Smardrobe

Generate. Connect. Exchange

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Abstract

Smardrobe is a geo-social, generative cloth-swapping app that aims to lower the immense quantities of thoughtlessly purchased clothes and reduce the amount of waste created by overconsumption. Its generative function connects to the user's network to provide a variety of outfit combinations which maximizes the possibilities of styles for each piece. It is a tool that generates outfit ideas based on your wardrobe and by adding people to your network, the application drafts other people's collections into consideration for your generative output. Smardrobe is a community-based tool that maximizes its potential through swapping, borrowing and lending with other Smardrobe-users. It serves as a type of companion to support you in your everyday outfit choices but also helps you to find specific pieces for future occasions.

Acknowledgements

First, I would like to express my gratitude to my two mentors, Verena Zeigler and Lucie Houel, for their unwavering support, guidance and continuous encouragement throughout the process of realisation of this project. Their expertise and insightful feedback have been fundamental in shaping this thesis.

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Introduction

The fashion industry is situated amidst the fast paced shift in styles and trends. While being one of the largest industries worldwide it is also responsible for an immense amount of waste and pollution [1]. Mainly the western world has created a need for overconsumption, a need of satisfaction through the purchase of a new item and to fulfill the desire of possessing something new. The wardrobe has become some sort of collection, a very individual collection of clothes [12].

Through digitalization, in the western world the average person has immediate access to technology through various devices where some of the collections are stored. Through social media and other community based applications these stored collections are being shared over the internet as it happens with images on Instagram and Facebook or music on streaming platforms such as Spotify and Soundcloud. Third party members get to look into others collections easily by looking up other people's profiles and make use of others collections too. On Spotify, for example, one can easily look up a user's profile and go through their playlists. A third user has the same possibility of listening to a playlist as the creator of it. A third user may not be able to edit it unless given permission to but has unrestricted access to the collections a user has shared with the public.

However there is hardly a possibility to share clothes in a digital space since garments are not data based and therefore cannot be "multiplied" through digitalization. For that reason society's purchase behavior has been shaped into buying mainly store-new items. The majority is rather hesitant about buying second hand clothes as they often do not know who the owner was before.

How can we share clothes in a digital space while keeping the analogue properties?
How can we access other people's clothes and make use of them too?

Research Questions - Hypothesis

What does the textile industry look like in about 20 years from now?

How shall we ensure a circular economy within the textile industry by rethinking the common use and purpose of clothing?

Is it possible to approach textiles in a digital rather than a physical way?

What are the issues that may occur if clothes only existed in a digital form?

What conditions need to be given in order to achieve less waste from the societal and the industrial part?
Can new conditions be set?

How can we increase sustainability in the textile industry and reduce overconsumption while accounting for consumers' needs to possess clothes and have variability in their outfits?

How can we leverage digitalisation to increase sustainability and reduce overconsumption in the textile industry?

Research Field

In the research field I mainly focus on the circular economy of fashion, as well as materiality and production within the textile industry. The field will be split into three major topics: societal behavior, economy and environment. The societal part will mainly describe overconsumption in close relation to trends and changes in the textile industry. The economical part will focus on production of the clothing items, as well as materiality or transportation like shipping things or other orders. Together when balanced they form sustainability. Another part is the field of digitalisation as a major sub-chapter of societal behavior containing related projects where analogue data/collections have shifted into a digital space through technological advances.

Pre-treatment, dyeing, printing, and finishing operations are among the various stages of the industrial textile manufacturing process. These fabrication operations not only utilize huge quantities of power and water, they also generate considerable amounts of waste [1]. The textile industry utilizes a number of dyes, chemicals, and other materials to impart the required qualities to the fabrics. These operations produce a significant amount of effluents. The quality of effluents is such that they cannot be put to other uses, and they can create environmental problems if they are disposed of without appropriate treatment. We are all aware of the phenomenon around the fashion industry or clothes to be precise. The Human thrives to express characteristics through clothing. We choose styles and colors depending on one's sense of aesthetics. In addition we choose the clothes to be part of a trend or intentionally against a trend. On the other hand there are situations where we do not have much choice about what we wear throughout the day. For example business clothing. We often see that people in business clothes do not feel entirely comfortable wearing white collar shirts and a suit but have to wear it nevertheless in order to fit in. Fitting in is another possibility why we choose certain types of clothing or styles. These days the change in trends happens on a very fast level [2]. Even though the most basic function of clothing is to cover up for social standards, weather conditions and to express attitude through fashion while covering the first two conditions. Clothes are also applied in order to give orientation and information. When going to a store, the people working there wear branded clothes to signal to be part of the company and customers can expect to get information about whatever they're looking for. In that situation the customer does not recognise the personality behind a worker's clothing. they rather see the company being represented by that person. However we tend to read the person in front of us to orientate and understand what information that person might be able to provide. So regardless if the clothes are branded or not, the viewer writes his own story depending on what they see. Therefore clothes provide a lot more than just being used as a second skin to protect us from the outside.

So not only can the viewer write their own story, but in my opinion the person wearing the clothes can also implement a story by dressing in a certain way. Though the person wearing clothes is in control of telling the story. So the person wearing the clothes is in control

of what others perceive. The opposite adds the visual appearance to what they already know of the person. I think that the visual appearance can therefore underline or manipulate what the viewer already knows. For example, we know Tony as the cashier at Migros and him wearing a Migros-branded shirt underlines his occupation. If Tony were to wear a coop-shirt, it would not match the story we already know of Tony. This example would not further confuse us but it would definitely open up some questions.
The fashion industry has always had a huge impact on societal behavior [2]. Fashion is an ever-changing expression of the contemporary trends observed in society. It is a direct reflection of the values, attitudes and social status of a nation. Fashion is a part of history as it is an integral part of our culture, influenced by the era it originated in. From daring designs to new fabrics, fashion has helped shape the world as we know it. The 1920s saw the beginning of mass production of women's clothes. This gave women more choices in their clothing style and design. Fashion designers also began to use new materials, such as nylon, for their creations. Neon signs also made their debut in this decade, complementing new fashions with whimsical designs. Women also began to wear makeup and styled their hair differently with curling irons and gels. In addition, jazz music started to gain popularity during this time. It was a time of optimism and change for women's fashion as mass production and neon lights introduced new ideas into fashion trends. The Great Depression was rough on all industries, including the fashion industry. Many women were unable to afford fashionable clothing, which led to a rise in homemade clothes. During the time in between the world wars, women oftenly had to work as money was scarce, which resulted in a shift in women's fashion as the women's clothing became more functional, for example adding pockets which did not exist before [13]. Following the World War in 1945, many countries imitated American military fashions in an effort to boost morale. This led to many fashionable clothing designs that were practical yet stylish enough for formal occasions. Many items were designed for outdoor activities such as hiking or camping, which lead to better quality and more fashionable clothing designs than before the war. Women also began wearing makeup again after several years of not wearing it due to wartime austerity measures. This led to a rise in fashion icons such as Bettie Page, who popularized glamor and eroticism among female models across multiple media formats throughout the 1950s and 1960s. Fashion has always been an expression of society's current trends and values. Based on history, recent events have led to unique creations like neon signs or risque modeling by icons like Bettie Page. Therefore designers must also think through the aesthetic aspects of creating something that looks both beautiful and functional at the same time. This way, garments look good on both an individual wearer and on a visual perspective, such as in a fashion show or online advertisement. Sadly, advertisements can be misused these days [3]. We tend to see a lot of references made to sustainability and the green environment when seeing fashion adverts. Since more people are concerned with the climate situation, brands fear losing customers when not operating under green conditions. The so-called greenwashing happens by a lot of companies [1]. It is a form of manipulating the customer into thinking the brand produces under sustainable conditions when in reality that may not be the case. We could be grateful for every little effort put into fixing the situation, because everything counts. But abusing the green movement to attract a clientele that may not identify with a companies' value, is wrong.

Motivation and intended contribution

My main motivation for this is my passion for clothes and its colors and patterns. Matching them brings me joy and peace. I believe that the way we dress underlines our mood, personality, taste and more. Therefore, it is and creates part of our identity and contributes to personal development. The thoughts into picking or choosing a certain piece of clothing tend to get lost these days as fast fashion plays a huge role on the market and low prices are the more important factor than carefully contemplating if we want to add a piece to our collection or not. Thoughtless purchases lead to overconsumption and I highly criticize these societal behavior patterns. By digitalising clothes, I believe in creating a way to keep on consuming without wasting material. Also, it is meant to bring the viewer to rethink their own behavior towards consumption in regard to the textile industry in particular.

Methodology chosen for my investigation

Interviews, user tests, surveys, exchange

Background Research

When thinking of fibers, textiles and lastly clothes there is a very long process tied to it. I try to break the lifecycle of the material down to four phases. In the first subchapter “Fibers” we are looking into different materials used to produce fibers and their first impacts on the environment. Beside that the process of how various fibers are being made into usable threads is also described. In the second subchapter “Textile manufacturing” the focus lies on the industry. It describes the state of threads being combined into fabrics. According to the usage of the fabric the process varies in terms of coloring or desired level of durability. In the third phase “Product lifespan” it is looked into the lifespan of a clothing piece. The customer defines how long a piece of clothing remains in the cycle before ending up in the fourth and final phase, the “Environmental impact”.

Fibers

Natural fibers are considered the source of all man-made fabrics. All natural materials have fibers for example, wood, paper and fabric. All of these materials are produced using a textile machine. They’re the core component of many textiles used in the modern world. Examples of natural fibers include cotton, wool, silk, ramie and cashmere [15]. Each of these is best used in specific situations. For example, cotton is best used as a natural fabric whereas silk is best used as a luxury fabric. Natural fibers are more durable than man-made fibers since they’re not subject to manufacturing errors. They’re also sustainably sourced since they’re naturally occurring elements in the environment. If we look closer to the cycle of a cotton fiber, we see its big journey, through various stages but it may not even last as long as it is made for. So the cotton fiber starts as a plant with fluffy white tops in the field. The manufacturing process for natural fibers is fairly straightforward compared to man-made materials though. It involves several different steps such as harvesting, spinning, weaving and cleaning.
When they get collected and washed, the fibers of the cotton get split up before being woven into strings. In this process a lot of clean water and chemicals are involved. The end product is a durable natural fiber that can be used in various applications. On the other hand, the manufacturing process for synthetic fibers is more complex due to the need for automated machinery [14]. This makes it easier to produce more synthetic materials at faster speeds with greater precision and control. Some examples of synthetic fibers used in the textile industry include polyester, nylon, rayon and Kevlar [16]. Each one is made from a different fiber, and they all have different uses.
Textiles are not only used for clothing but also many household items such as sheets and furniture. Fibers are an essential part of everyday life. So the process behind the actual textiles is huge to ensure durability. After all, textiles are mainly made to be used in some or the other way and therefore a long lasting product is advantageous. An exact definition of what long lasting means is very subjective though.
Once it’s a string a color usually gets added too. So the next step in this process is dying and bleaching the strings into its desired color.

Textile manufacturing

The world of textile manufacturing is a complicated one. It is an industry that creates beautiful, high-quality materials for use in clothing, home furnishings and other creative projects but on the other hand the environment pays a huge price for that luxury. The textile manufacturing industry is based on designing and manufacturing textiles using natural and synthetic fibers. Various materials are extracted from nature or manufactured in factories. In addition to designing new materials for use in textiles, designers also help interpret customer needs and generate new ideas for products. For example, designers must think through the practical aspects of creating a new item, such as how many pieces it can hold or how durable it will be.

Product lifespan

The third phase of the cycle is marked from the point that the textiles are worked into a sellable product to the moment when we throw the items away. In other words: the lifespan of the product in peoples hands. As stated before, defining an optimum time is very subjective. But for a very big part clothes get thrown away too soon. They are often in good shape and condition, nearly untouched and end up in the waste. Before that the clothes are in peoples hands and usually get worn very little. In the western world, the overconsumption is enormous and with that the availability of anything at any given time to „sustain“ the demand. In the past 20 years the number of clothing pieces per person bought in a year increased by 400%. A reason for that may be the fact that mostly fast-fashion brands provide an extreme frequency of launching new clothes. To keep up, many businesses choose to follow a quantity focused system. So the faster and the more often a new line can be launched, the faster the change in trends. The faster the trends change, the more frequently people feel the need to keep up with such trends and purchase new clothes. The market basically creates a need to keep up by defining the trend and also providing the product. From personal experience I can understand the sensation of keeping up with trends by shopping and being joyful over a new purchase.

Environmental impact

The environment is greatly impacted by textile manufacturing since so much waste is produced during industrial processes. To begin with, natural fibers are often harvested from animals such as cotton or silkworms- which leads to their deaths as they are harvested. Then excess materials are also created during the process of creating new synthetic fibers. There are a variety of chemicals involved when cleaning and working the material. We find the fabrics involved in the process to be spread globally. This results in far travel routes within the process. Due to economic reasons many fashion brands outsource their manufacture to third world countries to maximize the profit while also taking advantage of bad work conditions and environmental regulations. In addition, worn out clothing ends up in landfills which mostly are located in third world countries too. It seems so bizarre that a product ends up unusable back at the place where it origins after the wealthy get rid of it.

For faster processes within a company some products end up as waste after being sent back even though it may be perfectly fine because the reprocessing would cost them more than the untouched product [9].

The speed at which clothes end up in landfills is astonishing (one garbage truck per second), posing a severe risk to the environment, if the trend continues. The main reason for such waste is the overconsumption of goods [4]. Society is driven by the new and going shopping is considered as self-treatment. Surely there is a huge business behind it which creates its own world. The world of fashion. For it to exist in its glory a price is paid which is the dark side of this glamorous world. Due to the omnipresence of the industry in everyday life, besides the brands there are several other big players involved in this complex world of fashion. The biggest ones are political parties, society, economics and of course the environment [10].

My work is ought to be environment-focused but as the situation is very intertwined, I will consider any factor involved. My primary aim is to rethink the current situation by looking into methods to cut out the textile industry as much as possible [5]. An idea in order to do so would be a way to digitalise one's wardrobe where a person no longer possesses real fabrics but rather a digital projection of the colors and patterns of the clothes. The way I imagine it would be similar to the shift of digitalisation seen in other personal collections such as images, music and books.

Of course, the main motive behind the digitalization of those collections is comfort in order not to be carrying around all the CD's, all the magazines and books or all the photo albums. Nevertheless, a positive side effect of that comfort is that physical resources are no longer needed except for one device to store the data on.

These days the most common place to keep the data on is the mobile phone. In the western world pretty much, everyone has one filled with their personal things - music, images, texts, contacts, et cetera [6]. Not only does it allow us to store them but also to keep the collection updated by having access to the internet and by downloading new music or saving it to the library. This way our collection keeps changing - things are added or deleted but generally said it is personalized on a daily basis. Either way it seems important to access a personalized collection at all times. It is part of our individualism which plays a

huge role in human behavior [7]. It is also responsible for the (over)consumption of goods. If we take a closer look into wearables, mainly clothing, it is closely tied to material waste which comes from change and the fact that fabrics are produced one-way. Used or damaged clothes usually end up in landfills and even though we are aware of it, we still value individualism and personalisation more than circular economy. But mainly because circularity does not exist (yet).
However, what differs the collection of clothes to other collections mentioned above, is that clothes are closely tied to one's appearance and therefore the desire of individualism can also be spectated by others [8]. So, in order to achieve the same effect as physical clothing has, we need to be able to access other's collections or what they have displayed at that very moment.
With that in mind I think about the central question for my thesis:
How do we ensure individualism in the fashion/clothing industry without producing waste and waste resources or fulfilling a circular economy while guaranteeing the possibility to build personalized collecting in terms of outfits?

Related Projects

In the following chapter, related projects are being presented. At first a variety of closely related projects are being listed before presenting some not as closely related ones in the end. However the less related projects are a great source of inspiration for specific features and functions in my main project.

Acloset,
Heason Ko & Kijun Yun, 2020

This digital wardrobe application was founded by Heason Ko and Kijun Yun, two IT engineers in 2020. They have 2.5 milions of global users with over 70’000 fashion items uploaded daily.
Some key functions for Acloset are keeping track of the cost-per-wear and other basic wardrobe analytics, building, scheduling and tracking unlimited outfit ideas, as well as cataloguing your wardrobe with the help of automatic background removal and assisted tagging. Further the application gets daily AI-generated outfit recommendations based on the weather, allows you to comment on outfits created by other users and also helps to shop and sell second hand clothing within the built-in marketplace.
For my project all these features are a good inspiration, especially the part of managing your own collection. The feature of the marketplace would be less useful to investigate any further as my project follows a non-commercial approach.

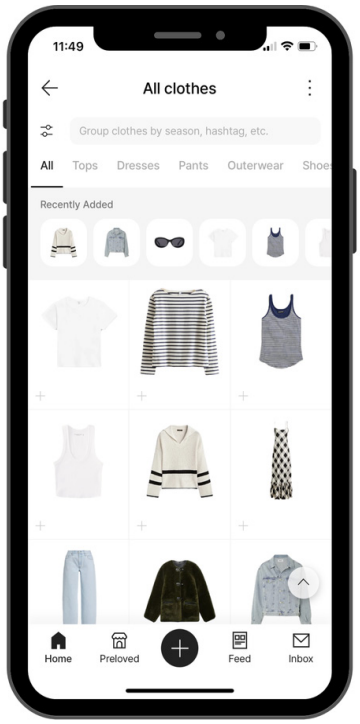


Figure 1: screenshot of the App Acloset, www.myindyx.com

Indyx,
Yidi Campbell, 2023

Indyx was founded by Yidi Campbell in 2023. Indyx is by far less popular with only over 10’000 downloads on Google play
For Indyx there is the possibility to catalogue your wardrobe on your own with automatic background removal or hire an Indyx archivist to catalogue your wardrobe for you.
Indyx lets you build unlimited outfits, track cost-per-wear too, plan packing lists or view other collections. In a premium package, the application gives weekly outfit recommendations from real stylists. As in Acloset there is also a built-in marketplace for easy selling and buying with pricing support and zero selling fees.

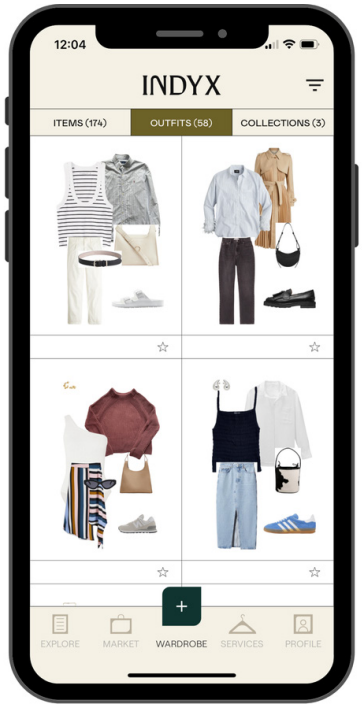


Figure 2: Screenshot of the App Indyx, www.myindyx.com

Depop,
Simon Beckerman, 2011

This online platform was founded by Simon Beckerman in 2011. There are approximately 35 million registered users with a total of over 34 million items available for sale. Depop is a platform that allows users to sell their clothes. It is a good place to connect with other profiles as it is built similar to common social media applications. Users can register themselves by creating a profile where they upload pictures of their clothes to re-sell. What I like most about this platform are the information one has to give on the pieces. That information mainly consists of sizes, asked price, quality and more. I do not like the focus on the selling part since that creates some sort of exclusivity for the pieces.

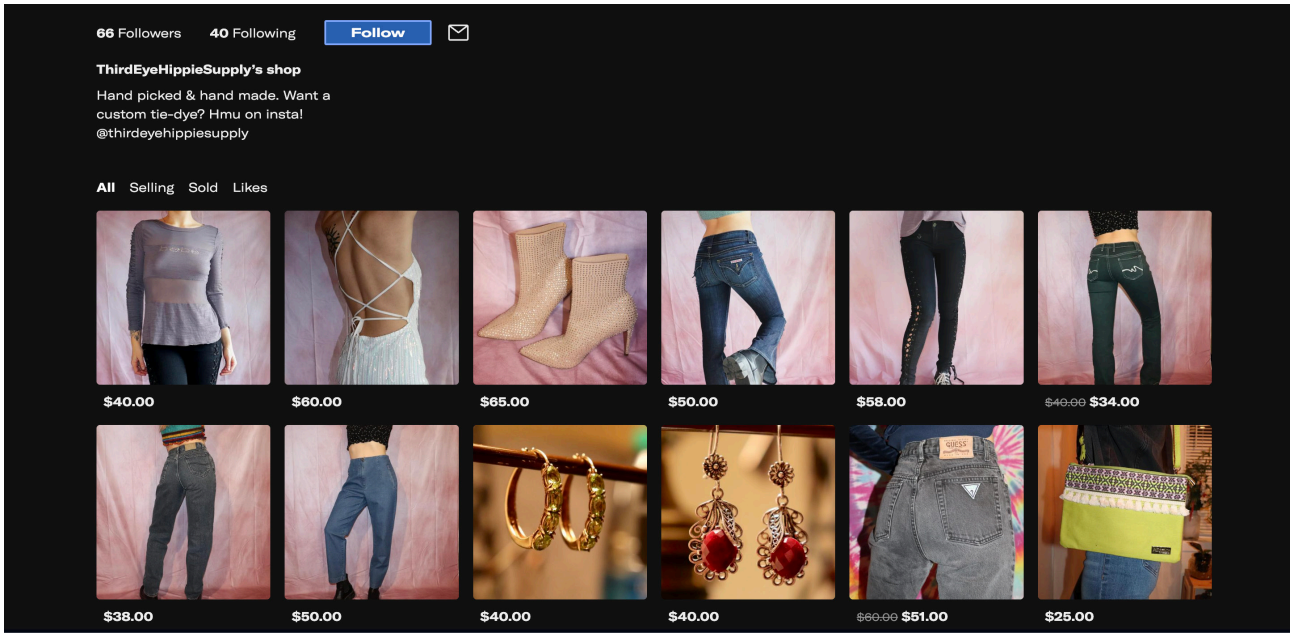


Figure 3: Screenshot of Depop in browser

Clothes Friends,
Carmen Jenny & Sonja Wunderlich, 2020

This application was founded by Carmen Jenny and Sonja Wunderlich in 2020 but launched in 2021. It has just over one thousand downloads in the Google Play Store.
This platform provides a network where sustainable oriented brands, fashion-tech companies and fashion-enthusiasts can connect with each other and grow together
This platform allows users to auction off their clothes. Once you “bid” on an item, a counter appears that shows when the piece will be won.
On their website they work on a community section for workshops and coachings, lectures and speaking engagements where they deal with circular fashion and communication, personal and employer branding, community building as well as the integration of creativity, technology and sustainability-strategies.

https://www.clothes-friends.com
https://www.reboundstuff.de/post/ein-weiterer-stern-am-kleidungs-miet-commerce-himmel-clothesfriends

Whering,
Bianca Rangecroft, 2020

Bianca Rangecroft founded the application “Whering” in 2020.
Whering is a rather basic digital wardrobe application. It covers the visualization of the clothes and building outfits. The visualization of the clothes is done by uploading a picture of a clothing piece and the application then removes the background automatically plus by scanning the image, it suggests tags for categorization. Even though that can be a nice feature done by the application itself, apparently it can also be very frustrating when the application suggests wrong tags.
Once the wardrobe is digitalized, users can build outfit ideas by scrolling through the collection, save those combinations and even add them to a calendar to plan the outfits throughout the week or month.

Figure 4: Screenshot of the App Whering, www.myindyx.com

Cladwell,
Erin Flynn, 2019

Cladwell was founded by Erin Flynn and it has over 10’000 downloads on Google Play. This digital wardrobe is positioned on the rather sales-oriented side. It has a free version with the possibility to upgrade the plan on two levels. The first one for $7.99 a month gets you unlimited access to outfits and access to “Ask Cladwell” which is an AI implementation by ChatGPT with up to 50 messages included. For $49 a month it grants you access to a human stylist via text or email.
The application focuses on generating outfit ideas based on their database which holds around 15’000 items. However, there is the possibility to add items from the gallery or from other websites to the Cladwell-library too. In order for the items to look nicely in the application, there is an automatic background removal feature.
They also implemented a function that allows the application to access the location and retrieve weather forecasts of that place for outfit recommendations based on the weather conditions. Cladwell believes to approach today’s issues with fast fashion by starting at your very own wardrobe. They aim to a more carefully selected collection of clothes by maximizing wear ability frequencies.

Figure 5: Screenshot of the App Cladwell, www.myindyx.com

Spotify,
Daniel Eck & Martin Lorentzon, 2006

Spotify was founded by Daniel Eck and Martin Lorentzon in 2006 and launched in 2008. Today it is the biggest music streaming platforms with more than 615 milion users.
The music streaming platform, Spotify, brought connecting libraries to a new level with some of their features. On the desktop version, there is a space on the right side where all your contacts are listed, showing what they are listening to at the moment. Furthermore, users can access each other's libraries by visiting their profile. Besides that, users can also manage playlists together and collaboratively collect music.
I find these features to be working quite well in the music streaming space. It is a great way to have quick insights into other's music tastes and bring similar oriented people together easily.

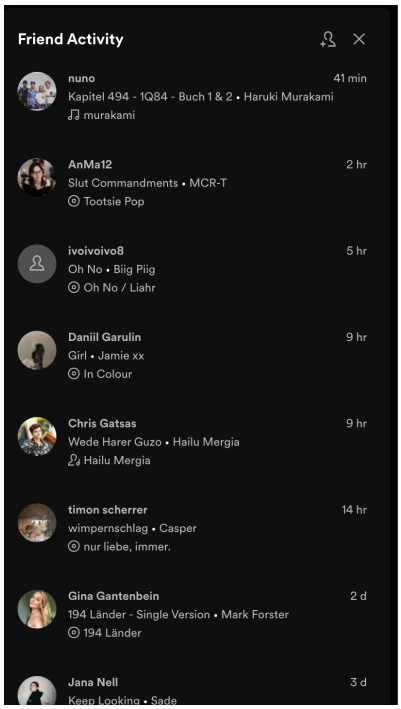


Figure 6: Screenshot from my Spotify Desktop-Application

Tinder,
Sean Rad & Justin Mateen, 2012

Tinder was founded by Sean Rad and Justin Mateen in 2012. Today it is the most popular dating application with over 530 million downloads.
The dating application, tinder, which is made to connect people on a romantic basis serves as a further source of inspiration. By swiping left or right, you either like or dislike a profile. If users add their interests and other personal preferences, the application already narrows down the suggested profiles. Once two profiles mutually like each other, the application recognises a match and opens a new chat window where the two can connect.
I find this to be inspiring because the users are in control of their preferences and can adjust those if needed. The notion of connecting two like-minded people works really well. To connect with a community is the basic of any dating application, so this feature is not a tinder-exclusive but due to personal experience with the application it makes sense to use this for reference.

https://time.com/4837/tinder-meet-the-guys-who-turned-dating-into-an-addiction/

Concept Chapter

The project with the title “Smardrobe” created for the Bachelor Thesis in Interaction Design is an innovative mobile application designed to revolutionize the way people manage and share their outfits. It allows users to create a digital inventory of their clothes, share them with friends and easily collaborate on outfit ideas. By fostering a sense of community and promoting sustainable fashion practices, Smardrobe aims to transform the way people think about their consumption of clothes. Users can upload images of their clothing items and manage the registered pieces by type, color, pattern, season and more. Through AI generated tags and categorisations keeping your wardrobe organized will be easily done. Individuals can choose to share their digital wardrobe with family, friends, or even with the whole community. This allows them to collaboratively plan outfits, borrow, or even trade certain items. The database of the application provides tips and resources for sustainable fashion practices, such as repairing clothes as well as information on eco-friendly brands and materials. The target audience are fashion-curious people who want to make the most out of their existing wardrobe, reduce their environmental footprint and connect with like-minded people to share and trade their wardrobe.

The application can be used individually or in community. By keeping track over the collection through adding new purchases or removing pieces out of it helps the user to stay up to date with their possessions and also allows the application to give accurate suggestions for outfits. Once the user opens up their collection for the whole community, accurate descriptions and information about clothing items are key to match pieces. By allowing the community to have insight into a wardrobe of another user helps to achieve circularity within the customers side of consumption. That means that users can request items from one another to borrow for a certain amount of time or even exchange the piece permanently if desired. With the option to exchange clothing items users experience a similar situation as if they’d get a newly purchased piece but instead of pushing the overconsumption even further, exchanged clothes get a second life. In addition, the user might also get rid of a clothing item they would have laying around for long or they moved on with their way to dress. So, by exchanging those pieces it not only prolongs said items’ lives but also lets another user be joyful about a new possession without having to buy a new piece in store. Of course, a further positive effect is each user’s awareness about their own collection. Instead of forgetting about some items lying in your wardrobe for ages, the application now considers them for outfits and might even suggest them if they match.

Method

User Interviews

To gain an overview of the field and the potential target audience I set up a survey which helps me to cover a good quantity of questions and gain a broad insight on the results. The focus lays on the consumption of people in my broader circle but it is still geographically quite narrow as the people are within my friends-circle or family members. Nevertheless, I believe to have covered a good amount of diversity regarding gender, occupation and over all mindset towards the given topic.
This survey consisted of 15 questions and was answered by a little over 50 people. Following the more important questions of the survey with its results.

Figure 7: Screenshot of the results, question 1 & 2

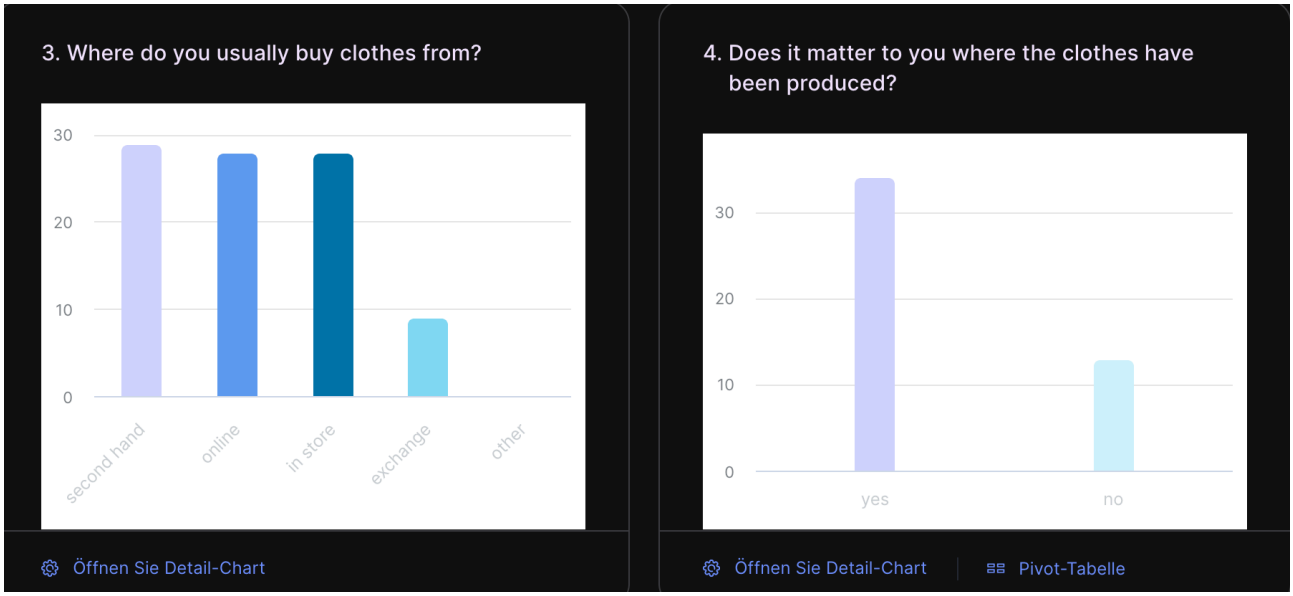


Figure 8: Screenshot of the results, question 3 & 4

Figure 9: Screenshot of the results, question 5 & 6

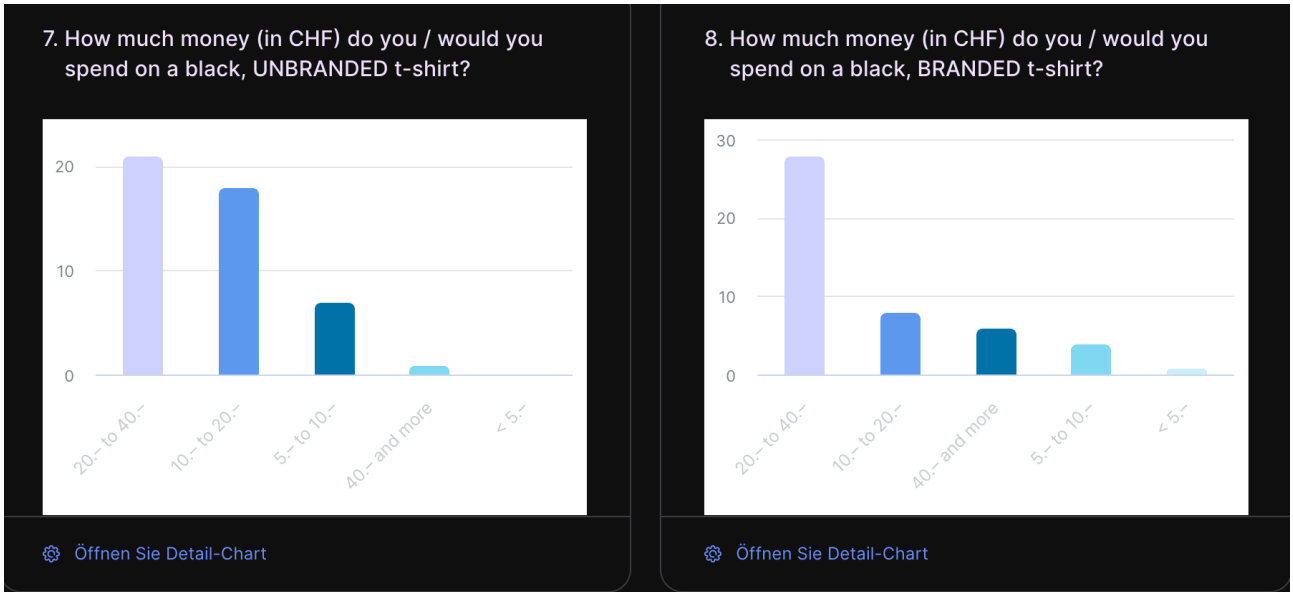


Figure 10: Screenshot of the results, question 7 & 8

Figure 11: Screenshot of the results, question 9 & 10

Figure 12: Screenshot of the results, question 11 & 12

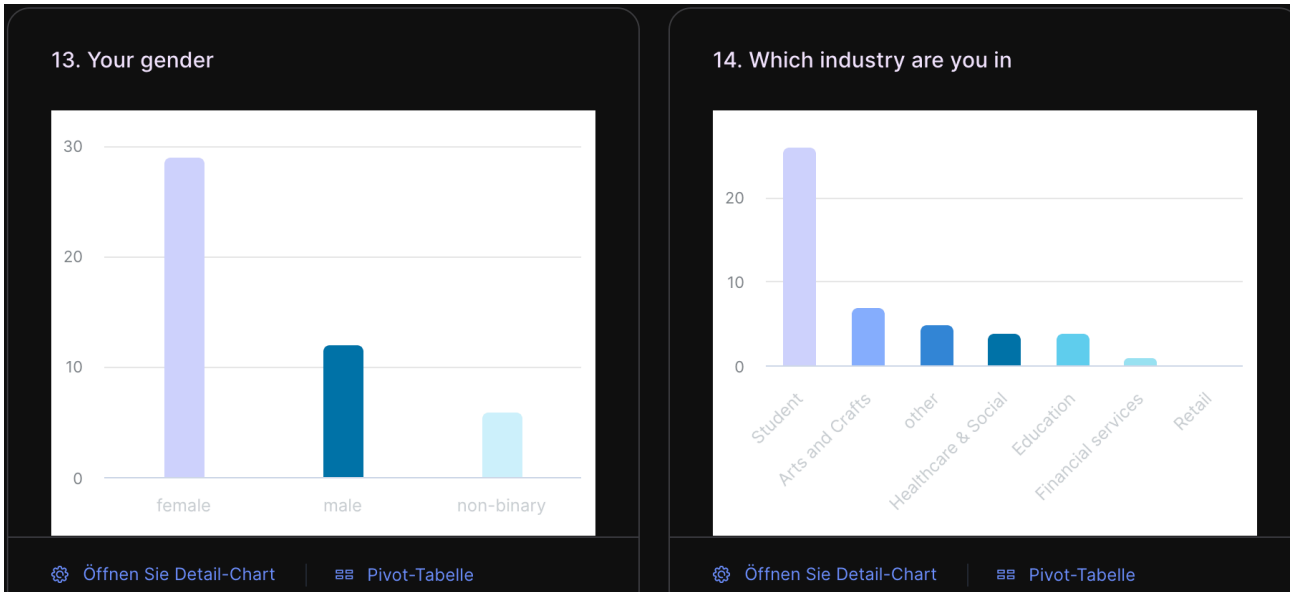


Figure 13: Screenshot of the results, question 13 & 14

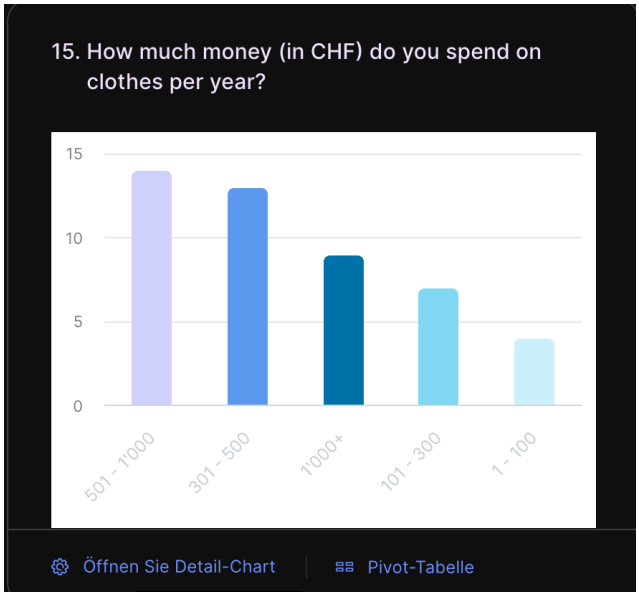


Figure 14: Screenshot of the results, question 15

Personas

Based on the result from the interview and the survey I created the following two personas in order to go through a specific use case when interacting with the prototype.

Persona 1

Max, 30 years old, works in an office

needs:
- wants to dress stylish
- dressing himself according to the situation

frustrations:
- critcises overconsumption
- struggles in crowded shops
- struggles to find/combine pieces
- accummulates possessions
- loses overview of his possessions

hobbies:
- outdoor activities
- friends & family

use case:
- needs a matching outfit for the next dinner but doesn't want to buy a new item

Persona 2

Julia, 22, student

needs:
- fashionable, trendy, alternative
- budget friendly purchases

frustrations:
- criticises fast fashion
- poor quality in low-cost productons
- range of choices within her own collection

hobbies:
- knitting
- movie nights
- sings in a rock band

use case:
- "borrowed" a new cardigan from her mother but has nothing to match it with

Figure 15: Personas created by me

Method: Prototyping

V0 Paper prototype

As a first iteration I started by bringing my key feature – the matchmaking of clothing pieces – on to a quick paper prototype. It consists of a cardboard phone screen with paper rows to slide through it. Two sliders represent the collection of the wardrobe digitalized and a third slider is the filter option. By moving the two clothing sliders horizontally, you can generate various outfits within the selected category. The vertical slider represents the filter option which narrows down the search results for the generative feature but also for the discover mode for more specific results when browsing. This low fidelity prototype was a good way to visualize the core feature of the application and gain valuable insights for the following iteration while keeping the effort quite low.

V1 (Figma Flow 1)

Based on the paper prototype I recreated the feature in Figma as a first version of the core feature. In order to make the core feature testable I implemented the most important functions to be clickable. Due to the rather open format of the application I also defined two personas which follows a specific use case on the utility of the application. Both personas are within my target audience but with different backgrounds, interests and values.

Landing Page/Home screen

At first, I thought about the home screen after launching the application.
I thought about the key functions and how they should be accessible while using the application. Of course, I wanted to make the generative option popular for quick access as soon as the application is launched. Beside that I also wanted to give the user the possibility to already preselect some filter options to achieve a more tailored generative result. These options are categorized into types, tags and wardrobes. The types include various outfit categories, for example T-shirts, trousers, hoodies, etc. require different amounts of clothing layers to feel comfortable. I want to implement the option to add layers on top of the four default ones.

Connecting

Beside the core feature to generate outfits, a very key feature is the option to connect your library with the libraries of your selected contacts. By building a network of shared wardrobes, the application has a wider range for pieces to be considered for the generative outfit part. The said range can be defined by the user of course. For this I defined three ranges. The most private range would be people within the same household such as family members or roommates. The second range is still exclusively to people known to

the user but do not necessarily live in the same household. This includes mainly the user's friends circle but can of course also include family members. The third range option consists of not restraining anything. It's opening up your library to the public and give insight to strangers.
It is crucial for the application to make some connections so the generative feature can take other wardrobes into account and even allow regulated lending/sharing/borrowing of matched pieces. Once the user finds a piece of clothing from another user's wardrobe in their generative result, they can request that said piece from the owner. Once the owner confirms the request, that exchange will be registered and noted within the application. Due to the fact that sharing/borrowing and lending clothes is the end goal of the application the clothes that the user's share may bring joy to another user and therefore should cut the need to buy store-new clothing while giving the existing fabrics a longer lasting life of its own.

Flow

The flow of the application is described based on the given persona, Max.
Max, a 30-year-old employee, is invited to a formal dinner with the company. Usually, on a day to day basis, Max dresses comfortably decent. Mostly a one colored Shirt with a pair of jeans. His coworker told him that the place where the dinner will take place is rather a fancy one, Max gets anxious about his outfit for this occasion. At home he notices that he has no suitable clothes to wear to that dinner. Luckily Max is a smardrobe-user and launches the application. He is specifically looking for a plain white-collar shirt as he just owns funky ones.

V2 (Figma Flow 2)

For the core feature, generating outfit ideas, an artificial intelligence system is required to put suggestions together based on given criteria, which get extracted from the user's personal library.

Machine Learning based on App-usage

As the users get to save generated outfits, the algorithm recognises these matched pieces and takes these compositions into account. This algorithm is based on machine learning. Therefore the more outfits are being generated and saved or categorized, the better future suggestions will be.

API

On top of that the artificial intelligence gathers information through API from various sources, such as online shops like Zalando where purchase habit data is collected but also sources like officially recognised fashion blogs, brands and papers, on trendy colors while regarding seasonal tones, styles and material.

Preset criteria

Apart from extracting data from users there are already presets on objectively formed style opinions on colorschemes, patterns and cuts

Colorschemes

Even though color scheme criteria are initially implemented, they are continuously updated as they change from era to era and from season to season too. These schemes are set by stylists but also get extracted from sources through API.

Patterns

Even though pattern combinations are very subjective, on an objective basis there are a few guidelines to follow. For example combining stripes with checks can be overwhelming for the eye and should be avoided if possible.

Cuts

In general cuts can be hard to categorize except the division between loose clothes and tight fitting clothes. So this is rather a preference than an actual criteria. Women's outfit choices often include a top or bottom piece to be either tight or rather loose. They usually choose loose bottoms if the top is already tight and vice versa.

Seasonal criteria

So depending on the time someone uses the app throughout the year, different suggestions are created. For outfits generated in fall, mostly earth tones such as brown, orange and green will be more popular while summer outfits contain colorful linen and overall light cloth. Outfits generated in wintertime are generally more functionality focused in order to be prepared for the cold and wet weather.

Tags

As the users get to add tags and further specifications and information upon registration of a clothing piece, the artificial intelligent algorithm uses that for reference in order to suggest outfits with matching or similar tags. This goes for the personal wardrobe suggestions, but also for the shared ones from the community.

Interviews

Based on the first prototype the following interview guide line was set. The qualitative approached interview allowed to get a more profound understanding of topics raised in the V1 prototype.
The answers given by the interviewees are summarized into a short text.

The interview questions:
1. How often do you borrow or lend a clothing piece to someone else?
2. Who would you share your clothes with?
    a. 1 – People in the same household
    b. 2 – Friends/Acquaintances
    c. 3 – Strangers
3. How much time does it take you to gather an outfit?
    a. 1 – 2 minutes
    b. 3 – 5 minutes
    c. 6 + minutes
4. Are there events where it takes you significantly longer to choose an outfit?
    a. If yes, what would they be? _____
5. What category of clothes would you be comfortable to share with your selection from question 2?

Interview I

Fabian H., 31
Fabian says he does lend, borrow and share certain pieces of clothing with but just very specific ones. Mostly for occasions that require a certain dress code that he cannot cover with his own wardrobe. He says he would be open to sharing his wardrobe with people in the same household and his friends/acquaintances but would be rather hesitant to share them with strangers but would also do so under certain circumstances.
Fabian said that it usually takes him three to five minutes to gather an outfit but can take significantly longer if the outfit is needed for a certain occasion when trying out new combinations.
Fabian stated that he would not want to share his underwear, socks or T-shirts even with the closer circles and also might restrict more categories when sharing with strangers.

Interview II

Alena W., 30

Alena would be willing to share, lend and borrow some individual pieces. She already has exchanged clothes in the past for specific occasions and situations when she did not have something matching at hand or just did not want to buy something new from the store as she probably could not use it again after the occasion. As an example, she refers to a customer event with a dress code for which she did not have a suiting outfit. She then asked her friends to send her pictures of matching pieces from which she then chose one. Regarding the range of sharing her clothes, she stated to be willing to share them with the people in the same household too, as well as her friends and closer circle. She says sharing with complete strangers would be possible too but not unfiltered.
Further she depicted two scenarios that reoccur to her on the regular. The first scenario of getting ready is a casual weekday when she has to go to work and picks a standard outfit which allows her to get ready quite quickly. For the second scenario she described a situation at work too but where she has to hold a presentation or attend a customer event. For this occasion, she takes significantly longer to put together an outfit as she has to think about the last outfit she wore for such events and does not want to show up wearing the same outfit as the previous time. Also, when she picks outfits for her time off, for specific events or if she just is not into wearing any of the clothes she has, it takes her even longer to choose.
Lastly she stated that she would share pretty much anything with people in the same household and her close circle except for underwear, socks, stockings and bathing suits. On top of that she says she would also share any clothes with strangers except a few specific pieces that were extremely expensive or very delicate to handle. She brings the example of a cashmere pullover, which she would be anxious about how it's washed and treated. Beside that she also is not sure about sharing shoes but generally she would share them with closer people. She says she would also share some shoes with strangers, for example high-heels, which she does not wear that often.

Interview III

Dora B., 30
She said that she often shared clothes with her sisters when they used to live in the same household. She says they still share clothes to this day but due to their living situation they just have less opportunities to do so. She says that the circle kind of shifted though. These days she shares clothes more with her friends – usually in situations when they get ready to go out or just casually hang out at one place and then it happens that they exchange some pieces. Similar to the other two interviewees, Dora would absolutely share her clothes with her closer circle. She says she would also share them with strangers but only if she would get something in return. In other words, she is more interested in swapping certain pieces, than just lending them to a person without getting a piece in return. She proceeded to say that it is very important to her to buy good quality clothes while paying attention to the sustainable aspect, as well as her preferences in materiality. That is important to her, so she would use the exchange options even more if you could borrow/lend or share clothes based on such criteria. Nevertheless, there are limits for her too. She says there are pieces that are too valuable to her and that those are also very delicate. C clothes that are worn directly on skin is a no-go for her too. For example, sharing underwear, shoes and training outfits would disgust her. Dora says it usually takes her more than six minutes to gather an outfit and it can take her even longer when she plans on going out and does not have anything matching to wear, does not find suitable combinations or just is not into wearing any of her possessions. For the last question, Dora listed trousers, tops, cardigans, jackets, dresses and skirts as clothing categories she would share with others. But she would also restrict some pieces for strangers to share with, would be willing to share most of her clothes with either people
form her household or other people in her closer circle.

Final Product/Application

Features

V2 of the Prototype (Figma flow 2, including findings test/questions)
After the qualitative approach interview, I took the first version of the prototype and implemented further features and incorporated the user feedback. The existing features are iterated while also describing the new features subsequently.

Library

To use the application to the fullest it requires the user to register their clothes into the application upon entry. The photographed piece of clothing can be cropped and added to the library without the background. Once the clothing piece stands freely, the user is asked to register further information or details on the registered piece and also add tags to achieve an accurate categorization of the library. The added tags help the application to filter and select pieces based on the given criteria.
Surely one does not need to register any clothes at all and still will be able to use the application. That results in just being able to use the discover mode as in browsing other user's wardrobes. Furthermore, based on the interviews beside the tags (business, festive,…), the option to give details on the materiality of the piece of clothing within the personal library was added.

Collaborating

Based on the previous described feature users can collaborate within the application on a shared wardrobe. This feature is mainly ought to be used for users on the first and second range setting. A collaboration requires two or more users to have quick access to the physical wardrobe of one another. It can mainly be used to generate whole outfits while considering any wardrobes that are part of that collaboration.

Discover

The discovery mode runs parallel to the core function of generating outfits. In case the generative function cannot provide a satisfying result due to the restricted range, the user can allow a range that exceeds the preselection from the connection mode. The application will consider the range by focusing on results within the vicinity. Beside that it also allows users to browse outfit ideas without generating an outfit themselves. While the core function's goal is to provide a satisfying output for the user in reality, the discovery mode follows a less result focused approach. The discover mode is ought to be an inspiration tool, a way to connect with like-minded people or users with extraordinary collections as well as providing useful information on clothes and their origin.

Iterated Generative Mode

The two most recently mentioned features are not yet incorporated into the figma prototype but nevertheless, I also iterated the core feature – the part to generate the outfit itself. That specific feature could look like the adjacent screen:

Outlook

The next and third version of the prototype is currently in development. The focus lies on refining the core feature, namely "generative outfits", by adding real information and making the generative feature more engaging. Also, what a valuable insight from the interviews was, is the ability to select the range of wardrobes to be considered for a user's own generative outfits, but also to restrict one's own clothing pieces to the community. Deriving from the user interviews, this especially regards valuable and delicate pieces of clothing that the users are not comfortable sharing with strangers.

User Experience (UX)

In the following part the user experience is described in form of an information architecture for the application or prototype in this sense. The information architecture has been formed after re-evaluating the previous iterations of the prototype considering the engagement during the exhibition. It does not contain all of the feature described before. The information architecture is based on the story that a viewer has to go through while interacting with the prototype in the setting of the exhibition taking place from June 6th to June 21st 2024.
This information architecture is based on two use cases that take the core features of generating outfit ideas and the option to borrow clothing pieces through requesting them within the owners wardrobe.

1. Home screen
2. Hello Laura, welcome back!
    a. Your wardrobes:
        i. my WR
        ii. friend 1 WR
        iii. friend 2 WR
        iv. etc.
        v. + Add wardrobe
    b. generate an outfit!
        i. surprise me
        ii. you have something specific in mind? (Event)
    c. your saved outfits
        i. outfit 1
        ii. outfit 2
        iii. outfit 3
        iv. etc.
3. Hello Max, welcome back!
    a. Your wardrobes:
        i. my WR
        ii. friend 1 WR
        iii. friend 2 WR
        iv. etc.
        v. + Add wardrobe
    b. generate an outfit!
        i. surprise me
        ii. you have something specific in mind? (Event)
    c. your saved outfits
        i. outfit 1
        ii. outfit 2
        iii. outfit 3
        iv. etc.

1. Navigation-Bar (permanent, bottom, from left (1.) to right (5.))
2. Home- button
3. Bookmarks/Favourites
4. Add item via Camera
5. Notifications (for example requests of clothing pieces or friend requests)
6. User profile

1. Wardrobes
    a. Text: “your wardrobes”
        i. own wardrobe pinned to top
        ii. connected wardrobes listed below
        iii. Navigation-Bar
        iv. <— arrow, “go back”

1. My own wardrobe
2. Use-case B (Max)
3. Content cards, categorized
    a. contains picture of the clothing piece
    b. —top right, button to open the content card—
        i. Tops
            1. Long sleeves
                a. jackets
                b. hoodies
                c. shirts
                d. …
            2. short sleeves
                a. t-shirts
                b. tanktops
                c. …
        ii. bottoms
                a. pants
                b. shorts
                c. skirts
        iii. shoes
        iv. dresses/onesies
4. Profile picture of the owner (Max)
5. top left <— go back to point 4)
    a. Navigation-bar

1. A friends wardrobe (Dora’s WR)
2. Use-case A (Laura)
3. Content cards, categorized
    a. contains picture of the clothing piece
    b. —top right, button to open the content card—
        i. Tops
            1. Long sleeves
                a. jackets
                b. hoodies
                c. shirts
                d. …
            2. short sleeves
                a. t-shirts
                b. tanktops
                c. …
        ii. bottoms
                a. pants
                b. shorts
                c. skirts
        iii. shoes
        iv. dresses/onesies
4. Profile picture of the owner (Dora)
5. top left <— arrow, “go back”
6. Navigation-bar

1. Filter
2. Title “filter”
3. filter symbol to exit
4. Tags
    a. festive
    b. business
    c. holiday
    d. functional
5. colorway
    a. monochrome
    b. muted colors
    c. loud colors
6. range filter
    a. my own WR
    b. connected WRs
    c. whole Database
7. button “apply filter” on the bottom
8. navigation bar

1. Content card, opened (own library)
2. blur/ gray-out background
3. Use-case B (Max)
    a. contains picture of the clothing piece
    b. information
        i. material
        ii. size
        iii. brand
        iv. further information
            1. how to wash
            2. etc.
        v. range
        vi. profile picture of the owner (Dora)
    c. availability for others
        i. just for my WR
        ii. for connected WR
        iii. Anyone
    d. generate outfit based on this piece
    e. top right —> exit content card view
4. navigation-bar

5. for “generate outfit based on this piece” (point 9.2.4)
    a. lay over, blurred background, 3 options
        i. generate based on own WR
        ii. generate based on connected WRs
        iii. generate based on whole database
    b. exit-option, top right

1. Generative function
2. 3 rows
    a. tops
    b. bottoms
    c. shoes
    d. —add layer—
3. if generated from one piece, row containing piece is locked on that piece
4. if generated freely, non of the rows are locked
5. Filter, top right
6. vertical row to highlight selected items
7. navigation-bar

1. Content card, opened (own library)
2. blur/ gray-out background
3. Use-case B (Max)
    a. contains picture of the clothing piece
    b. information
        i. material
        ii. size
        iii. brand
        iv. further information
            1. how to wash
            2. etc.
        v. range
        vi. profile picture of the owner (Dora)
    c. availability for others
        i. just for my WR
        ii. for connected WR
        iii. Anyone
    d. generate outfit based on this piece
    e. top right —> exit content card view
4. navigation-bar

5. for “generate outfit based on this piece” (point 9.2.4)
    a. lay over, blurred background, 3 options
        i. generate based on own WR
        ii. generate based on connected WRs
        iii. generate based on whole database
    b. exit-option, top right

1. Content card, opened (Dora’s WR)
    a. blur/ gray-out background
    b. Use-case A (Laura)
        i. contains picture of the clothing piece
        ii. 3 stages of generative options
            1. own WR
            2. connected WR
            3. whole database
        iii. information
            1. material
            2. size
            3. brand
            4. further information
                a. how to wash
                b. etc.
            5. range
            6. profile picture of the owner (Dora)
        iv. request item
        v. generate outfit based on this piece
        vi. top right —> exit content card view
        vii. navigation-bar

    c. for “generate outfit based on this piece” (point 7.2.5)
        i. lay over, blurred background, 3 options
            1. generate based on own WR
            2. generate based on connected WRs
            3. generate based on whole database
        ii. exit-option, top right

User Interface (UI)

For the interface of the application a typeface, colorscheme and a palette of icons had to be chosen. Two different types of fonts have been implemented. One, a rather artsy font, called Expletus Sans, was taken for titles, as well as other major descriptive parts. The other font is Helvetica Neue, which is used for any parts that require readability like contents. For the colorscheme a colorpalette has been chosen, based on earthy tones, as the main color is a soft beige with a warm brown for content cards and buttons to create depth and contrast. These colors are ought to remind one to a classic wooden wardrobe while not creating a balance to the rather colorful and rich in pattern contents in order to ease the viewers eyes. Most icons were taken from the royalty free google fonts library while some have been redrawn or reshaped by me.

Typeface

Title	**Expletus Sans, bold**	**64 px**
subtitle 1	**Expletus Sans, bold**	**48 px**
subtitle 2	**Expletus Sans, bold**	**36 px**
subtitle 3	**Expletus Sans, bold**	**24 px**

Text	Helvetica Neue, Regular	48px
subtext 1	Helvetica Neue, Regular	36 px
subtext 2	Helvetica Neue, Regular	24 px
subtext 3	Helvetica Neue, Regular	16 px

Figure 16: Colorpalette Smardrobe (Adobe color-wheel)

Icons

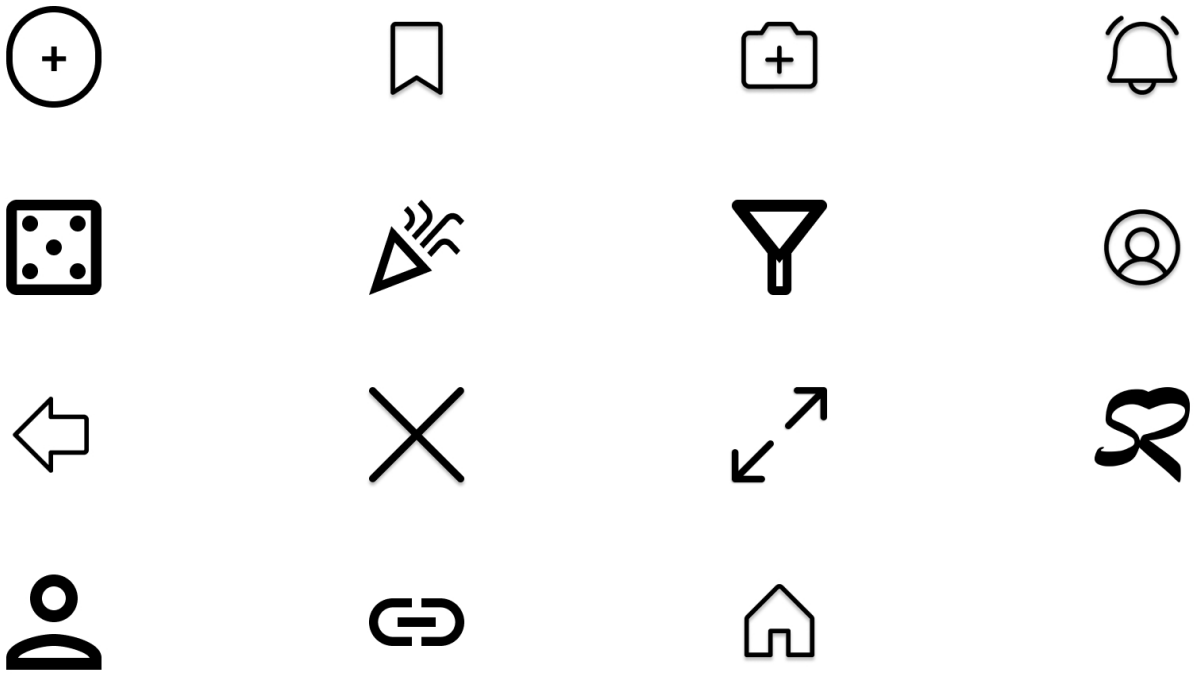
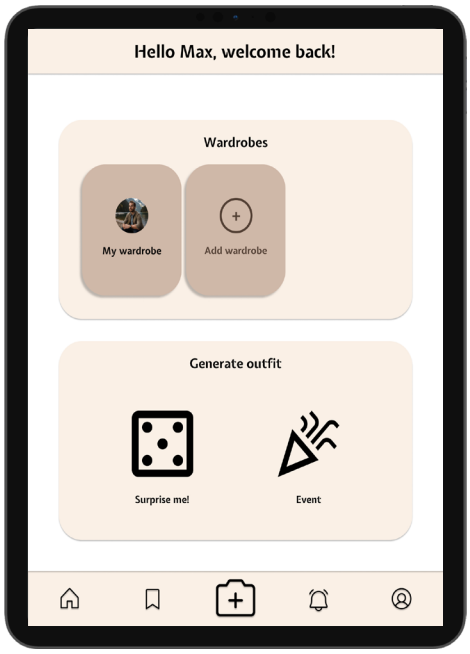
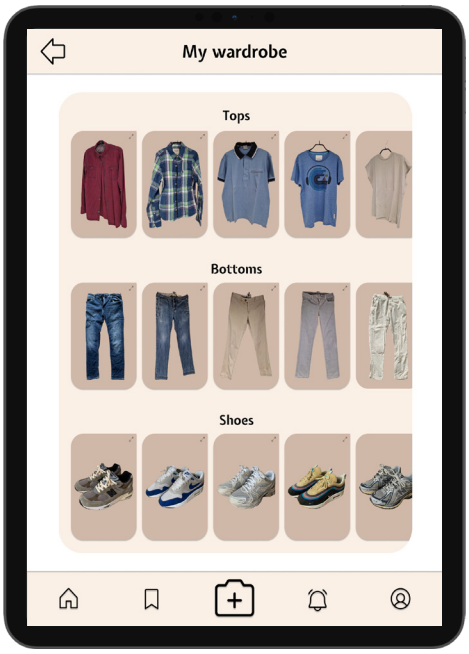


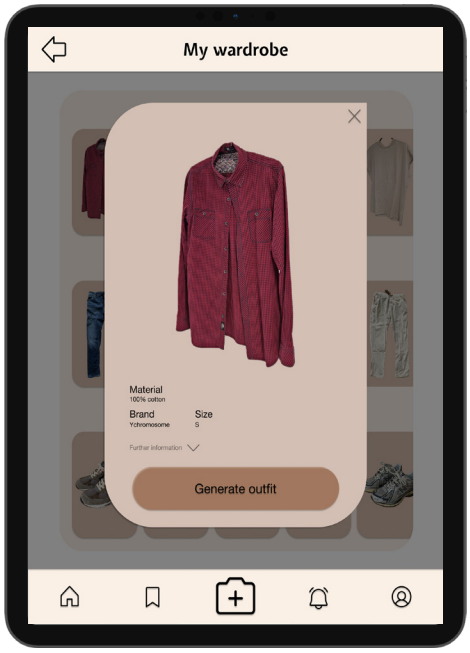
Figure 17: Icons Smardrobe

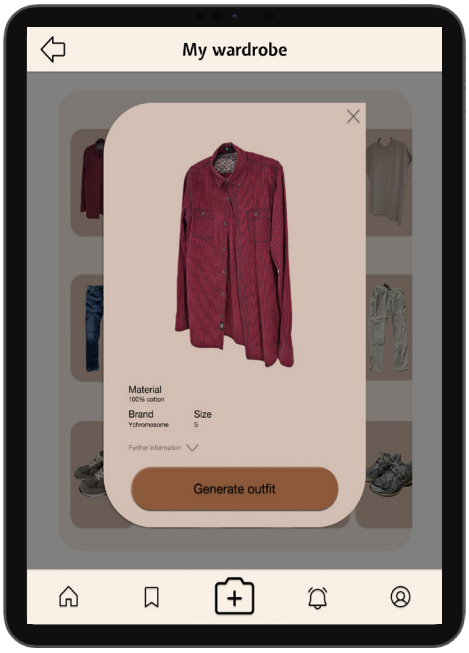
Screens

Use-Case 1



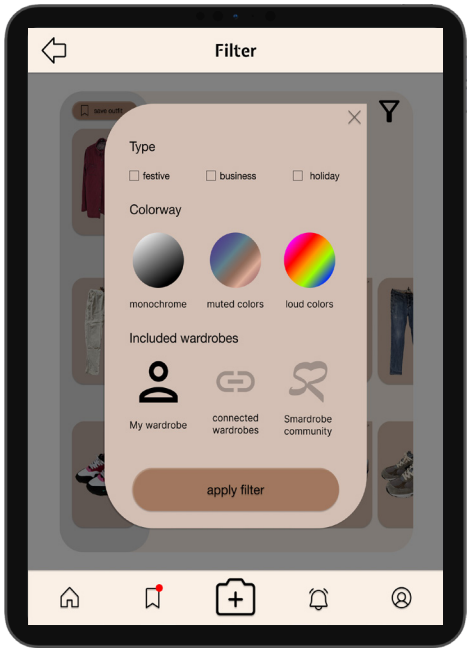


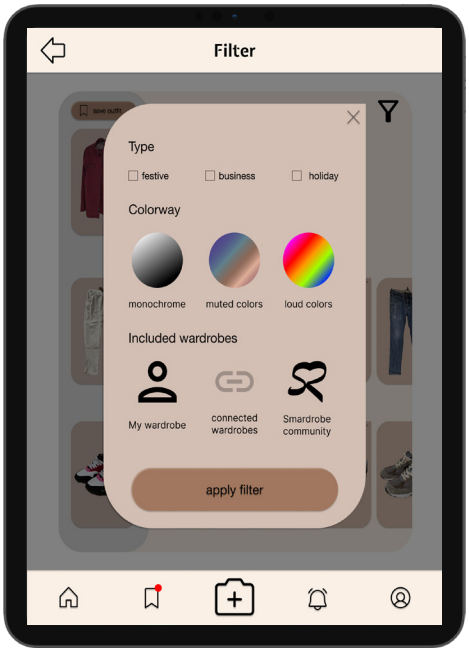





Generated Outfit
save outfit
Matching Bottoms
Matching Shoes


Generated Outfit
save outfit
Matching Bottoms
Matching Shoes


Filter
Type
festive
business
holiday
Colorway
monochrome
muted colors
loud colors
Included wardrobes
My wardrobe
connected wardrobes
Smardrobe community
apply filter


Filter
Type
festive
business
holiday
Colorway
monochrome
muted colors
loud colors
Included wardrobes
My wardrobe
connected wardrobes
Smardrobe community
apply filter

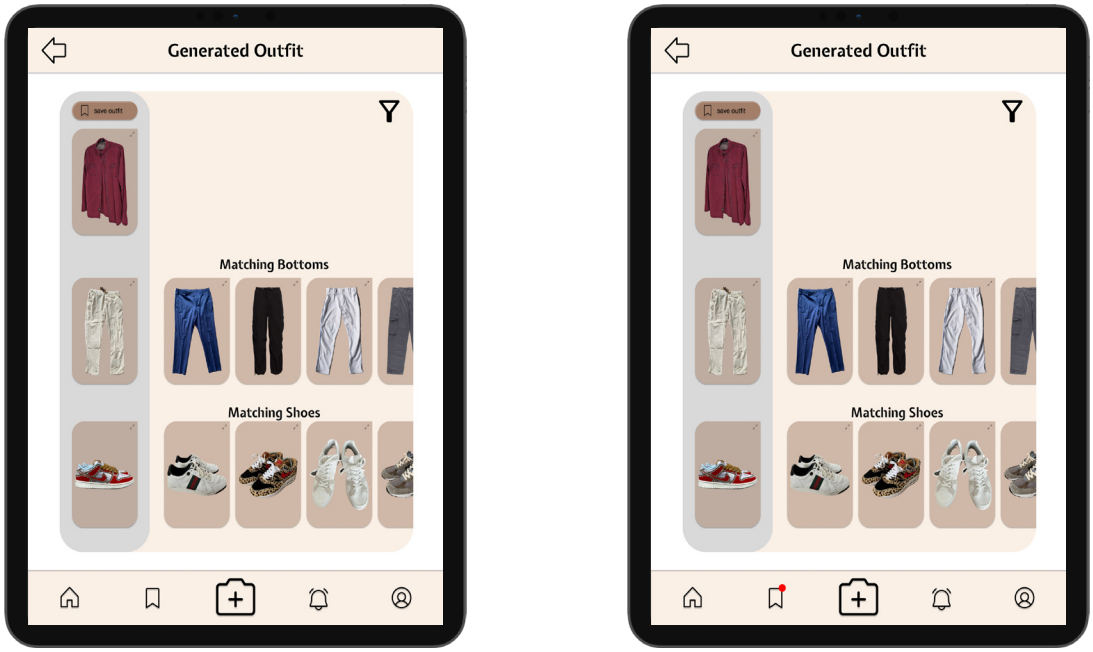
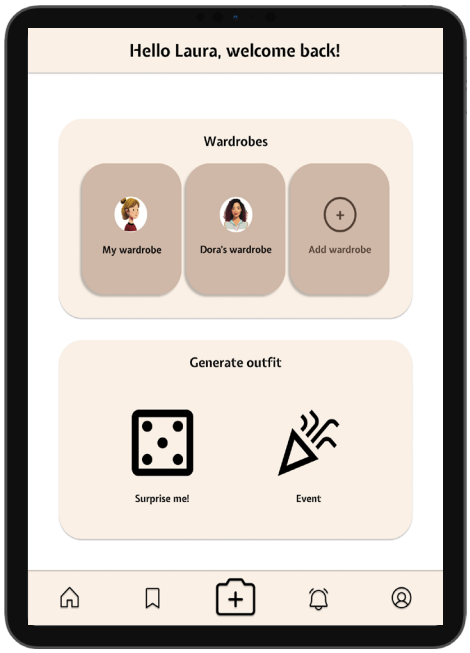
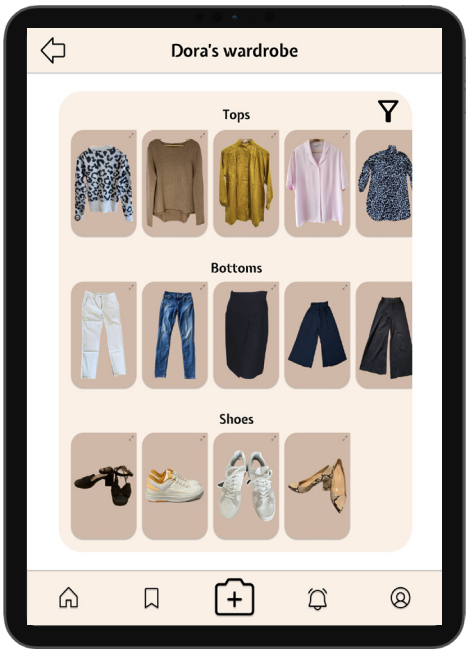
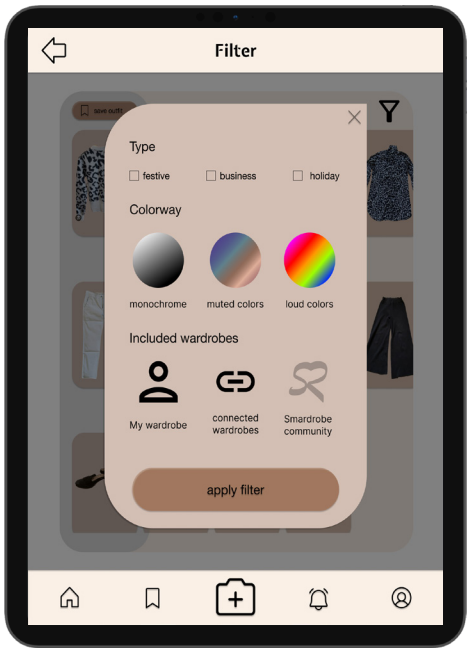


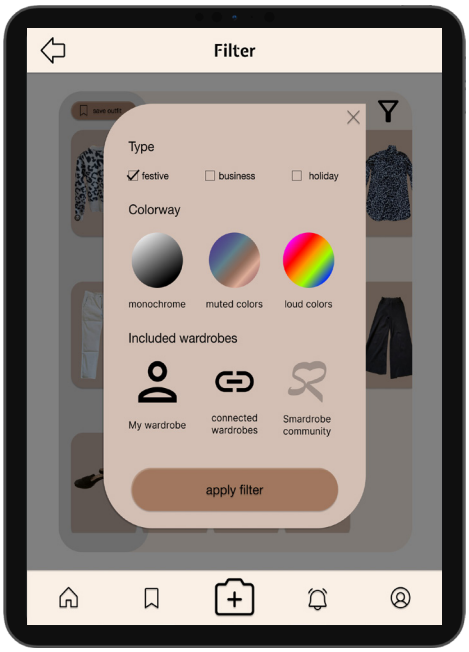
Figure 18: Screens 1-10, use-case 1

Use-Case 2


Hello Laura, welcome back!
Wardrobes
My wardrobe
Dora's wardrobe
Add wardrobe
Generate outfit
Surprise me!
Event


Dora's wardrobe
Tops
Bottoms
Shoes


Filter
Type
festive
business
holiday
Colorway
monochrome
muted colors
loud colors
Included wardrobes
My wardrobe
connected wardrobes
Smardrobe community
apply filter


Filter
Type
festive
business
holiday
Colorway
monochrome
muted colors
loud colors
Included wardrobes
My wardrobe
connected wardrobes
Smardrobe community
apply filter

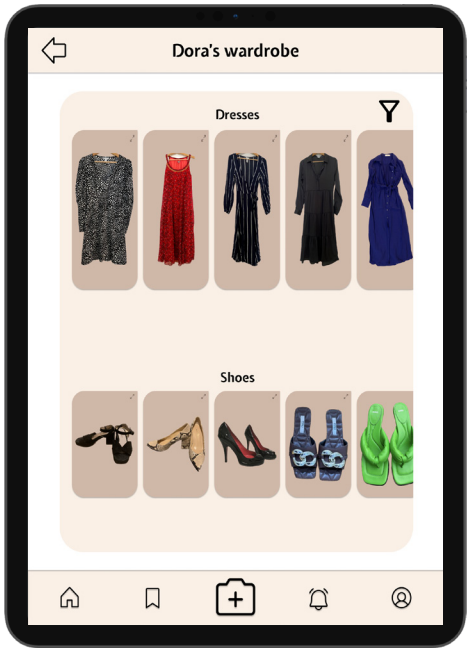


Figure 19: Screens 11-17, use-case 2

Conclusion

This thesis aimed to explore the field of the textile industry and its impact on the environment while taking societal behaviour, mainly referring to consumerism and overconsumption, into account. Through continuous exchange, exploration and analysis, several key insights were identified.
Firstly, the exponential uprising of fast-fashion brands and industries motivates to participate in the fast paced changes of styles and therefore support overconsumption. Technological advances make it easy to immediately access information. These information are easily spread through social media and therefore accessible for anyone while creating a need to keep up with trends.
Secondly the fashion industry is missing circular economy. Mainly for the reason that recycling fibers consumes a lot of energy and clean water which results in throwing away old and used clothes instead of breaking up the fibers. Further more interviews have shown that the second hand market is rather a niche as some people prefer to get new clothes over used ones unless they know the person who the piece belonged to. For that reason the focus of digitalising the wardrobe lays on sharing the pieces between familiar people with the option to not give them away completely but rather borrow or trade them with like minded people.
Lastly the generative part which takes other peoples digitalised wardrobes into account replaces the need of purchasing a store-new item by allowing a further instance to fill the need of possessing and adding a new piece to their collection. It is an approach to situate this project within the final step in the lifecycle of the textiles and somewhat achieve circularity by keeping a clothing piece in use instead of throwing it away while shifting the joy from possessing a new piece by making purchases towards feeling joyful about sharing, borrowing and trading clothing pieces.

In conclusion, consumerism and overconsumption can be faught by replacing a need with a more sustainable way of satisfying that need. Trading, sharing and borrowing clothing pieces can replace thoughtless purchases while empowering circularity.

Join Smardrobe and start generating, connecting and exchanging.

Future Steps

A huge further step would be to realise the application in order to allow it to process real user information. Mainly by letting users digitalise their clothes and get real outfit suggestions based on their style preferences. Further, the features need to be refined and also implement new features like outfit suggestions based on weather conditions during the time of generating the outfit. Also, the application should provide a lot more information on the registered pieces and it should have an option to track the clothes about when they have been used the last time. Tied to this it should recognise the material and tell the user how to treat it correctly in order to maximise the potential of the fabric.
Beside that, the feature of connecting wardrobes needs development. Users should be able to communicate within the application to make it as easy as possible to make exchanges with one another. With that the application should be able to transfer pieces from wardrobe to wardrobe.
Users should also be able to set up shared collections to make it even easier for the members to have insight about shared pieces.
Since borrowing pieces from other users is possible, the application should require a confirmation about the condition of a piece before returning it to the owner.
But all of that would not be possible without a community, so in order to make it work, the first and most important future step is to build a community of Smardrobe-users to maximise its potential.

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