 3.2.17 – 3.2.20 shows how the screens in the create avatar process.

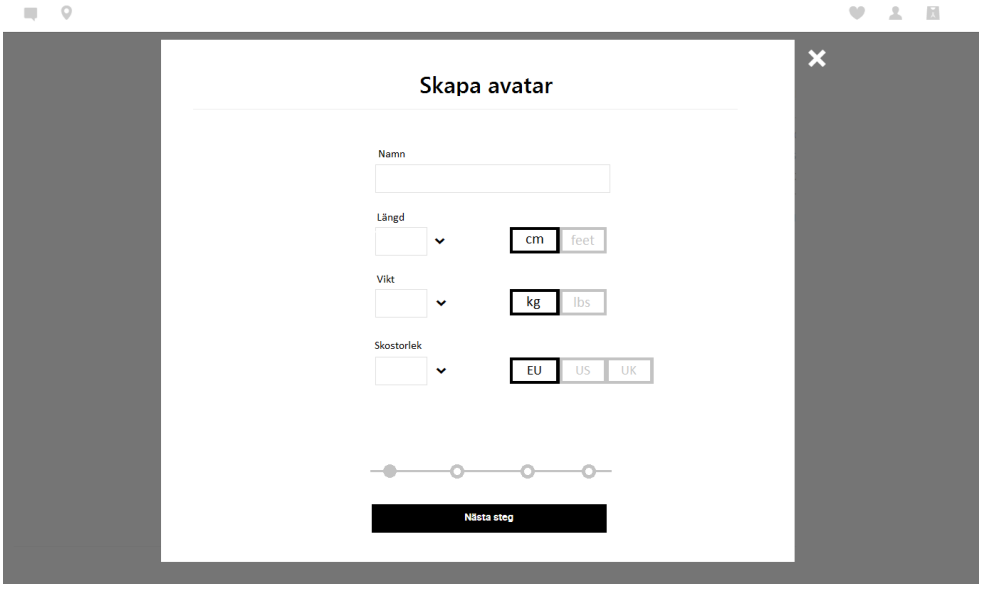

Figure 3.2.17 Create avatar process screen 1/4

The first screen has limited information input and has the purpose of collecting data for visuals. The first field is for naming the avatar and should be able to accept characters and special character up to a certain number, depending on what looks good in graphics. The scroll down menus should have reasonable limits, which changes when changing unit. For example, Length in centimeters could have a max of 200 or 210 depending on what looks good when modeling in the interface. Shoe size is entered here, as it is not a measurement measured by the user.

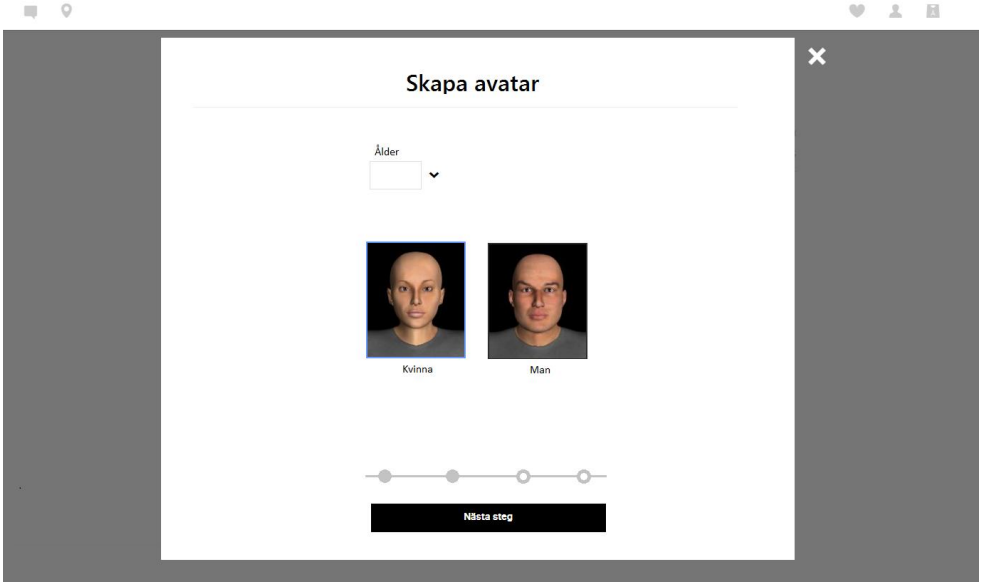

Figure 3.2.18 Create avatar process screen 2/4

The second screen is a very simple menu where the user selects age and gender. The gender choice affects the options of the third and fourth screen. This functionality could be merged into the first screen, as there are no dependencies between them.

Figure 3.2.19 Create avatar process screen 3/4

For the third screen is where measurements are filled in. As the italic text explains, there are four required fields marked with a *. This is because there need to be a certain threshold for where the avatar can portray its subject. The fields should have reasonable requirements for limits, as the scroll lists in screen one.

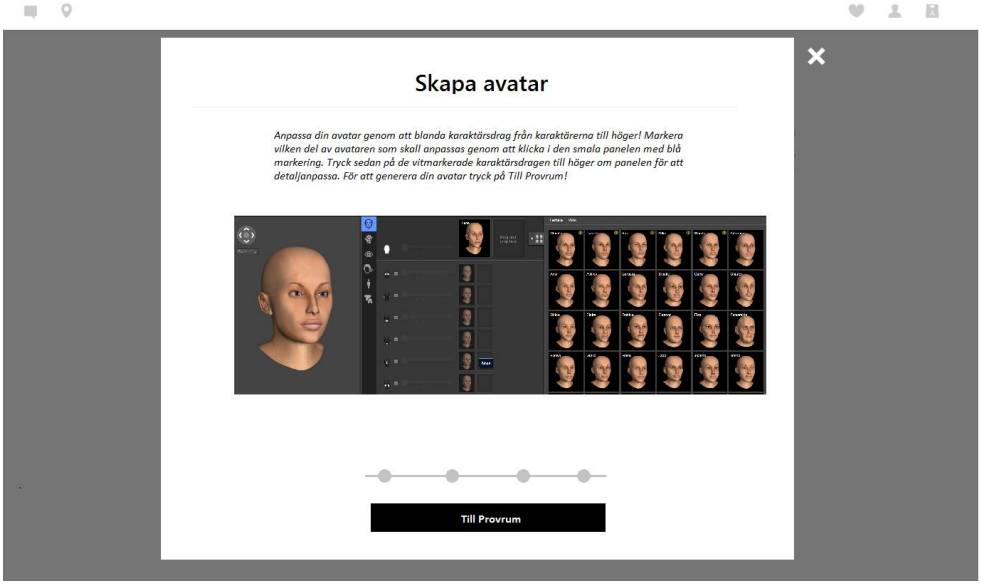

Figure 3.2.20 Create avatar process screen 4/4

The last screen is where the avatar is visually customized. In this case there is a female avatar. The italic text explains how to interact with the GUI, and that clicking “Till Provrum” will generate the avatar. When the avatar is created, it will appear in the fitting room. Users can change between avatars and change features on the avatars. There is only possible to apply apparel to one avatar at the time.

The avatar will have two layers. One functional layer with all the measurements and one visual layer with the customized appearance. The functional layer will compare all measurements to size charts and somewhat contribute to the appearance of the avatar with certain attributes.

3.3 Use Case Scenarios

To concretize the virtual avatar model, the requirements was formed into use case scenarios. The following three use cases scenarios are examples dedicated to the main functionality. The Use Case Scenario model used is adapted from Jira, a tool used in the testing process of Ahléns IT.

3.3.1 **Creating an avatar.**

Test step	Test data	Expected Result
User presses the create avatar icon ( )		The first screen in the avatar process appears
User enters required data and presses 'Nästa steg'	Avatar name, height, weight and shoe size.	The name field accepts å,ä,ö. The height, weight and shoe size attributes has required limits.
User enters required data and presses 'Nästa steg'	Age, gender.	The third screen appears. Age limits meet requirements. It's possible to switch between man and woman in the gender option.
User enters required data and presses 'Nästa steg'	Bust, Hips, Waist, Leg length. Optional attributes…	Menus have default value and it is possible to change units.
User customizes the avatar and presses "Till Provrum"		Functionality of customization is in order. User is redirected to the fitting room with the avatar placed as selected avatar when pressing "Till Provrum". The avatar looks as previewed.

3.3.2 **Visiting the fitting room**

Test step	Test data	Expected Result
Enter the fitting room via member panel.		Everything looks accordingly
Enter the fitting room via category level → PDP-level.		Everything looks accordingly
Enter the fitting room via PDP-level.		Everything looks accordingly

3.3.3 **Trying on several items simultaneously.**

Test step	Test data	Expected Result
User enters the fitting room		Page looks all right and an avatar is selected in the middle
User tries on an item labeled 'shirt'.	SKU (Stock Keeping Unit)	The shirt is applied to the avatar
User tries on an item labeled 'jacket.	SKU	The jacket is applied to the avatar with the shirt still underneath
User tries on a new item labeled 'shirt'.	SKU	The new shirt is applied on the avatar with the jacket still on

4 Conclusions

The interest for a virtual avatar seems to be very high according to the interest survey and previous research, which is a good response to RQ1 in chapter 1.4. Although, to answer RQ2, people probably have very different visions of what this concept would contain as the survey response suggests. For many years this has seemed like a futuristic dream often seen in sci-fi films and other media. These inspirational sources of information have probably given us very high expectations on how such a system would work. In sci-fi films there are no system errors and no back end developers dictating what is actually possible to implements. These high expectations set a high threshold for when virtual avatar solutions will be available on the market.

When looking at the established solutions in Metail's MeModel and for Fit Analytics, we can see that even though they have very big brands as partners, none have integrated their models into their sites. To elaborate on RQ3, this is probably because launching a model that is not good enough could hurt the brand. None of the big brands dare to risk being first and failing, and everyone is waiting for someone else to try it out. This is a very important part of the puzzle: why have no big brands launched virtual fitting rooms? When the technique matches up to the expectations of the customers, there will probably be a pioneer, launching the virtual fitting room. The value of such a product, if the product is desirable, will be tremendous. When one big brand succeeds, others will follow, probably with big wallets.

The main idea of the virtual avatar concept was to create a model based on lots of existing systems and techniques. To answer RQ5 - integration is key, and with that comes practical problems that is too much for this master thesis to consider and will be discovered in the future work to come.

The avatar creation process was created in a minimal fashion towards the site of ahlens.se and would need a designer's touch. This goes for the fitting room as well, and that is why the design is as plain and simple as possible. Some leading decisions had to made regarding icons, placements, and looks of different objects. These could of course be switched to other objects since the design is independent of the functionality.

The value in this product is the desire to use it, which makes design choices very important. This concept was designed according to design principles rather than created like artwork. Sometimes, the initial feeling is more important than doing

everything by the book, but the design principles should be fulfilled to some extent for reliability.

Regarding the avatar, there is still much functionality to figure out. Autodesk's character generator might not be the best fit after all practical implementations are considered. An advantage of the Autodesk characters is the level of complexity. They are more complex than the MeModels but not so complex it they become a liability for what the browser can handle. In reality this is an important aspect. We want everything to look as realistic as possible, but when interacting in real time, too much data in a system can seriously affect the user experience. For most systems it is more important with a good flow and overall feeling than details.

The measurements are fairly easy to measure, and it is easy to add or remove measurements from the GUI functionality. Since most big apparel brands uses size charts, but have different layouts and measurements involved, there will need to be a configuration matrix unique to each site.

The hi-fi prototype of the avatar concept did very well in the SUS-test, which is satisfying for RQ4. Although, this test is mainly for implemented systems and not prototypes. If the system was fully implemented there would probably have been functionality that would bother some users. It is hard to say how much the score would have differed but the prototype getting a high score is definitely better than low score. The number of test subjects is also a liability when interpreting the score.

5 Future work

The first order of business would be to implement and test this design. This would set some practical limits that would affect the functional requirements and use case stories.

A key functionality is applying apparel to the avatar. For this to be visually pleasing there needs to be better product information on the apparel. Garment maker is one way to make this possible, another would be to photograph very extensively, as in the case for Metail.

The photogrammetry technique would be interesting to apply in the fitting room. First of all, for facial features, and creating a feeling of that it is actually you on the screen. This could also be useful for detailed views and when zoom function is used. If a user wants to try on detailed jewelry or similar this could be a useful tool.

The layout and functionality of the fitting room could be improved a lot with the game engine Unity. There could be different lightings, mirrors and interior design in the fitting room. The user could perhaps design his or hers own fitting room if the desire to develop that side exists. The avatars could perform different movements as well.

A goal for the future would be to have auto generated avatars, where the visuals are created from photogrammetry and measurements alone, so the user would not have to customize the graphics as well.

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Appendix A

This appendix contains the original interest survey with answers, all in Swedish.

Intresseundersökning: virtuell E-handel

Detta är en intresseundersökning för att få reda på attityden kring e-handel och hur man är villig att förändra sitt shopping-mönster.

*Obligatorisk

Vilken åldersgrupp tillhör du? *

- 18-29
- 30-45
- 46-65
- 65+

Vilket kön identifierar du dig med? *

- kvinna
- man
- övrigt

Har du någon gång handlat kläder på nätet? *

- Ja, flera gånger!
- Ja, någon enstaka gång
- Nej

Om du svarat ja på föregående fråga, hur upplever du e-handel jämfört med att handla i butik?

- ◯ Bättre
- ◯ Sämre
- ◯ Beror på

Om du svarade 'beror på', på föregående fråga, kommentera gärna kort vad upplevelsen beror på!

Ditt svar

Skulle du vara intresserad av att använda en virtuell avatar (se exempelbilden nedan) för att testa kläder på nätet? *

- ◯ Ja
- ◯ Nej

Om du svarade nej på föregående fråga, varför inte?

Ditt svar

Answers

Tidstämpel	Vilken åldersgru	Vilket kön ide	Har du någon gång handlat k	Om du svarat ja p	Om du svarade 'beror på', på föregående	Skulle du v	Om du svarade nej på för
2016-09-21 15.46.09	18-29	kvinna	Ja, någon enstaka gång	Beror på	bilden stämmer inte alltid överrens med I	Ja	
2016-09-21 15.47.31	18-29	man	Nej	Sämre		Ja	
2016-09-21 15.54.27	18-29	kvinna	Ja, någon enstaka gång	Beror på	kan vara svårt att veta vilken storlek mar	Ja	
2016-09-21 16.01.43	18-29	kvinna	Ja, någon enstaka gång	Sämre		Ja	
2016-09-21 16.31.17	18-29	man	Ja, någon enstaka gång	Sämre		Ja	
2016-09-21 16.40.20	18-29	kvinna	Ja, någon enstaka gång	Bättre		Ja	
2016-09-21 17.05.55	18-29	kvinna	Ja, flera gånger!	Bättre		Ja	
2016-09-21 17.23.04	18-29	kvinna	Ja, någon enstaka gång	Beror på	Om det är snabb och billig frakt och om c	Ja	
2016-09-21 17.24.27	18-29	man	Ja, någon enstaka gång	Beror på	Ibland vill man bara testa sig runt	Ja	
2016-09-21 18.32.17	18-29	man	Ja, flera gånger!	Beror på	Svårt att handla kläder på internet så att	Ja	
2016-09-21 18.42.28	18-29	man	Ja, någon enstaka gång	Bättre		Ja	
2016-09-21 19.12.46	18-29	man	Ja, någon enstaka gång	Beror på	Alltså det är ju fett jävla jobbigt att skicka	Ja	Svarade ja, men om jag k
2016-09-21 19.24.21	18-29	man	Ja, någon enstaka gång	Sämre		Ja	
2016-09-21 19.27.38	46-65	kvinna	Ja, någon enstaka gång	Beror på		Ja	
2016-09-21 19.31.30	65+	kvinna	Ja, flera gånger!	Beror på		Ja	
2016-09-21 19.53.26	18-29	kvinna	Ja, flera gånger!	Beror på	Passar kläderna är det bättre, passar de	Ja	
2016-09-21 20.03.53	18-29	kvinna	Ja, flera gånger!	Beror på	Smidigt att handla hemifrån, men sämre	Ja	
2016-09-21 20.27.11	18-29	man	Ja, någon enstaka gång	Beror på	Ingen möjlighet att prova.	Ja	
2016-09-21 20.30.57	30-45	kvinna	Ja, flera gånger!	Beror på	Vad man köper!	Ja	
2016-09-21 21.01.51	46-65	kvinna	Nej			Ja	
2016-09-21 21.02.49	46-65	kvinna	Ja, någon enstaka gång	Sämre		Ja	
2016-09-21 21.36.41	18-29	man	Ja, någon enstaka gång	Beror på	Vissa kläder behöver man testa	Ja	
2016-09-21 21.48.18	18-29	man	Ja, flera gånger!	Bättre		Ja	
2016-09-21 22.20.01	18-29	kvinna	Ja, flera gånger!	Bättre		Ja	
2016-09-21 23.31.54	18-29	kvinna	Ja, flera gånger!	Bättre		Ja	
2016-09-22 02.22.50	46-65	man	Ja, någon enstaka gång	Beror på		Ja	
2016-09-22 08.41.16	18-29	man	Ja, någon enstaka gång	Beror på	likvärdigt	Ja	
2016-09-22 09.15.11	18-29	man	Ja, flera gånger!	Beror på	Ibland svårt att veta storlek eftersom mai	Ja	
2016-09-22 09.20.27	30-45	man	Ja, flera gånger!	Beror på	Hur bra siten är, hur lätt att hitta produkte	Ja	
2016-09-22 10.08.16	65+	kvinna	Nej			Ja	
2016-09-22 10.09.44	65+	man	Nej			Nej	
2016-09-22 11.01.06	18-29	man	Ja, någon enstaka gång	Bättre		Ja	
2016-09-22 11.33.08	18-29	man	Ja, flera gånger!	Sämre		Ja	
2016-09-22 13.09.18	18-29	man	Ja, någon enstaka gång	Beror på	Kan inte prova kläder, omständigt att att	Nej	Bättre på en riktig männis
2016-09-22 13.39.24	30-45	kvinna	Ja, flera gånger!	Bättre		Ja	
2016-09-22 15.28.19	30-45	man	Nej			Nej	Inget intresse för kläder, b
2016-09-22 18.39.38	18-29	man	Nej			Ja	
2016-09-22 19.39.44	18-29	kvinna	Ja, flera gånger!	Beror på	Ibland stämmer inte varan med vad bilde	Ja	
2016-09-22 20.32.07	18-29	man	Nej			Nej	
2016-09-23 09.13.23	18-29	man	Nej			Ja	
2016-09-23 09.59.29	30-45	man	Ja, flera gånger!	Sämre		Ja	
2016-09-24 19.20.10	18-29	kvinna	Ja, flera gånger!	Sämre		Nej	Det räcker med bilder.
2016-10-05 12.57.37	18-29	man	Nej	Sämre		Ja	