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# Spots On Design Report

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**Abstract**

Obesity is a growing societal problem. But the fact that it is, shouldn't affect the self-confidence of these people in relation to their clothing. Moreover for people with a plus-size it is already tough to find clothing, especially for special occasions when you want to look your best. With this project we tried to find a solution in a service for making a custom made garment with and print. The result was a evening dress that had a personalised embroidery which was digitally fabricated. So the wearer felt special when wearing it.

**Authors Keywords**

Obesity; Plus-size; Design; Fashion; Parameteric; Digital Fabrication.

**Introduction**

The perfect body shape is something people thrive to achieve. This is already a tough challenge. Especially, for people with obesity. They have a lot of challenges to have the perfect body shape. They often need to have surgery to 'create' the desired body shape so that they too can have that perfect picture. For them it is currently more about hiding their beautiful assets, rather than showing them. Especially for special occasions.

Currently in the plus-size fashion industry, they support the hiding of the body. This doesn't support the fact that you should feel beautiful in your own skin. Also big brands are not proud of having a plus-size range, since they don't market it and have a poorly presented plus-size department. This also takes away the joy of a shopping experience and the self-esteem of the person has. And added this it becomes more and more popular to show off your beautiful assets in the plus-size industry.

The goal of this project is to design a platform that provides a service to create a garment for special occasions that flatters the plus-size body using digitized fabricated print to boost their self-confidence.

To find a way to reach this goal we needed to explore different ways of fabrication tools and the self-confidence of plus-size women regarding their clothing. We believe that a properly placed and designed print can enhance the beauty of the plus-size woman, because it can enhance the beautiful parts of her own body.

The proposed garment is an evening dress that woman with a plus-size can buy. The basic concept of this dress that it is made of stretchy fabric enhanced by a print that is placed on the most flattering part of the body. The print on the dress will be customisable to the taste of the wearer.

### User and society

#### The beautiful(I) body

When looking at our concept it is hard to ignore the fact that we are facing a couple of psychological phenomenon. Since the target user addressed in this research have or had obesity, it is important that this is addressed. Other important psychological phenomena that are addressed in this design are self-esteem, body image and the relationship to fashion.

### Obesity & Self-esteem

Firstly, it is important to know what obesity is. Obesity is defined by the WHO (2017) as abnormal or excessive fat accumulation that is accompanied with a Body Mass Index (BMI) of greater or equal to 30. And is caused by an imbalance between calorie consumption and calorie expend. Obesity is growing problem in society (Jacob, 2000).

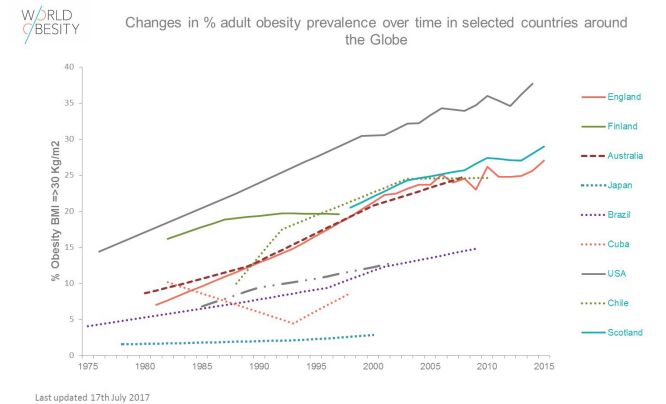


Figure 1. Changes in obesity

The chart above give data about the obesity rates tendency in developing countries from The European Report 2014 of The World Obesity Organization.

Looking at obesity research of Klaczynsky, Goold & Mudry (2004), they suggest that there is a mediated relationship between obesity and self-esteem. They mention that this is primarily caused by the belief that obesity is a personality shortcoming. According to the psychologist, Gerbrand van Hout, who is specialised in working with people with obesity. The general self-confidence of women with obesity is quite poor. And which is to his belief related more to their weight then their personality. Looking at the results of our user research the average plus-size woman feel average regarding their confidence. Also research of Rubinstein (2005) showed that women who are involved in a weight reduction process have a lower self-esteem.

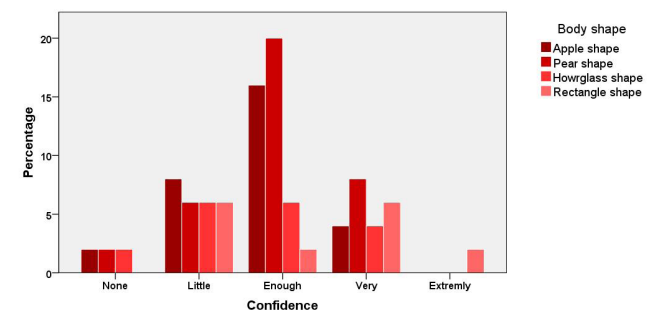


Figure 2. Table chart displays the user research results

Body perception is the perception of and feelings about a person's own appearance. This influences the way people look at each other, and is not only influenced by the length and de weight of an individual, but also by the opinions of others and the cultural norms. Findings of Stormer & Thompson (1996) show that social comparison and societal factors are predictors for body satisfaction. This was supported by the interview that was held with the psychologist. He explained that the general audience has a negative attention bias. Which means that they like to pick out the negative things. And that is the same thing people with overweight do.

## Embodied design research

### Feeling it on the own skin

After this experience we discovered that it felt very uncomfortable and heavy. Very hard to move around and not very beautiful. This experience provided us valuable insight that it is hard to celebrate a body that you are not proud of.



*"I felt uncomfortable and overreacted to the the surroundings because I was trying to accept my new appearance."*

Looking at the way the fashion industry uses their tools allowed us to develop an understanding of the way fashion works and how to integrate that into our project. To generate we looked at several fashion blogs, visited a plus-size store (Ulla Popken), looked at plus-size fashion in magazines and websites (Meyer Mode, Ulla Popken, H&M, River Island and Asos).



A couple of fashion tools were identified that are most commonly used in the (plus-size) fashion industry. The main goal in fashion is to emphasize certain body parts that you want to highlight. This can be done in different ways by using: patterns, colours and accessories. For a more excessive explanation on these tool, see appendix 2 .



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Figure 6. Embodied design viewed from different perspectives.

### Body-Shapes

Also learned from the fashion tool review is that body-shape is an important factor in the chosen fashion tools. So the way the body 'behaves' and looks is a very important factor. To get a better understanding of this behaviour, acting out and embodied design were used to improve the design. To get an understanding of different body-shapes an embodied design method was used in combination with a literature review of fashion blogs and sites.

By doing this experiment we discovered that not all kinds of clothing work for all body-shapes. And this finding was supported by the things we found on fashion blogs, since every different body-shape had her own styling advice. Using these findings, combined with the findings from the fashion tool review a magazine was created to provide plus-size people with suitable body-shape fashion advice. Which means that according to the body-shape tips and tricks are provided to help the user find the right garment for their body-type.



Figures 7 & 8. Experiments with pieces of garments with our model

### Embodied design with the model

In order to understand what the garment should look like, the embodied design method was used on the model. During this experiment the model was asked to put on different parts of a dress or dresses she really liked to define what she likes. When the model was wearing the garment or piece she was asked what she felt, and why it made her feel beautiful and special.

The conclusion of this experiment was that the model wanted:

- A heart shaped neckline, because it makes her feel more feminine and it attracts the attention to her most beautiful asset.
- The model doesn't want a scarf to go with the dress.
- preferable the dress has to have an asymmetrical skirt with
  - A v-split in the front. But if that wouldn't be possible, because of the time she would be ok with a longer straight skirt.
- Placement of the print should be on the top-part of the dress to accentuate her waist or chest. She doesn't want a print on her stomach area. The size of the print should be the maximum size of 20x30 cm.



## Collaboration and design development with summa students and model



Figure 9. Team collaboration

After the midterm, we collaborated with two students of Summa College who specialize in fashion design in order to help us with the production. Each of them had to deliver one garment regarding to our research findings in order to get the right design. The weekly development was discussed with different parties namely: the model and fashion experts from the squad.

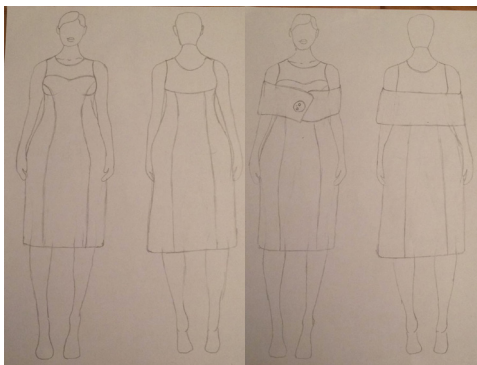


Figure 11. Two new design proposals after the second collaboration

The second time collaboration, all the parties attended to the meetings. Summa students brought their new design proposals. The proposal with scarf did not meet our requirements. In the end, we all made agreement with the other one.



Figure 10. Two design proposals after the first collaboration

After the first collaboration, Summa students completed design proposal regarding to our findings from embodied design research. We exchanged our ideas about their proposals and addressed improvements.



Figure 12 & 13. First prototype & Final prototype

The last collaboration, Summa students brought their semi-prototype and we put on our model. We realized that the she did not transform exactly what we expected from the proposal. Our model also exchanged some ideas. The improvements can be seen in the final prototype.

## Technology

In this part of the report the focus will be on the Technology & Realisation and Math, Data & Computing. Within this part the focus will be on exploring parametric design. Parametric design is a design process based on algorithmic thinking that users to create their own algorithmic expressions by connecting parameters following certain rules().

The parametric design allows designers and artists to explore the creative possibilities of digital environment. By creating visual programming algorithms, designers can create interactive architectural installations, generate 3D visuals that respond to user input or the physical environment. This method has been widely used in architectural design, digital fabrication and industrial design. However, based on the historical research, we found out that this method has not yet been used widely in fashion design. The results of this research would provide insights for the fashion industry and open up new design opportunities.

## Technical Challenge

Initial technological challenge was: How to manipulate stretch fabric so it gains another attribute. After conducting research and experiments and the design process developed, the technological challenge was changed to: How can stretch fabric be manipulated, so it retain its' ability of stretch. But still have the aesthetic appearance that we thrive for. To make a garment look high end print.

This is an overview of the conducted experiments throughout the entire project.

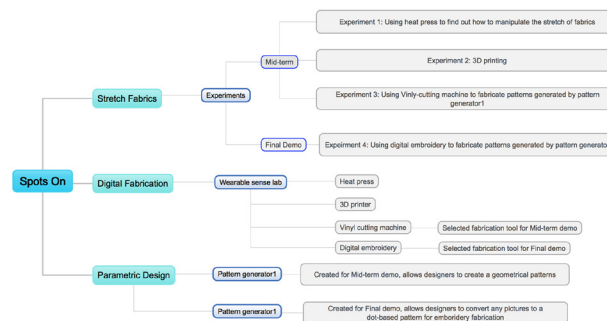


Figure 14. Overview of the technical experiments

## Experiments

### Experiment 1

Experiment 1 was executed in the 2nd week of this project. By using heat press and experimenting with different types of 3D materials, we aimed to find out how to manipulate the characteristic of stretch fabrics (figure 10). The results provided us with useful information on how to properly use heat press with different 3D printing materials and vivak.



Figure 15. Experiment 1

Following by our fashion tool review, we found out that patterns can be used to emphasize small attribution of someone's body. In order to achieve to make a pattern generator that allows designer could easily to customise the patterns without investing time on modification, meanwhile visualizing the outcomes in real-time. We decided to use Grasshopper 3D, which is a plug-in for Rhinoceros 3D that presents the users with a visual programming language interface to create and edit geometry. Grasshopper was chosen, because of a variety of reasons:

- the learning goal of a team member
- real time update of the programmed result.
- most recommended for digital fabrication, since it can be converted to any format.

#### Generator 1: Geometrical pattern generator

Based on the research of the fashion tools, we discovered that patterns with diagonal lines or vertical lines make someone look thinner. This requires that the pattern generator should not only be able to create patterns like the following pictures suggest, but also be able to perform more other functions like attractors in order to follow different curvatures of female body.

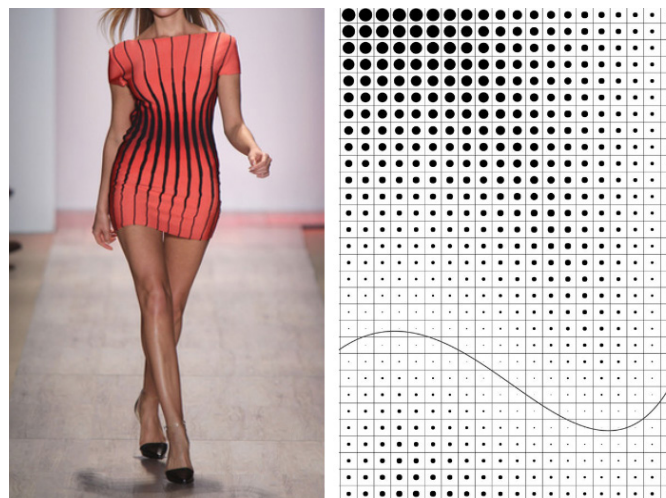


Figure 16. An example of curvature attractor and design

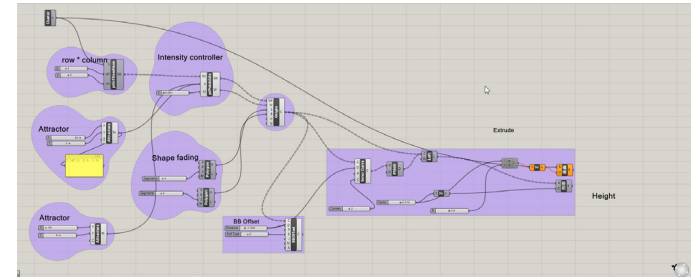


Figure 17. Generator 1

This pattern generator allows designers to modify:

- Number of columns or rows
- Number and locations of attractors
- Density of patterns toward to attractors
- Offset values of each patterns
- Fading shapes
- Size of the canvas

The outcomes from this generator can be converted into correct formats to fabricate with fabrication tools provided from Tu/e wearable sense lab. Here is a picture shows all the possible designs created by this generators.

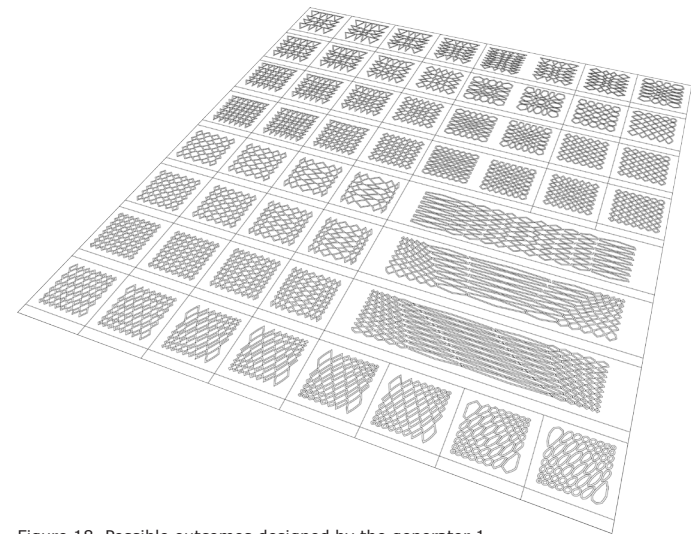


Figure 18. Possible outcomes designed by the generator 1



## Experiment 2

In experiment 1, we discovered that in sample 5 and 10, the stretchiness of fabrics still retain, which determined PLA to be the selected printing material for the following experiment.

In this experiment 2, our aim was to find out how to fabricate patterns created by the Generator 1 with a 3D printer and using PLA. However, after several experiments, we discovered that the printing processes is very time consuming, additionally, the outcomes seem not as clean and neat as we wanted. This is because the printer could not achieve to print the patterns with high density in a small scale. As result, we decided not to use 3D printer in our project.

## Experiment 3

In this experiment, we discovered that by using Vinyl-cutting machine to fabricate the patterns in combination with heat press, these two fabrication tools have successfully achieved to create a garment, with the patterns created by the generator 1, meanwhile retain the stretch ability. Which is also not as time consuming as 3D printing. Also it provided the additional bonus of being able to use the already-developed generators.

After showing the prototype and swatches to the squad members and our model. They mentioned that the Vinyl print certainly added aesthetics value into garment, however the results seems way too geometrical even though the stretchiness of the fabric remains. The use of materials did not look elegant but cheap.

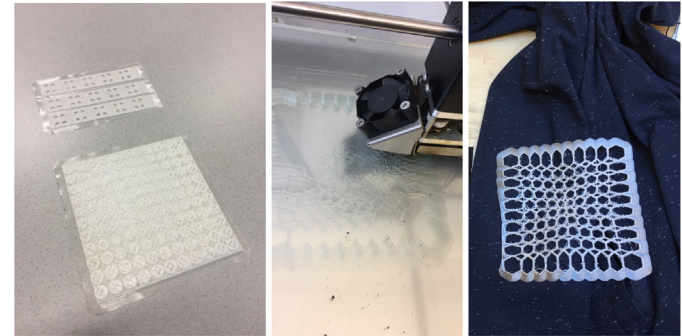


Figure 19. Experiment 2



Figure 20. Experiment 3



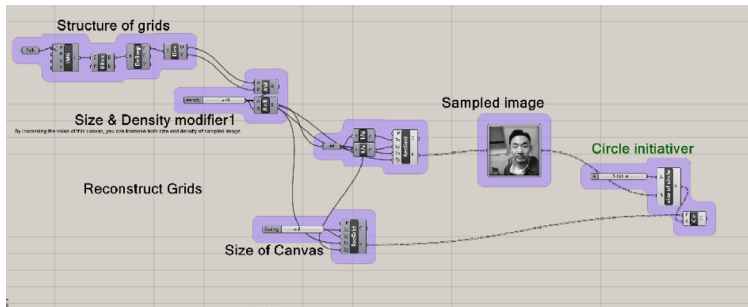


Figure 21. Generator 2

The second pattern generator was an evaluated version based on the first one. By simply importing a picture into this generator, it creates a dot based outcome. Which also allows designers to modify the density, amount and distance of a the dot based product.

This pattern generator allows designers to:

- Convert any pictures to a dot based pattern
- Modify the size and density of pattern
- Modify the size of canvas.

On the right is a picture that shows some potential designs created by this generators. The biggest challenge was how to fabricate these patterns on garment. Different tools were used in order to see which outcomes would have the most aesthetic appeal.

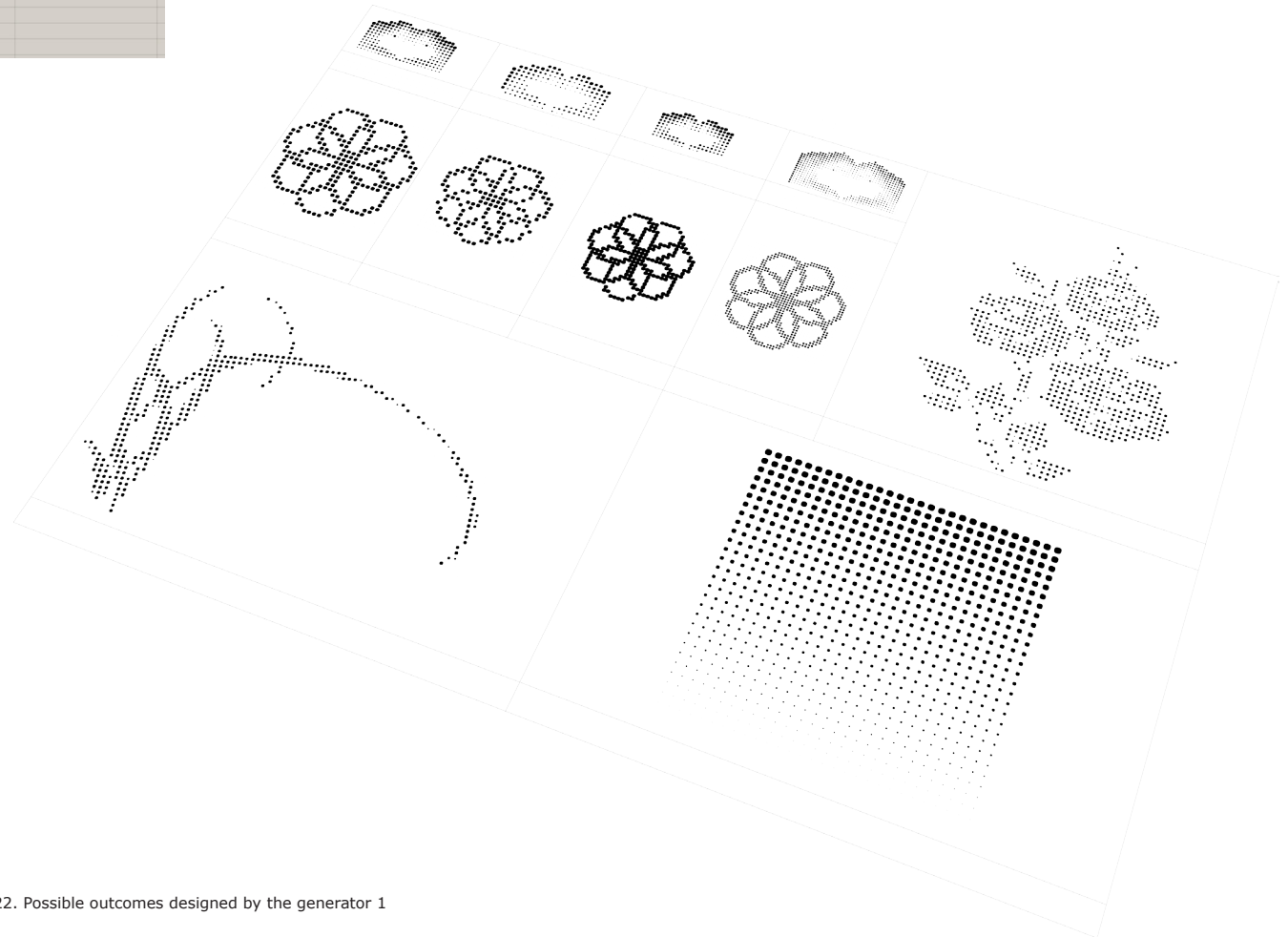


Figure 22. Possible outcomes designed by the generator 1

**Here is an overview of different results that were fabricated by the different tools.**

After showing the results to our model and squad members, the use of digital embroidery received most positive feedback. So this method of fabrication was chosen for completing the production of the final prototype.

#### **Experiment 4**

The purpose of this experiment was to find out how to use the digital embroidery machine on fabrics and what patterns will retain its stretch. Because the use of an embroidery machine certainly adds aesthetic value to a garment.

Here are some advices:

- Using ball point needles on stretch fabrics.
- Using Solvy backing
- From experiments, we discovered that the settings from demo 7 give the best result. The fabrics look flat and the stretchiness retain.

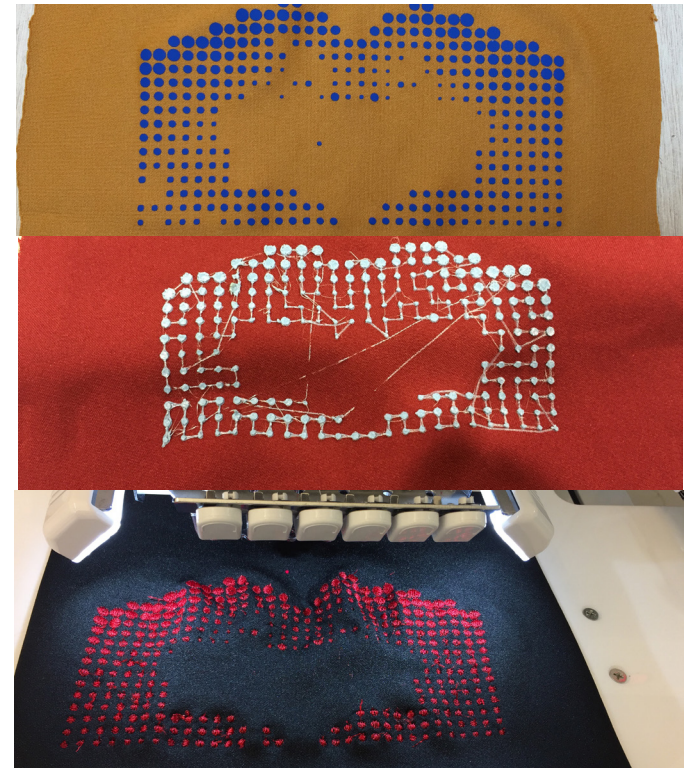


Figure23 . Overview of different fabrication methods

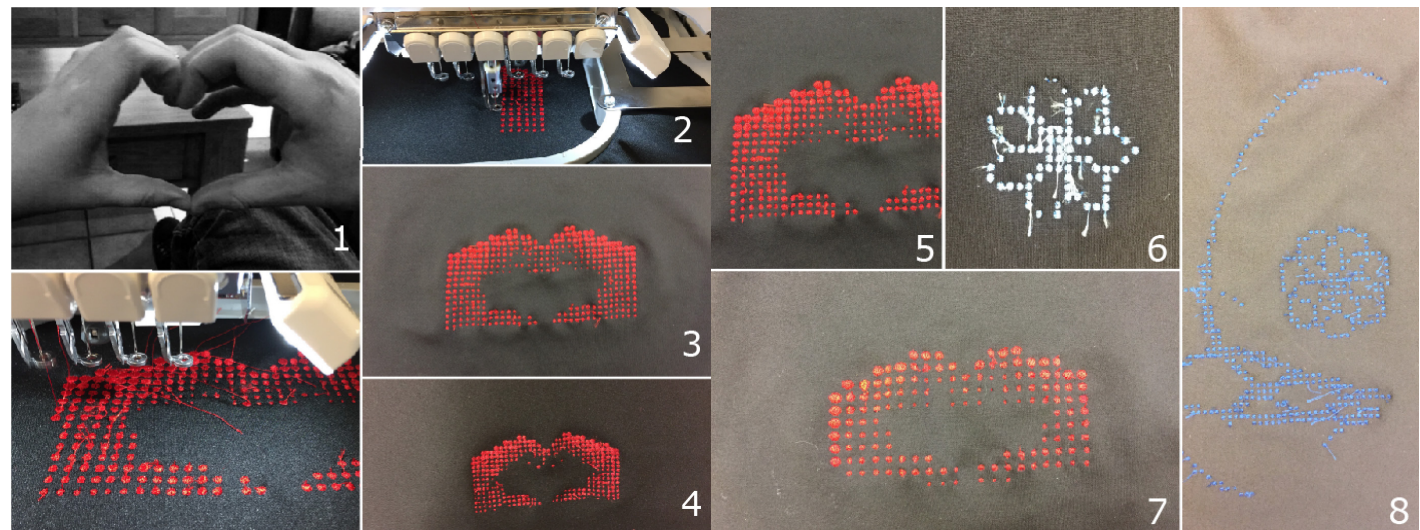


Figure 24. Experiment 4



Business

The plus-size fashion market is defined by an industry that specializes in the clothing for plus-size women. These clothes are in special proportions to the larger female body. The sizes 44 (large) and up are considered to be plus-size, but not all retailers follow this convention, according to IBISWorld (2016).

There are a couple of places that the buyer and the company meet. This is online and offline. They use channels like:

- A physical stores around the country
- Websites
- Social media
- Fashion shows
- Through a catalogue.

Regarding to the business plan (appendix), we attempted to explore the possibilities of e-commercial. Additionally, we created an website, where provides customizable services, allows customers upload a picture, we can convert it to pattern that regarding to their preferences.

There are a lot of developments and trends in the plus-size fashion industry. Tabel 1 explains the positive and negative developments in this industry. The results in the tabel are a combination findings from of literature and field-research.

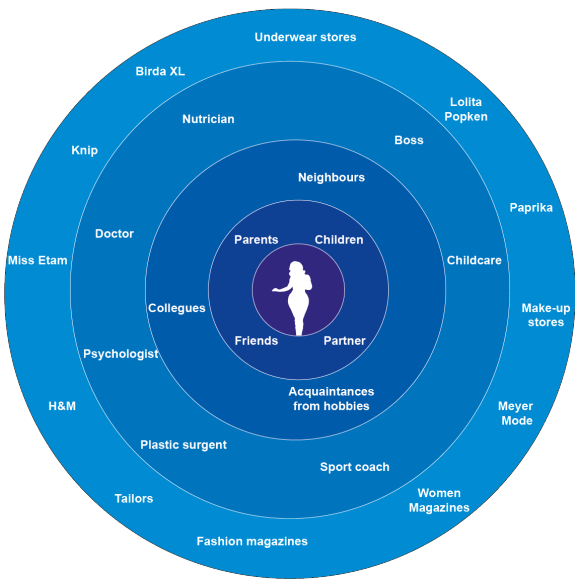


Figure 24. stakeholder map

Positive	Negative
Rapidly growing market	Big (non-plus-size) brands aren't proud of their plus-size department: <ul style="list-style-type: none"><li>- bad lighting;</li><li>- poorly stocked shelves</li><li>- badly organized</li></ul>
Non-plus-size brands are investing and expanding their range of sizes	Patterns of plus-size clothing are just and explanation of 'regular' clothing. This creates a miss-fit with the body shape of the plus-size women.
More visibility regarding plus-sized women.	Hard to find clothing hard to personal body type.
Trend of celebrating the body, showing beautiful assets and self-acceptance.	Different treatments for women with a plus-size.
	Too little investment in site navigation, personalisation and fulfillment of the demand of the customer.

Figure 26. The development of plus-size fashion industry

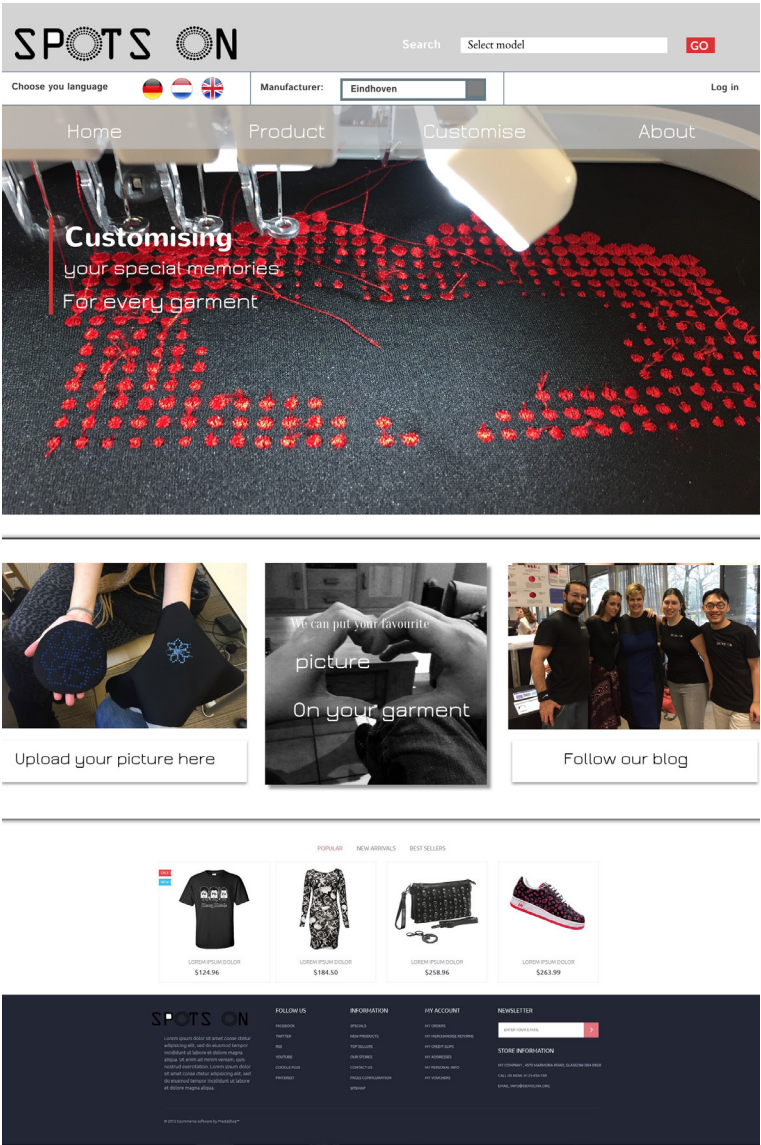


Figure 24. The website interface

## Improvements

Finally, at the demo day we realized that the outcome was not the desirable one. So, we need to take further steps for improvements. To be more specific, the final garment for our model, Linda, did not meet our expectations. The fitting of the dress was not the proper one and a lot of details of the dress had been modified differently from our demands.

Firstly, the upper part of the dress was not transparent as we asked.

Secondly, the area of the front side of the dress was not being sewed with the correct portions of colors. Our purpose was the blue part of the dress to be bigger and the black areas to embrace only the siding parts of our model's body in order to create the illusion of a slimmer silhouette.

Last but not least, the length of the garment was not so flattering for our model.

For these reasons, we asked our model about her feelings and her thoughts about the garment. It was obvious that she did not feel that great wearing this garment. So, she confirmed all the above imperfections of the dress and also, she added that she would prefer the embroidery part to be done with a lighter colored thread in order to get a more obvious visual.

We took all these feedbacks into account and we are willing to enhance our service according to our user's demands.



Figure 25. Pictures from demo day

## Discussion

In order to reach our goal of designing a special occasion garment with a digitized fabricated print, throughout the entire design processes, different fabrication tools were implemented and experimented, finally we discovered that the use of digital embroidery machine brought the most attractive outcomes.

- People are interested in new ways of using the embroidery machine
- How empowering is a print?
- Plus-size offers a lot of opportunities now and in the future and people with a plus-size are grateful for new inventions to improve their fashion
- This research brought useful insights about, with the current fabrication technology, it is possible to combine parametric design method in textile, especially on stretch fabrics.

This project has created a new process of creating a garment with digital fabrication tools. This design process might open up the new possibilities for customizing services. By printing a picture, which has special meaning to the wearer, it will create an intimate relationship between the users and garment, which might be helpful to increase their self-confidence.

## Acknowledgements



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## Appendix 1. User research & Persona's

### Results User research

User research focuses on understanding user behaviors, needs, and motivations through observation techniques, task analysis, and other feedback methodologies. Through the ages, people's perception about the beauty differs widely. Nowadays, people are bombed with misleading beauty standards which promote slim body shapes. Unfortunately, the realm of fashion addresses only to women who satisfy these standards. As a result, this situation keeps women with extra kilos at bay and make them feel neglected. It is difficult for an oversized woman to find a proper garment at the market.

### Method

The first step in the research was to define the user target group, their preferences and requirements. This was achieved by applying mixed methods research approach (quantitative and qualitative research) and the research has been divided in different phases. In the first phase, a questionnaire (1st questionnaire = 84 participants) was carried out in order to narrow and define the project target user.

After this, a persona was created. A persona is a imaginary potential customer that helps the researchers to visualize the customer requirements more easily. With further definition, we decided to change our persona for real person. Linda is from The Netherlands, she is a 30 years old fashion model and she filled the characteristics of the predicted customer perfectly.

The shift to a real case allowed us to define a proper solution following the defined approach of our concept and involving the customer in many decisions.

A further step was to explore the fashion requirements of the target group. According to the published literature and preliminary findings, we decide to create a second questionnaire (2nd questionnaire = 50 participants) and carry out some interviews to narrow the necessities of the customers and proof some user related assumptions.

A second literature review was necessary as well, the psychological problems of our target user group has been an important factor to understand how this user segment feel. Literature research in that area enable us more easily to find a proper solution for them and prove the real social necessity. Obesity is an increasing problem in developing countries and it is a studied issue in many countries (1,2). As shown in the study from Gidi Rubinstein, Women who are involved in a weight reduction process have lower self-esteem levels (3).

Then a second phase followed using qualitative research tools like interviews. We conducted interviews to specialists with various backgrounds, amount these specialists we asked Dr. Psychologist Gerbrand van Hout from Catharinaziekenhuis in Eindhoven (psychologist specialized in obesity), Plus-size specialized commercials from Plus-size store in Eindhoven and PhD investigators involved in related surveys.

### Sandra



**Age:** 28  
**Occupation:** nurse, working fulltime  
**Hobbies:** music & visiting amusement parks  
**Country:** Sweden  
  
Married with one child

#### Goals

- Make people around her feel happy and cared for.
- Having an comfortable outfit, that is useful for any occasion.

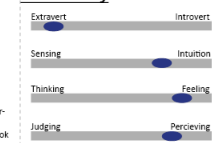
#### Motivation

Sandra is a young, just married, woman who has overweight. As a nurse she is used to put herself second place. Yet as a young mother she would still like to look nice en presentable at work and in her private life. Especially, for special occasions it is hard to find the right outfit. It is hard for her to find nice clothing that provide her just that, because of her overweight.

#### Frustration

- Not being able to purchase comfortable, yet fashionable clothing for during the day.
- Not being able to find nice occasional dresses or garments in the store.

#### Personality



#### Style preference

Sandra doesn't really have a style preference. As long as it is comfortable and easy to move around in. She would like her fashion to be fashionable. She prefers to wear dark clothing, because she

### Anna



**Age:** 18  
**Occupation:** student with a job as cashier  
**Hobbies:** dancing, clubbing, make-up & fashion  
**Country:** United Kingdom  
  
not in a relationship

#### Goals

- She wants to built a future as a fashion designer to make people feel more beautiful.
- Looking fashionable without looking old.

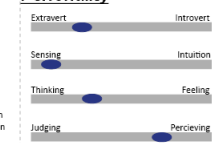
#### Motivation

Anna is a fashion forward person. She likes to dress in the latest fashion. She also wants to become a fashion designer herself, because she is very passionate for fashion. She likes to try new things and see what the result of that is. She is someone who is willing to try new never done before, things.

#### Frustration

- Not being able to dress to her age, because a lot of clothing for overweight woman are for older women.
- Not being able to fit into the latest fashion like all the other girls from her age.
- Not being able to buy brand clothing that her classmates buys, because they don't come in her size.

#### Personality



#### Style preference

Anna loves to look modern yet casual. She wants to blend in with her other classmates. She prefers to wear different shades of blue and grey, because they are her favorite colors. She likes to make bold statements with her clothing, that is why she also likes to wear patterned clothing. Lastly, she likes to wear clothing that is produced in an eco-friendly way.

### Emma



**Age:** 35  
**Occupation:** logistics manager  
**Hobbies:** baking & photography  
**Country:** Germany  
  
Married with two children

#### Goals

- Would like to find an outfit that makes her feel attractive and comfortable at the same time.
- Saving time during the morning for more relaxing things, rather than choosing the proper outfit.
- Taking less decisions as possible during the morning, so she can be more productive.

#### Motivation

Emma is a really busy mother of two kids and simultaneously holds a demanding position at the logistic department of a big company. She is very passionate about fashion, but her extra kilos are an obstacle for her to follow the fashion trends.

#### Frustration

- Not being able to follow the fashion trends. Fashion is addressed only for the thin people.
- Wasting a lot of time every morning in order to find the proper outfit for the office and for a working mom.

#### Personality



#### Style preference

Emma loves to be chic and elegant. Her favorite color is black, because it is always in fashion. Lastly, she likes to enhance her outfit with impressive jewellery.

Appendix2. Interviews

User questionnaire ENG

Which kind of clothing do women prefer and which are more recommendable for them.

1. 1. In which age group do you are?  
No emmagadretsa pava jia éklogis.

☐ 20 - 24  
☐ 25 - 29  
☐ 30 - 34  
☐ 35 - 40  
☐ More than 40

2. Which country do you come from?

3. 2. What is the main factor for choosing or buying clothes?  
No emmagadretsa pava jia éklogis.

☐ Price  
☐ Comfortability  
☐ Fashion trends  
☐ Feeling attractive and feminine  
☐ Catching the attention of others  
☐ Quality

4. 3. Which color do you prefer to wear? Only one answer

5. Why do you prefer to wear this color?  
No emmagadretsa pava jia éklogis.

☐ Favourite color  
☐ It makes me look better  
☐ It fits better for every situation

Questionnaire 1

Questionnaire vol3

We would like to answer the following questionnaire in order to help us in our project.  
All answers will be processed anonymously and be used for the purpose of the current course.


1. 1. How old are you?  
No emmagadretsa pava jia éklogis.

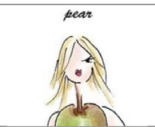
☐ 20-24  
☐ 25-29  
☐ 30-34  
☐ 35-39  
☐ More than 40


2. 2. Are you interested in fashion? Do you like to follow fashion trends?  
No emmagadretsa pava jia éklogis.


☐ Yes  
☐ No  
☐ Maybe

3. 3. Choose one of the following figures that you think is more fitted to your body shape?  
Emmagadretsa éka éka exelous.

  
☐ Apple shape


  
☐ Pear shape


  
☐ Hourglass shape


  
☐ Rectangle shape

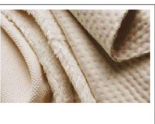
Questionnaire 2


6. 5. Which fabric texture do you like to wear?  
No emmagadretsa pava jia éklogis.


  
☐ Shiny texture

  
☐ Matt texture

  
☐ Semi-transparent texture

  
☐ Pluffy texture

  
☐ Leather

  
☐ Lace texture

☐

4. 4. How confident do you feel about your body?  
No emmagadretsa pava jia éklogis.

1 2 3 4 5  
None ☐ ☐ ☐ ☐ ☐ Extremely confident

5. 5. How easy is to find clothes which are flattering your body shape?  
No emmagadretsa pava jia éklogis.

1 2 3 4 5  
None ☐ ☐ ☐ ☐ ☐ Extremely easy

6. 6. How enjoyable is usually your shopping experience?  
No emmagadretsa pava jia éklogis.

1 2 3 4 5  
None at all ☐ ☐ ☐ ☐ ☐ Extremely enjoyable

7. 7. And why do you give this ranking?

8. 8. Do you prefer e-shopping than the traditional one?  
No emmagadretsa pava jia éklogis.

☐ Yes  
☐ No  
☐ Maybe

9. 9. If yes, tell us why.

10. 10. Do you prefer to wear loose or body shape clothes?  
No emmagadretsa pava jia éklogis.

☐ Loose clothes  
☐ Body shape clothes  
☐ Both of them  
☐ Other

11. 11. Why do you prefer this clothing shape?

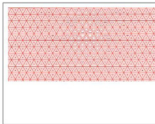
12. 12. Are you aware of the kind of fabrics your clothes are made of?  
Emmagadretsa éka éka exelous.


☐ Yes  
☐ No  
☐ Maybe

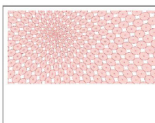
7. 6. Do you prefer to wear one color, a pattern or a combination?  
No emmagadretsa pava jia éklogis.

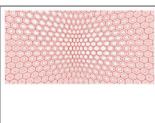
☐ Color (ex: blue, red, pink, black, etc)  
☐ Pattern (ex: flowers, abstract, geometrical, etc)  
☐ Color combination (ex: two colors, monochrom, three or more colors)  
☐ Combination color pattern


8. 7. Which of this patterns do you prefer/like?  
No emmagadretsa pava jia éklogis.

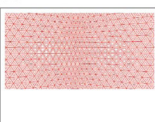
  
☐ Pattern 1

  
☐ Pattern 2

  
☐ Pattern 3

  
☐ Pattern 4


  
☐ Pattern 5


  
☐ Pattern 6


9. 8. Which kind of fabric do you prefer to wear?  
No emmagadretsa pava jia éklogis.


☐ Natural fabrics (silk, wool, cotton, etc)  
☐ Synthetic fabrics (spandex, lycra, polyester, etc )  
☐ Combination of them  
☐ No matter


10. 9. Considering comfortableness, which clothing cut do you like to wear?  
No emmagadretsa pava jia éklogis.

  
☐ Body shaped

  
☐ Straight (no shape)

  
☐ Asymetric

  
☐ Wide

  
☐ Fitted

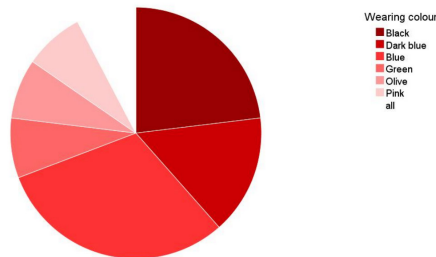
11. 10. Describe your favourite outfit in one sentence

13. 13. If yes, which kind of textiles do you prefer to wear?  
No emmagadretsa pava jia éklogis.

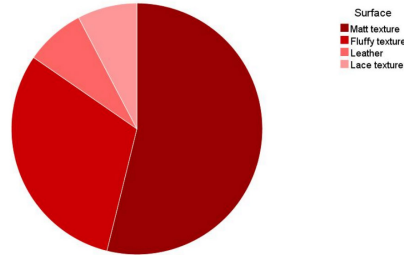
☐ Natural fabrics (silk, wool, cotton, etc)  
☐ Synthetic fabrics (spandex, lycra, polyester, etc )  
☐ Combination of them

Με την υποστήριξη της  
Google Forms

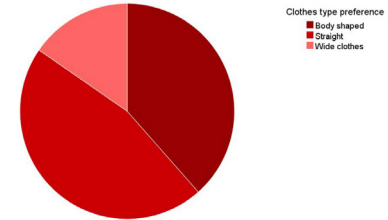
### Appendix3. Data Analysis and Visualization of user research results



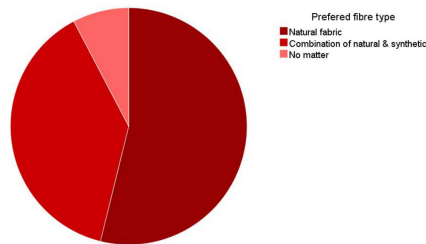
The first pie chart shows the wearing colour preference for our age group (35 to 40 years old). The tendency is clearly for dark colours but the most chosen is blue. It is remarkable that this group answer a wider palette of colours than younger ones.



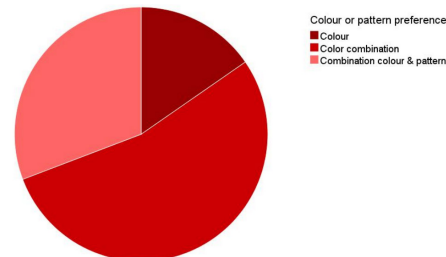
The second chart gives data about the preferred fabric surface. In this case, more than 50 % of the participants within the selected target group preferred clothing made from matt fabrics.



The third pie addresses to the preference of wearing an outfit composed of one colour, a colour combination or the combination of colour and pattern. Here, similar to the previous pie, more than the half of the participants prefer to wear outfit combining colours.

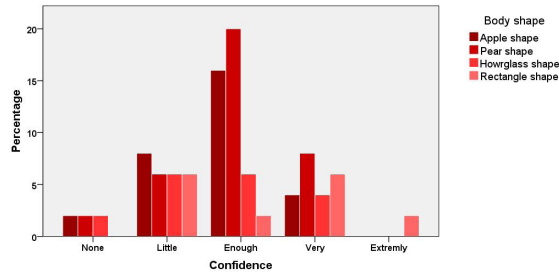


In the case of the type of fabric fibre, the selected age group have preference for natural fabric, being the fibre chosen from more than 50 % of the interviewees.

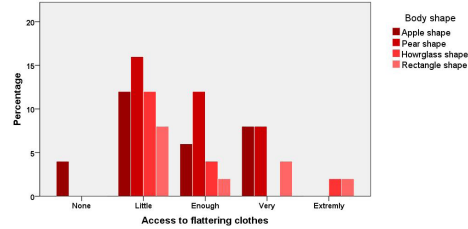


Finally. the last chart shows the preference in terms of clothes cut type. The most preferred outfit shape is straight. Many of the participants explain that this shape hide their real body shape and so, they feel more comfortable.

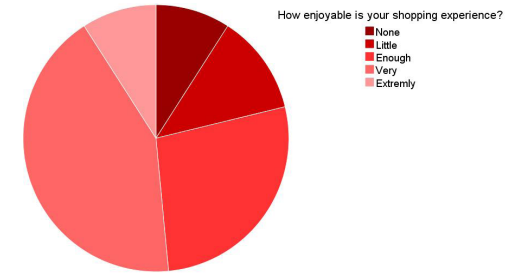




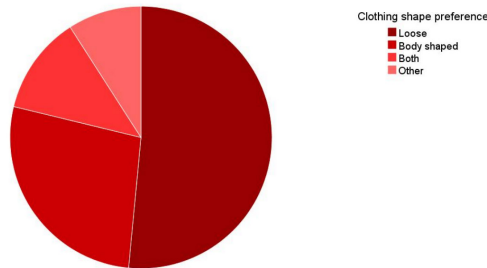
This graph illustrates how confident women feel related to their body shape



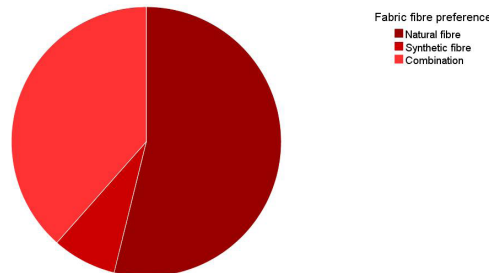
This graph indicates how easy women can find flattering clothes according to the body shape.



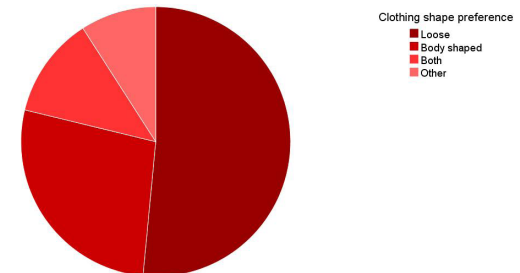
As we can see the highest percentage of women seems to enjoy shopping. But they actually do? We realized that many of the women who answered that they enjoyed shopping, also mentioned that they have hard time looking for a garment in proper size.



According to this pie, the majority of women prefer loose clothes. When these women were asked why they prefer this shape, for their clothes, they mentioned the lack of body shaped flattering options for their size.



This pie chart displays the kind of fabric which women prefer the most. It is obvious that most of these women choose natural fabrics.



The last pie shows the preference of the shopping way. Most of the women prefer to shop the traditional way. With this way, they have the possibility to try on the garment immediately.

## Appendix 4. Review of the interview with a shop owner

To get a better understanding of how a plus-size store operates right now, we visited one and talked to the owner. The visited store was Ulla Popken in Eindhoven. This is part of a chain of the same stores all around the Netherlands. Ulla Popken is a brand from Germany that is specialized in plus-size fashion.

After interviewing the owner of the shop we learned that:

- They offer a lot of ways for customers to buy their items. Online and offline. They have a webstore, physical stores and a catalogue that customers can order from.
- They can try the clothing at home for 14 days or in the store if they prefer the help and opinion of a sales-person.
- They are available 24/7 online, in a shop during the week and also available by phone for orders or advice.

Additionally, the owner of Ulla Popken in Eindhoven shared with us some tips for a proper garment for oversize ladies. Although, she admitted that this issue relies heavily on the personality and the taste of the woman.

- Favorite color: Black
- Preferable element: Nice prints
- Preferable fabrics: Natural fabrics ( cotton and viscose) especially at the top part of the garment, because they sweat a lot on this part of the body and stretchy material for the other parts.



## Appendix 5. Review of the fashion tools

Looking at the way the fashion industry uses their tools allowed us to develop an understanding of the way fashion works and how to integrate that into our project. To generate we looked at several fashion blogs, visiting a plus-size store (Ulla Popken), looking at plus-size fashion in magazines and websites (Meyer Mode, Ulla Popken, H&M, River Island and Asos).

A couple fashion tools were identified that are most commonly used in the (plus-size) fashion industry. The main goal in fashion is to emphasize certain body parts that you want to highlight. This can be done in different ways by using: patterns, colours and accessories (Wikihow, n.d.).

Patterns can be used to emphasize the 'smaller' attributes of someone's body. This can be done by using bigger prints or lines. Vertical lines create an elongating effect, what makes people look taller and thus slimmer. Divergent lines have the same effect as vertical lines. Horizontal lines create a widening effect, which can be used to create a proportional body shape (Marinelli, 2014; Raes, 2011).

Colours can be used to create a slimming effect. Using dark colours makes someone look smaller, especially when it is combined with a lighter colour next to it. Using contrast in colours you can draw the eye to a specific area or asset of the body (Marinelli, 2014; Dean, 2012).

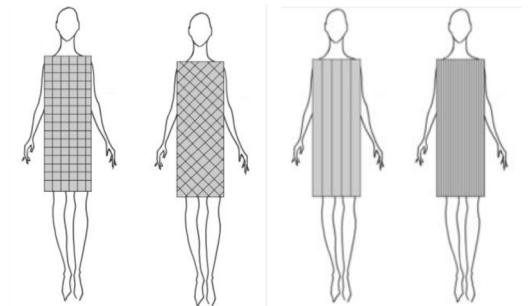
Accessories can be used in a couple of different ways. Using longer accessories like necklaces can create an elongating effect, what makes people look taller and thus slimmer. Using a big accessory like a bag can create proportion in relation to the body, which also creates a slimming effect (Marinelli, 2014; Wikihow, n.d.).

To create an understanding of why these tools work, we looked into perception and more specifically Gestalt psychology. Since this final one is a theory about perception that provides an explanation for these phenomena.

### Gestalt psychology

The Gestalt Psychology is a theory that tries to explain errors in your perception. Perception is an image that is associated with a concept, memory of an event, emotions or motives. This theory tries to explain the way stimuli are interpreted by our brain and how they are made into perception to help the brain organise what it is looking at. The Gestalt psychology has a couple of laws:

- Law of similarity: the brain groups' objects that look similar. This can be linked to a print. If the print on a garment is small, the brain thinks that the object behind it is also smaller.
- Law of proximity: the brain groups' things that are close to each other. If you create a print using a same amount of dots, the brain believes it is one cohesive picture.
- Law of continuation: the brain prefers to see images that are continuing and cohesive. When using vertical lines in clothing, the brain believes that it is part of the motion. So the person appears to be smaller, because of the lengthening effect.
- Law of common density: the brain groups' objects together that have the same look and the same motion or density.
- Law of Prägnanz: the brain looks for the easiest way of ordering that requires the least cognitive effort [.]





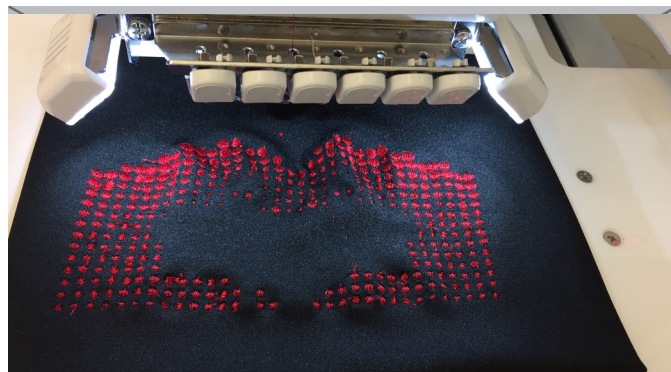
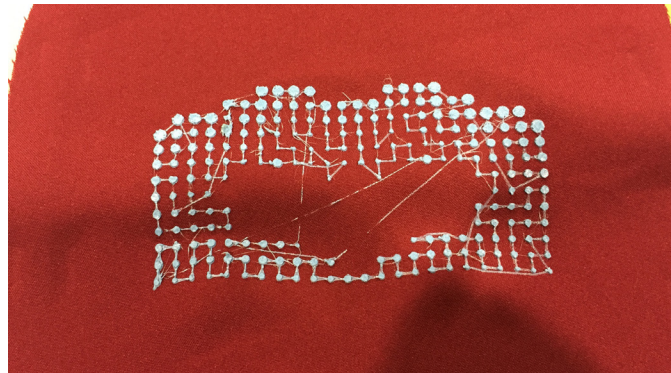
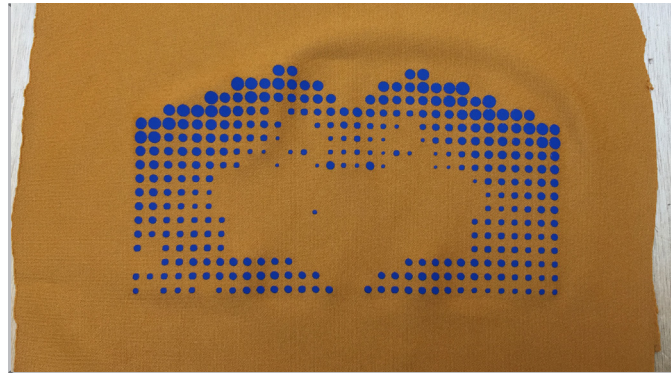
## Appendix6. Embodied design with the model

During this process we wanted to figure out what the model wanted or didn't want in her garment. In order to get a clear idea the embodied design method was used.

The model was asked a variety of things regarding their opinion of the swatches. She was also put in a variety of different parts of dresses and dresses she really liked to define what she wanted and how she felt.

### Talking about samples

first of all I wanted to figure out with method of 'print' she would like best on her outfit. Immediately, she mentioned she prefers the embroidered pattern. Because the vinyl one has been done so many times already and it doesn't look special anymore.



### The skirt

To experiment with different skirts, I put her in a dress that had a long skirt. From that point we started pinning the skirt until the model liked the skirt. We also tried different dresses to see which length the model liked.



### Scarf

To experiment with a scarf, the model tried on a different variety of scarves. In the end she mentioned that she doesn't like any of the scarves, except for the triangular one. The reason why she likes it, because it makes her feel more slim, since it creates length in the back and front.







### Neckline

To experiment with different necklines, I put the model in some dresses of her own, but we also made some tops of her own. We played around with the design of the, by us created, necklines to see what the model liked and disliked.

### Conclusion

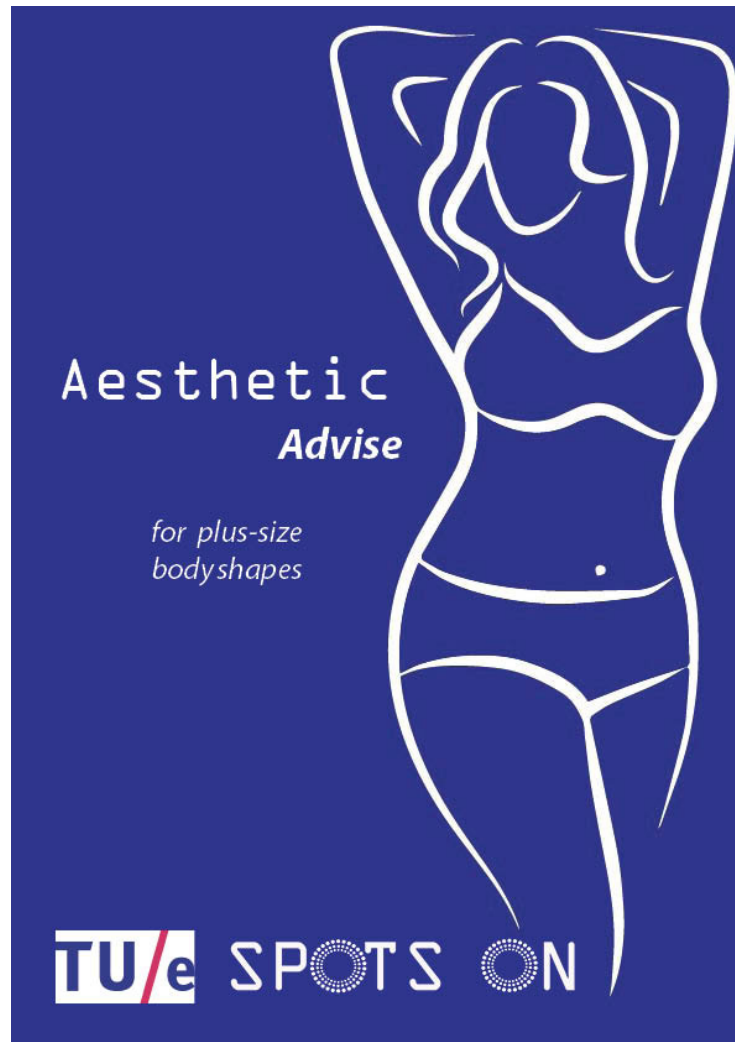
What the model wants in her dress is a heart shaped neckline, because it makes her feel more feminine and it attracts the attention to her most beautiful asset (according to herself). Her breasts. But she still wants it to look sophisticated, which means the cut shouldn't be too deep.

The model doesn't want a scarf to go with the dress. Unless it is a triangular shaped scarf. But she prefers non, because it makes her look heavy.

For the bottom of the dress she would like to have a skirt that is asymmetrical or with a v-split in the front. She likes these styles because she thinks it is appropriate for special occasions. Since a straight skirt for her seems a bit boring. If the designers choose for a asymmetrical skirt the cut can not go above thigh high.

For the placement of the pattern, she prefers it to be on the top part of her dress. She wants it to go around her waist and chest area, because that is where she wants to attract the attention towards. She doesn't want any prints on her stomach area! If the prints should be put on the side of her waist, the measurements for that print should be at a maximum of 30x20cm.





## Introduction

Dear reader,

We are very delighted that you are taking your time to read our magazine. Within this magazine we want to explain to you some of the principles the fashion industry uses to help people dress in a nice and flattering way. This mostly implies making someone look 'smaller' by using visual effects.

WE want to introduce you to a couple different types of body shapes. We will explain things about the characteristics of that body shape, which fashion goals they have for dressing themselves and some fashion do's and don'ts.

This magazine was established as a result of literature and qualitative research. In the qualitative part of this research stakeholders were interviewed about this subject. Also embodied design was used to get some insight into the body-type pear. The literature part of the research was done by conducting desk-research into fashion blogs and videos and additional visual material that provided insight into body shapes.

Hopefully you enjoy reading this magazine and if there are questions don't hesitate to ask us!

kind regards,

Spots On

**all the credits of the pictures go to the original owners.**

## Basic Tips & Tricks of Fashion

The fashion industry uses a couple of basic tricks to make people look slimmer. We want to discuss some of the basic tips and tricks to create a visual effect that creates this 'slimmer' look. There are a couple of techniques to do it.



### Emphasize

Emphasizing is the way of drawing attention to the things you want to be seen first by the other. During our research we found that it is important to emphasize the natural waist of the women. So that makes them look thinner.

You also have to pay attention to the fit to the body. If something fits right, it also makes you look thinner. Another way to draw attention is to use the technique of flaring out.

There are also other ways to draw attention like:

- Stitching/ pleating
- Accessories
- Texture
- Patterns
- Color

### Patterns

You can also use patterns to make someone look smaller. You can for instance do that by using lines. There are different ways to use lines to your benefits:

#### Vertical lines

They make people look longer and therefore smaller. Also the distance between the lines matters. The closer they are together, the smaller someone looks.

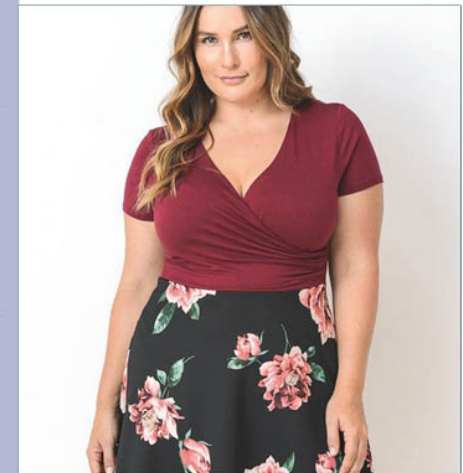
#### Diagonal lines

They have a similar effect like vertical lines and therefore also make people look thinner.

#### Divergent

By broadening the shoulders with a wider neckline the hips appear slimmer. Additionally, by widening the shoulder area of a bottom heavy woman, the eye naturally focuses on the shoulder area and ultimately makes her appear taller and slimmer.

Another way of doing that is using big patterns. Try to avoid smaller patterns, they make people look fatter than they are.



### Colors

Dark colors are slimming. Yet any dark color can be even more slimming if there is a lighter color fabric placed next to it. The most important part is that the darker color should be placed on the place where the person is the heaviest for the most optimal slimming effect.



Also using shadows and degradation create a slimming effect. As you can see on the picture on the left.

### Accessories

You can also use accessories to make yourself look smaller. You can do that in a couple of ways.

**Use long accessories**

If you use a long accessories, like a necklace, that will make you look longer. This in turn will make you look less big.

**A big bag**

If you use a big bag it will make you look smaller, because of the proportions.

**Bright colors**

If you use bright colors it will attract the eyes toward that item. Which in turn makes you less aware of the shapes of the human body.





## Apple body shape

### Properties of the body shape

A characteristic of this body shape is a fuller waist, which is less defined as well. The bust is average to big. The legs are the 'smallest' asset of this body-type. This body type is one of the more difficult ones to dress. An apple mostly gains weight around her middle.

The ratio of the bust:waist:hips is 4:4:3.



Apple

### Fashion goals

- Finding ways to add definition to upper body and the chest.
- Finding a way to elongate the torso and create a waist
- Draw attention to the legs
- Find structured pieces of clothing, because they can help you to hide your extra weight and give your body proportion.

### Fashion Do's

- Short or knee length dresses with an A-line skirt.
- Put emphasize on the neck. This can be done by a V-shaped or wide neckline.
- Empire cut tops and dresses. That are dresses that flow from under the bust.

- Straight lines work very well for this body-type, since it 'changes' the perception on the proportions of the waist.

- Slim fitting pants or leggings, since it emphasizes the legs.

- Accessories like: statement necklaces, big or dangling earrings and shoes with high heels.



### Fashion Don'ts

- Anything that cuts off below or above the middle.
- Patterns or embellishments details in the belly area.
- Shapeless and boxy clothes.
- High-waisted pants and skirts
- Shirts that have a lot of decorations like e.g. ruffles.

**Don't accentuate the middle!**

## Hourglass body shape



Hourglass

### Properties of the body shape

A characteristic of an hourglass is a perfect balance between shoulders and hips. This body shape also has a defined waist. This is considered the most ideal body shape and the most common plus-size shape. There are two variations of this body type the hourglass and the full hourglass.

The ratio of the bust:waist:hips is 4:2:4.

### Fashion goals

- Finding ways that enhance the natural curve of the body and balancing out the proportions of the upper and lower body at the same time.
- Finding a way to show off the waist.

### Fashion Do's

- There are a couple of ways to accentuate the waist:
  - using a belt.
  - using waist-defining tops and jackets., could be with a short cut.
- Peplum tops, since they flare at the waistline and enhances the proportions between the waist and the hips.

- Figure hugging clothes, since it accentuates the hips and bust. Also colour can be used to enhance the silhouette.

- Scoop, sweetheart, halter and V-shaped necklines.



### Fashion Don'ts

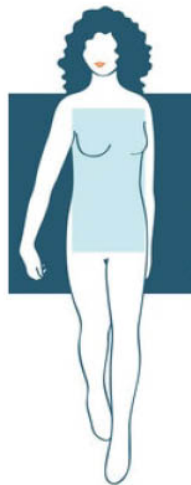
- Heavily beated and/or embellished dresses/skirts.
- High necklines.
- Low rise jeans.
- Empire cut tops and dresses.
- Tops with a lot of volumizing details like ruffles or bows.
- Don't hide the body with baggy or boxy clothing.

## Rectangle body shape

### Properties of the body shape

This bodyscape is characterized by no waist definition. This means that there is no distinct waist and shoulders and hips are equal. Which means this body-type has not that many curves.

The ratio of the bust:waist:hips is 3:3:3.



Rectangle

### Fashion goals

- Finding ways to add definition the chest and waist.
- Finding a way to create the illusion of curves and a defined waistline.
- Finding a way to show off the arms and legs.

### Fashion Do's

- Draw attention to the top of your body. This can be done in a variety of ways, like:
  - Using accessoires
  - Specific neckline like: off the shoulder, scoop or open neckline.
  - Using a collar or ruffles.

- Create a waistline. This can be done in a couple of ways:

- Using a belt.
- Using hip length jackets or blazers.

- Shirt that cuts off at the waist.

- Show off the legs by using: skinny jeans, pencil/ A-line or tulip skirts.



### Fashion Don'ts

- Avoid using clingy styles.
- Baggy or boxy tops and tunics.
- Drop waist dresses and jackets.
- Crop tops.
- Square shaped accessories.
- Halter/ heavily decorated or off the shoulder tops.

## Pear body shape

### Properties of the body shape

A characteristic of this body shape is fuller hips. A person with body type has a defined waist. This is one of the classic plus-size shapes and will typically gain weight below the waist first. Another name for this body shape is the inverted triangle.

The ratio of the bust:waist:hips is 3:2:4.



Pear

### Fashion goals

- Finding ways to add definition to the upper body. Especially, the waist and chest. This helps balancing out the silhouette.
- Enhancing the arms to add volume to the shoulders. This helps to create balance between in the silhouette.
- Don't look for clothing that attract attention to the hips and thighs.

### Fashion Do's

- Clothes that make your shoulders look broader. This can be done by a specific neckline like:
  - strapless;
  - off-the-shoulder or one shoulder tops;
  - boat, cowl, ruffled or a wide V- or U-shaped neckline.

By doing the attention will be focussed on the upper part of the body.

- An A-line dresses with preferably a big skirt.

- High waist jeans, because they provide a better fit.

- Ruffled, puffy or ruched sleeves.

- Using jackets or gilets for layering to create structure in the shoulders.

- Accessories like: shoulder bags, statement necklaces and patterned scarves.



### Fashion Don'ts

- Baggy tops, tunics or one-sized dresses.
- Patterns or embellishments details on hips or thighs.
- Pencil, fishtail and any form of tight skirts.
- Low-waisted skinny jeans.
- Low-slung belts.
- Thin straps.

**Bottom line: Don't accentuate your hips!**





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## Appendix 8. Body shape experience

The body shape experience.



## Appendix 9. Data analysis from experiment 1

### <Experiments>

Fabric Mate.. NO.	Time	Result	Melted items		
Scuba	Sample 1	3	Hard surface, plastic part can be formed to any shape, longer heating process is needed for melting the plastic on the fabric.	Hard plastic	
	Sample 2	1	A plastic structure was give before the heating , the result is interesting: the so fabric is being able to stand, but lost its strechness.	Hard plastic	
	Sample 3	1	A plastic structure was give before the heating , the result is interesting: the so fabric is being able to stand, but lost its strechness.	Hard plastic	
	Sample 4	1	An alternative experiment as No.3. we wanted to see how a "cross" structure will a ect on the fabric. Additionally, the roughness of surface with protection layer is better than without.	3D printing materials	
	Sample 5	1	A designed pattern was gave before the heating, after 30s, the plastic melted inside of fabric completely, after heating and we stretched result, the fabric created a bumpy surface.	3D printing materials	
	Sample 6	2	Fabric lost its strechness after two times heating, but the shape was deformed.	3D printing materials	
	Sample 7	1	Dfferent 3D printing materials mixup/It was an study of melting temperature point/ The back side of this fabric has a formed shape.	3D printing materials	
	Sample 8	1	Dfferent 3D printing materials mixup/It was a study about how d erent color of 3D priting materials will look like a er the heating process.	3D printing materials	
	Sample 9	1	Dfferent 3D printing materials mixup/It is was an study of melting tempera- ture point.	3D printing materials	
	Sample 10	1	A designed pattern was gave before the heating, after 25s, the plastic melted on the surface of fabric, ater stretching, the fabric created a bit bumpy surface, But not as bumpy as NO.5. Maybe something to do with the quantity of materials or the thinnkness.	3D printing materials	
	Sample 11	1	Same material used as NO5, but with short-time heating, the plastic only melted on the surface, and not bumpy.	3D printing materials	
Spandex	Sample 12	3	Need to strech the fabric when it was still hot.	3D printing materials	
	Sample 13	1	Fabirc remains its strechness. e vivex remains its harndess when get cooled.	3D printing materials	
	Sample 14	2	The vivex melted into a less rough and more shiny surface. e vivex remains its harndess when get cooled.	3D printing materials	
				0 20 40 60	0 50 100 150 200
				Duration (s)	Temperature (°C)

Sum of Duration (s) and sum of Temperature (°C) for each Melted items broken down by Fabric Material, NO., Time and Result.



Appendix 10. Data analysis from experiment 4

<Experiments Analysis>



Sum of Scale and sum of Density for each Result broken down by No., Backing, Needle type and Distance. Color shows sum of Density. The marks are labeled by sum of Density.



## Appendix 11. Fabrication pipeline

1. Place a picture then the generator will convert it to a dot-based pattern. Here you can modify the distance, size of the canvas and density between dots.

The recommended settings:

- Scale: 5
- Density: 25

2. Export the result to AI format.

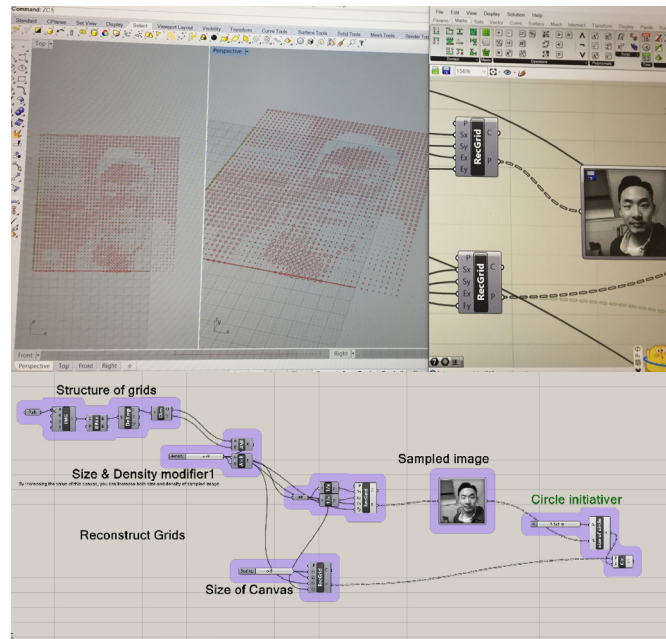
3. The preparation of use digital embroidery machine:

- Spraying KK100 on the fabric.

- Using the solvy backing, this is recommended when using stretch fabrics.

- Put the prepared fabric on loop, slightly stretching the fabric until it becomes flat.

- Using ball point needle.



## Appendix 12. Business research

Analysis of the current market, segments and business structure are issues completely necessary for a project of this kind. Using economic tools like Porter's Five Forces Analysis or The Design Canvas, we have defined a business plan and have proved the viability of our concept.

### MICHAEL PORTER'S FIVE FORCES ANALYSIS

Porter's Five Forces Model is a tool for analysing the competitiveness of a business. It analyses five forces that determine the competitive intensity and, therefore, the attractiveness of a sector in terms of its profitability.

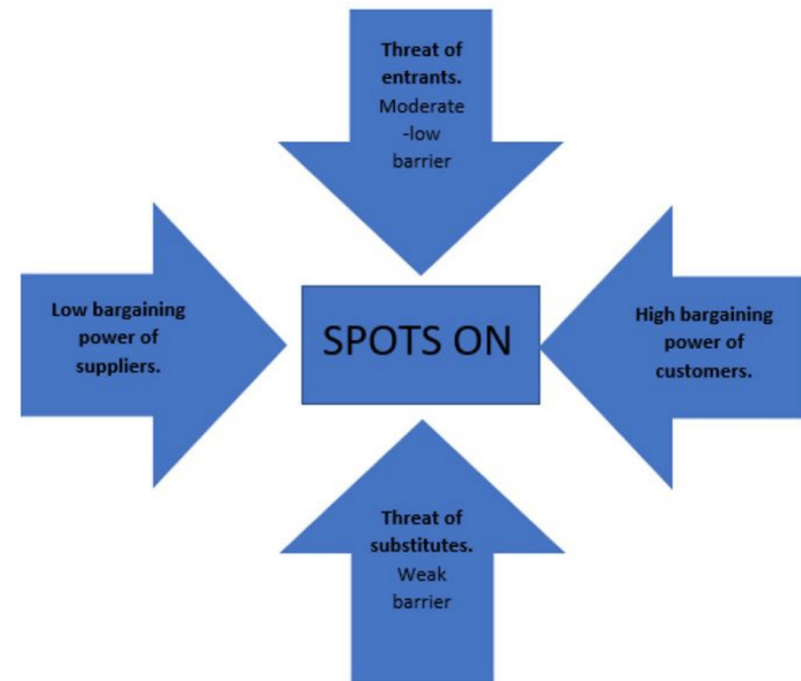
According to Porter's analysis the power of our concept resides on weak barriers of entrants like government policy with tax facilities, a high product differentiation or not dependence to distributions channels. Besides a high bargaining power of customers through flexibility and freedom in all decisions and during the creation process of the garment lend the concept clearly advantages for the customer but help us to offer something completely custom made. Finally, low threat for substitute services rounds the analysis and shows the viability and profitability of the concept.

Using Design Model Canvas we have defined Key partners, activities and resources, we identified value propositions and recognized customer relationships and segments. This commercial concept seeks to help the customers reviving their wardrobes having something like a virtual couturier and stylist. Specially for curvy women who, as shown on the collected data, often suffer more than enjoy from shopping tasks.

A totally personalized profile of the customer will be created through:








- An online questionnaire in order to set customer's preferences.
- Picture of the customer will be required to adapt the garment to the customer's appearance.
- Body measurements will be taken in order to create a perfect fit of the customer's body and adapt the garment to the customer's shape and preferences.

According to the customer's profile, a parcel with customized solutions will be sent to the buyer. Making from a normal e-purchase a shopping experience. The customer finally choose which pieces want to keep and which will send back to us.





# Business Model Canvas

<div><div>Key Partners</div><div></div></div> <div><div>- Fashion Designers: take care of the acutal design of the garment and the manufacturing.</div><div>- Suppliers: Make sure the garments are delivered to the customer on the right place and at the right time.</div><div>- Hosts of the website and social media.</div></div>	<div><div>Key Activities</div><div></div></div> <div><div>- Design the garment</div><div>- Manufacture garment</div><div>- Marketing</div></div>	<div><div>Value Proposition</div><div></div></div> <div><div>- Exclusive clothing suitable for evening outings that are custom made for the wearer.</div><div>- Clothing that has a personal print so it gives extra personal value to the garment.</div></div>	<div><div>Customer Relationships</div><div></div></div> <div><div>- Personal advises from a fashion designer.</div><div>- Personal aid</div><div>- Online consultancy</div></div>	<div><div>Customer Segments</div><div></div></div> <div><div>- Woman with a plus-size in the age cate-gory of 25-40.</div><div>- Woman with a plus-size that look for trendy clothing that suits their body type.</div><div>- Woman who want custom made and personalised clothing</div></div>
<div><div>Cost Structure</div><div></div></div> <div><div>- Regular costs: rent, wages</div><div>- Costs for materials</div><div>- Administration costs</div></div>		<div><div>Revenue Streams</div><div></div></div> <div><div>- Sales of a garment</div></div>		