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Background Research and Data Sources

Retail Transformation

The Retail Industry Transformation Map (Ministry of Trade and Industry, 2016) detailed that retailers can no longer rely on physical stores alone. The transformation guide raised some reasons such as the growth of e-commerce and increasing customer expectations for personalised options. The guide also suggested the incorporation of the omni-channel approach which spans from physical stores to mobile devices and desktops. To remain as competitive, retail stores should build seamless shopping experiences across multiple channels. By doing so, retailers increase opportunities to connect with the customer.

New Shopping Habits

According to the Nielsen Impact of COVID-19 on Consumer Behaviour survey (Nielsen, 2020), the online shopping behaviour is here to stay. The report revealed two in five consumers in Singapore have increased their online shopping activities while 3 in 4 indicated that they will not return to initial levels of online shopping prior to COVID-19. Furthermore, a report on retail trends also emphasized on the importance for retailers to go “mobile first” with the increasing growth of mobile payment (Microsoft Dynamics 365, 2019).

In another global survey, 51% of the respondents stated that they were willing to use Augmented or Virtual Reality (AR/VR) to assess products and services (Nielsen, 2019). Baytar, Chung, and Shin (2020) found that the use of AR can enrich interaction with the product, enabling the consumer to perceive the AR products as more tangible and attractive. Even though the tactile experience with the product cannot be replicated and the customer might have to rely on the physical try-on eventually, the AR try-on is a complementary tool which can enhance the online shopping experience. The paper revealed that participants with higher telepresence level using the AR showed more positive attitudes towards the item and displayed greater purchase intentions as compared to participants with lower telepresence level. The paper defined telepresence as “consumer’s sense of being present in a virtual environment, such as an online store, where consumers would browse and shop as they would in a brick-and-mortar location”. In the current pandemic situation, fashion retailers can leverage on the use of such technologies to create more immersive and engaging experiences for online shoppers. Moreover, the adoption of such technologies is not limited to enhancing just the online shopping experience – it can supplement the physical try-on experience as well.

Limitations of Physical Shopping

In spite of the rising prominence of online shopping, brick-and-mortar are still largely significant. In fact, more than 70% of fashion purchases are still made offline (McKinsey & Company, 2020). Data from a McKinsey Returns Management Survey (McKinsey & Company, 2020) revealed a lower return rate for clothes bought in-stores as compared to online. This could be due to clear advantages of in-store shopping, such as the opportunity to try on the

product as well as being able to check if the product is compatible with the buyer. Additionally, a Global Payments Trends Report (J.P. Morgan, 2019) highlighted that e-commerce as a percentage of overall retail expenditure is 4.2% in Singapore, significantly lower than 19.1% and 15.1% in UK and Germany respectively. The report also suggested high population density and transport interconnectedness as drivers of store visits and in-store expenditure.

However, there are some pain points in physical shopping such as longer queues for fitting rooms (Heng, 2019). The article also listed examples of fashion retailers adopting technology to improve the in-store customer experience. For example, customers can make use of the online booking system to book the fitting room and browse other items while waiting. In another example, the electronic queuing system is implemented where customers' queue numbers are displayed on the screens which meant they do not have to wait in line.

While the use of such technology allows for time savings, it only manages to enhance the in-store customer experience to a small extent. Ultimately, customers are still waiting for a fitting room. As mentioned earlier, the use of virtual try-ons need not be limited to online shopping. The physical store environment can leverage on virtual try-ons and allow shoppers to sort through different sets of outfits easily before deciding if the item is worth waiting for a physical try-on.

Need for Comparison

Furthermore, an apparel consumer survey (Oliver Wyman, 2017) revealed that 57% of shopping journeys which ends with an online purchase begins from another website, a physical store, or both. This could mean that shoppers have a high tendency to compare items before making a purchase. Therefore, a potential user need is a one-stop platform to not only visualise, but compare products or outfits easily.

Social Media

According to the Digital in 2019 Singapore Report (Hootsuite, 2019), 79% and 72% of Singapore's total population are active social media users and mobile social media users respectively. The State of Social Commerce in Southeast Asia report (Econsultancy, 2019) revealed 59% of respondents indicated that more than a quarter of their online shopping is influenced by social media and stated Facebook and YouTube as the most popular channels which triggered a purchase. Additionally, 44% of them shared that they have made three or more online purchases in the past month after viewing social media posts or ads. This means that a significant number of online purchases are encouraged by social media content. Aside, the report also mentioned that these consumers typically use social media to browse for product ideas with 65% browsing in the evening and 53% in the afternoon. This could mean that consumers are browsing at the comfort of their homes in the evening and browsing on the go in the afternoon. Lastly, the report revealed that a significant 82% of respondents share their purchases via their social networks. This means the act of shopping

could be remote but the entire shopping experience can be a social one. These key findings further reinforces the importance of convenience and mobility of the design solution. The most popular social media platform in Singapore is YouTube, followed by Facebook, Instagram and Twitter (TechinAsia, 2019). More specifically, 82% of internet users in Singapore was also found to access YouTube monthly. Furthermore, Instagram has now introduced Instagram Checkout which allows for direct purchases. This means the mobile browsing and checkout experience will become increasingly crucial as users look to making direct purchases after browsing on social networking sites.

Data-driven Approach to Guide Design Requirements

The data collated above has provided some insights on the competitive retail scene and the potential for virtual try-ons, especially in the current pandemic. Evidently, retailers should tap on technology to enhance customer experience and sharpen their competitive edge. More importantly, the data also highlighted the increased preference for online shopping and mobile payments. Furthermore, In the pandemic situation where remote shopping is likely to be preferred, the adoption of virtual try-ons is more relevant than ever. Therefore, it is important to use the shopping patterns derived from the data to drive the design of the mobile application.

Mobility & Contextual Awareness

A user-centered design considers how users might use the app and under what kind of context. From the perspective of a customer, the mobile application should enable one to complete the key tasks anytime and at anywhere. Linking to the omni-channel approach as discussed earlier, the application should enable mobility across different channels to maximize customer reach. The purchasing process of each customer is highly variable. Customers can begin browsing the products online before purchasing it offline and vice versa. Therefore, the application should be compatible with both the in-store and online browsing experience. For instance, a user might gain outfit inspiration from YouTube instead of browsing in-stores. This means the app has to provide for smooth transition not only from different physical and online retail stores but also other online sites. The virtual try-on features can enable mobility across different brands and websites as well.

From the retailer's perspective, the mobile application should be able to expand customer reach. For instance, the pairing of complementary products by other retailers might be able to cross-sell the products in an outfit and boost sales. Furthermore, the presence of the retailer on a mobile application extends the connection with the customer. The customer experience does not have to end once he or she steps out of the store or the mall.

Personalization

Aligned with the increasing customer expectations for personalization, the mobile application should incorporate features for personalization to curate a unique user

experience. Building on the virtual try-on features, users should be able to key in their unique body measurements or their sizes to virtually try-on the apparel more accurately.

Convenience

Similar to the key strength of e-commerce, the application should strive to offer one-stop convenience for the user. Therefore, the mobile application should include features to make the shopping journey more convenient. To sum up, the basic design requirements ought to be met for this application to be practical and useful for the user. It should seek to complement the different types of purchasing processes and context.

Design Problems

The problem lies in the lack of design. Currently, there is a minimal number of shopping applications which offer a virtual try-on feature. Even within these applications, the virtual try-on features are only limited to a particular brand. Furthermore, many online shops are hosted on websites and not mobile applications. Most, if not all of them do not offer a virtual try-on function. There is an absence of an app which targets potential user needs such as the need to compare clothing items from different retailers and channels before making a smarter purchase.

How might we then redefine the shopping experience?

- How might we enhance the purchasing experience in-stores and online?
- How might we transform the purchasing process into a mobile experience?
- How might we enable customers to make smarter purchases online and offline?
- How might we use a mobile application to integrate purchasing within different context?

Initial Idea

In consideration of the above design problems, the mobile application aims to build an integrated shopping experience for the customer. The idea is to create an app that leverages on virtual try-ons to depict how an item will look on the customer anytime and anywhere. It also allows users to curate, plan and compare entire outfits easily. In turn, the opportunity to perform virtual try-ons on any applicable product and compare outfits enables the customer to make smarter, more suitable purchases.

A potential way of using the app will begin by building a personalized avatar for the user. The user will be requested to key in specific measurements such as height, weight, waist, hips and pit-to-pit. This allows users to visualize the item on their bodies.

Possible scenarios include a user trying on a handbag to decide if it suits the typical outfits she has for work. In another example, the user can visualise a pair of shoes to see if it complements other accessories such as her clothes and purse. This complementary app can enhance the in-store shopping experience. For example, instead of queuing to try on items

which are potentially incompatible, the user can scan the product and try-on virtually to see how it looks before trying on physically. As customers can access and compare their saved looks easily, it extends the time they take to consider a purchase. This increases the chance of them purchasing an item as compared to forgetting about it entirely after walking out of a store. Even if they remember to search for it online after leaving the physical store, they might not be able to remember the name of the product.

Retailers can capitalise on this platform to generate direct sales once a customer has made up his or her mind. As mentioned, this is not only limited to scanning the products offline but also online. For instance, the featured product can be added from YouTube or Instagram as well. Other potential features can allow users to contribute their “looks” which are outfits they have curated personally. User generated content can effectively promote a range of products to other users of the application. Users might also be able to plan for their outfits for the week which allows for time-saving.

Justification for Target Audience

The target audience for this mobile application is young working adults. This specific target audience was chosen because they possess certain attributes which will allow them to benefit the most as compared to other age groups. These attributes include being tech-savvy, active users of social media as well as a higher spending power.

Tech-savvy & Active Social Media Users

A study by iPrice established that 60% of the respondents prefer to shop on mobile (iPrice, 2017). This is aligned with Singapore’s internet penetration rate of 84%, one of the highest rates globally (TechinAsia, 2019). Singaporeans spend around two hours and eight minutes on social media (Hootsuite, 2019) with the majority of the activity dominated by individuals ranging around 23 and 38 years old (TechinAsia, 2019). Evidently, a significant portion of the young working adults are not only tech-savvy but also active on social media. In particular, the mobile application will look to integrating different browsing platforms (online and offline) and social networking sites. It was also established earlier that social media users have also made frequent purchases that were triggered by social media content. This means the high social media usage provides opportunities for the application to tap on such as encompassing a page which feature online influencers’ “picks”. This means the shopping and browsing habits of this target group are aligned with what the mobile application seek to deliver – convenience and mobility.

Higher Spending Power

According to another study (iPrice, 2017) on different online consumer profiles in Singapore, the majority of Singaporean online shoppers are aged 25 to 34 years old. The study also suggested that the 18 to 24 year old age group is not the largest group because of their limited spending power as students compared to the young working adults in the former. Aside, the study also highlighted three distinct shopping behaviour – the speedy, meticulous

and slow and steady shoppers. The first group purchases swiftly and need only a few minutes of research. The second group spends weeks in advance to look for the best deals. Therefore, wishlists and email reminders are highly suitable. The last group of users researches for months before jumping in to buy. In the Singapore Online Shopping Trend Report (MediaOne, 2020) it was also known that the percentage of online shoppers by gender is 51% and 49% for male and female respectively, which is not very significant.

Therefore, the target audience selected for this mobile application will be young working adults. It is believed that this target audience will stand to benefit the most as the application greatly complements their social media usage, fast-paced lifestyle and the need for mobility across browsing platforms.

User Interviews

User interviews (refer to Appendix 1 for the interview responses) were conducted in order to substantiate the secondary research of data sources above. Interviews centred on customer touchpoints present in the online and offline shopping experience. Key topics include the in-store shopping experience, online shopping experience, users' browsing habits and perception of virtual try-ons. The summary of the interviews are discussed according to the key topics. Recruited interviewees were young working adults, aligned with the specific target audience of this proposal.

Aim of the Interview

- Examine online and offline shopping habits (apparel & accessories)
- Learn the difficulties faced in shopping online and offline
- Find out the decision-making process of shoppers
- Find out the browsing habits of target audience
- Assess the potential of virtual try-ons
- Discuss potential functionalities which can enhance shopping experience

Key Findings

- Displayed shared frustration on long queues for fitting rooms
- Found the usefulness of online sizing guides limited
- Interviewees are avid users of social media, especially Instagram and YouTube
- Interviewees follow a considerable number of fashion accounts on Instagram for inspiration
- Established visual and size compatibility as main considerations driving a successful purchase
- Users mentally pair items before deciding on a purchase
- Established willingness to use virtual try-ons online and offline

Shopping Experience

The interviews have provided more insights and pain points faced during the entire shopping experience, from casual browsing to purchase. It has also validated the secondary research. For the physical shopping experience, interviewees had shared frustration arising from long queues for fitting rooms. One of the interviewees also mentioned that as a working adult, she usually shop on the weekends. However, the crowd levels during these periods are particularly high and the average time spent queuing for the fitting rooms range from 30 minutes to an hour. This is also the main reason why she had switched to mostly shopping online. For the online shopping experience, both interviewees shared difficulties in online sizing charts. The male interviewee shared that some guy shirts are designed to be of a looser fit, hence, vague measurements such as "S", "M" and "L" are not informative enough. On the other hand, the female interviewee claimed that sizes seem to be "a hit or miss" and that different stores have different sizing systems. As a result, she usually resorts to using the model's measurements as a guide to gauge how the item might look on her. She also mentioned she can only rely on the text description provided by the online retailer for the material and sizes. This means that shoppers find difficulty in visualising the outfit on themselves. This also justifies the virtual try-on as an additional tool to make an accurate purchase.

Shopping Routines

In terms of general shopping routine, both interviewees had some differences. The male interviewee shared that he can take up to 2 hours to browse for items during weekends and after work. During working hours, he will usually save the item on Instagram to view them later. After narrowing down, he requires around 15 mins to compare the items across retailers. He will usually end off with trying it on in-store and purchasing it directly. For the female interviewee, browsing is on and off and can last up to three hours. She will also take some time to gauge the product based on the model's build, for example, comparing her own height with the model's height and guessing where the pants will end on her. Both interviewees also shared that they frequently seek opinions from their close friends as well. This means additional time is also spent communicating with friends to obtain additional opinions before making a purchase. The difference in time taken to compare and consider products is aligned with the three distinct shopping behaviours mentioned in the secondary research. The male interviewee is likely to be a speedy shopper while the female interviewee is a meticulous shopper. The shopping routines of both interviewees highlight a great amount of uncertainty before making a purchase. Throughout, there are many channels that are used to make a final decision. They have to browse through social media, study the limited product information online, share the outfits with their friends and try it on in-stores. Therefore, the mobile application can help to facilitate parts of their shopping routines. More importantly, the virtual try-ons can alleviate the uncertainty of shoppers and help the user visualise more accurately.

Browsing Habits

When asked to share their browsing habits, both interviewees also confirmed that they are extremely active on social media. Both shared that they use social media “all day” whenever they have “free pockets of time”. They also shared that they use Instagram most frequently, followed by YouTube. This is aligned with the secondary research of Singaporeans being active social media users. Interestingly, they raised different uses of Instagram. For instance, the male interviewee mentioned that he frequently saves outfit inspiration while the female interviewee expressed her interest in live try-ons hosted by blogshops on Instagram. Both also shared that they follow at least 20 influencers or brand pages for outfit inspiration. This further justifies that the solution should be a mobile application because of their high social media usage which makes them likely to be constantly on their phones. Furthermore, a mobile application is better in complementing both online and offline shopping experiences. A shopper is likely to always have a mobile phone as compared to having a tablet or desktop while shopping in-stores. Mobile application allows the users to refer to the outfits on the go as well.

Usefulness of Virtual Try-ons

During the discussion on try-ons, both interviewees unanimously agreed on the importance of visual compatibility as well as product fit. This highlights the need for them to gauge if an item is compatible with their look or personal style. On the topic of virtual try-ons, both shared that they were not familiar and had not try virtual try-ons. Even so, they were very optimistic about this feature. While both think it will be useful to input specific measurements, the male interviewee expressed some concern that it might be a hassle if users have to measure.

Additionally, there were some features that interviewees had contributed. The male interviewee had shared that he found the save feature very useful on Instagram. However, he wished this could be applied in reality. He recalled having seen some interesting outfits in-store but did not have time to “save” the look as it was during his lunch time. This also reinforces the importance of the application to encompass the mobility aspect. It should be able to make the shopping journey a mobile experience. The male interviewee also mentioned he would like to see outfits inspiration contributed by normal people other than influencers as this might reflect the product more accurately. The female interviewee stated that it might be more useful if the virtual try-on avatar can be customised according to one’s height and size. It might be user-friendly if one can just drag the clothes to the avatar. Additionally, she suggested the virtual try-on feature to be linked with a direct checkout. She also proposed the possibility of linking the application to social media accounts so she can post it straightaway and create a poll on Instagram to seek some opinions from her friends. Both interviewees have validated the usefulness of virtual try-ons. Aside, their shopping habits and preferences have also demonstrated potential in certain functionalities of the mobile application. Therefore, the proposed design will seek to encompass as many useful features which can enhance the online and shopping experience. The proposed design will also build on the suggestions offered by the interviewees.

User Persona

Based on the interview findings, a user persona is formed. The persona is a potential user of the application. The persona was built to describe the key pain points mentioned during the interviews.

Grace (26, Sales Manager)

Description	User behaviour
<ul style="list-style-type: none">- Grace is a budding sales manager who believes that dressing well is important. She usually shop in-stores but have recently converted to more of an online shopper as the queues on weekends can be quite time consuming.	<ul style="list-style-type: none">- Shops online more than offline- Shops and browses more after work- Very active on social media- Follow many retail brands on Instagram
Goals	Pain points
<ul style="list-style-type: none">- Wants to skip the queue- Like to share an outfit with friends to get a second opinion- Get a more accurate gauge of product fit while shopping online	<ul style="list-style-type: none">- Long queues for fitting room when shopping in-stores- Unable to try on a product while shopping online- Having to refund items of wrong sizes

Grace enjoys shopping in-stores and online. However, the long queues in-stores especially during the weekend can be very frustrating. As an avid user of both e-commerce applications and social media, it is likely that she becomes a user of the application.

Defining the Problem

The empathy stage and interview analysis have generated the problem statement. Online shoppers need a way to visualise a product because there is a risk of making an incompatible purchase due to the absence of product try-ons which makes them feel uncertain. The primary and secondary sources have also streamlined the “how might we” questions to become clearer design opportunities. More specifically, the focus will be:

- How might we increase user confidence before making a purchase? (virtual try-on feature)
- How might we tap on the pros of online shopping to improve the in-store shopping experience? (direct checkout feature)
- How might we help the user to save potential purchases? (scan to app feature)
- How might we make the shopping experience less time-consuming and more satisfying? (all the listed features)

Proposed Design – Anywear

Approach of the Project

The proposed design is a mobile application which aims to reduce uncertainty and reassure shoppers by allowing them to visualise how products will look on them. The proposed design will redefine both the in-store and online shopping experience. The virtual try-on feature will enable the user to try on an outfit anytime and from anywhere. This will potentially improve the shopping experience in different contexts. It will primarily be a virtual try-on based shopping application and a secondary social media application.

Based on the user needs obtained from the user interviews, a virtual try-on based solution can target users' pain points of not being able to gauge a product's fit. This design is also aligned with business needs as the provision of this shopping tool is likely to increase sales of apparel. Aside, it has also been noted that the potential users are active on social media and frequently seeks opinions from their friends and families. Therefore, the application will also contain elements of a social media application to provide opportunities for more social interactions. These interactions could encourage more browsing activity and sales.

Features of the Application

Virtual Try-On

It is established in earlier sections that the virtual try-on feature is likely to aid shoppers in visualising potential items and outfits which improves the purchasing experience. Therefore, the type of virtual try-on for this mobile application will be a personalised avatar based on specific measurements users have input. Previously, the male interviewee also mentioned that it might be a hassle to have to key in measurements. This is why the input of specific measurements will be a one-off action. Even so, users can also build more avatars with other measurements if they wish to visualise and potentially purchase a product for their loved ones. This will allow the application to demonstrate contextual awareness as users can be using this virtual try-on application for different purposes. The female interviewee also mentioned that she usually has multiple tabs opened just to refer to different items and compare. For ease of comparison, avatars can be easily duplicated for the user to compare items or entire outfits. Entire outfits on the avatar can be easily compared just by swiping left and right. Users can also customise their avatars and curate outfits to be saved for future reference. This digitalises their outfits and enable users to manage their outfit inspirations in a convenient manner. As the target users are deemed to be very tech-savvy and have shown a preference for communicating with friends during the decision-making process, the save and share function within the virtual try-on feature will be very useful.

Scan to App

Users can scan the barcode of a product to try on virtually. After scanning and viewing it on the avatar, users can choose to save it to the digital closet. The scanned products will also be saved in the scan history. The "Scan to App" will not be limited to in-store shopping. To

enhance the mobility and usefulness of this feature. Online retailers can also provide digital barcodes together with the product description. Online shoppers can use the mobile app to scan it and try on virtually as well. Linking to the user interviews, this feature allows the user to “save” looks in reality, regardless of the mode of shopping. The user can quickly scan an item and add it to his or her digital closet or search for it through the scan history. This not only helps the user to keep the item in mind but also increases the chance of a purchase which benefits retailers.

Direct Checkout

The interviewees and secondary sources have justified a need to go “mobile-first” as mobile payments are increasingly being used. Even though the design of this application is centred around virtual try-on, it should enable the user to make direct checkouts to provide convenience.

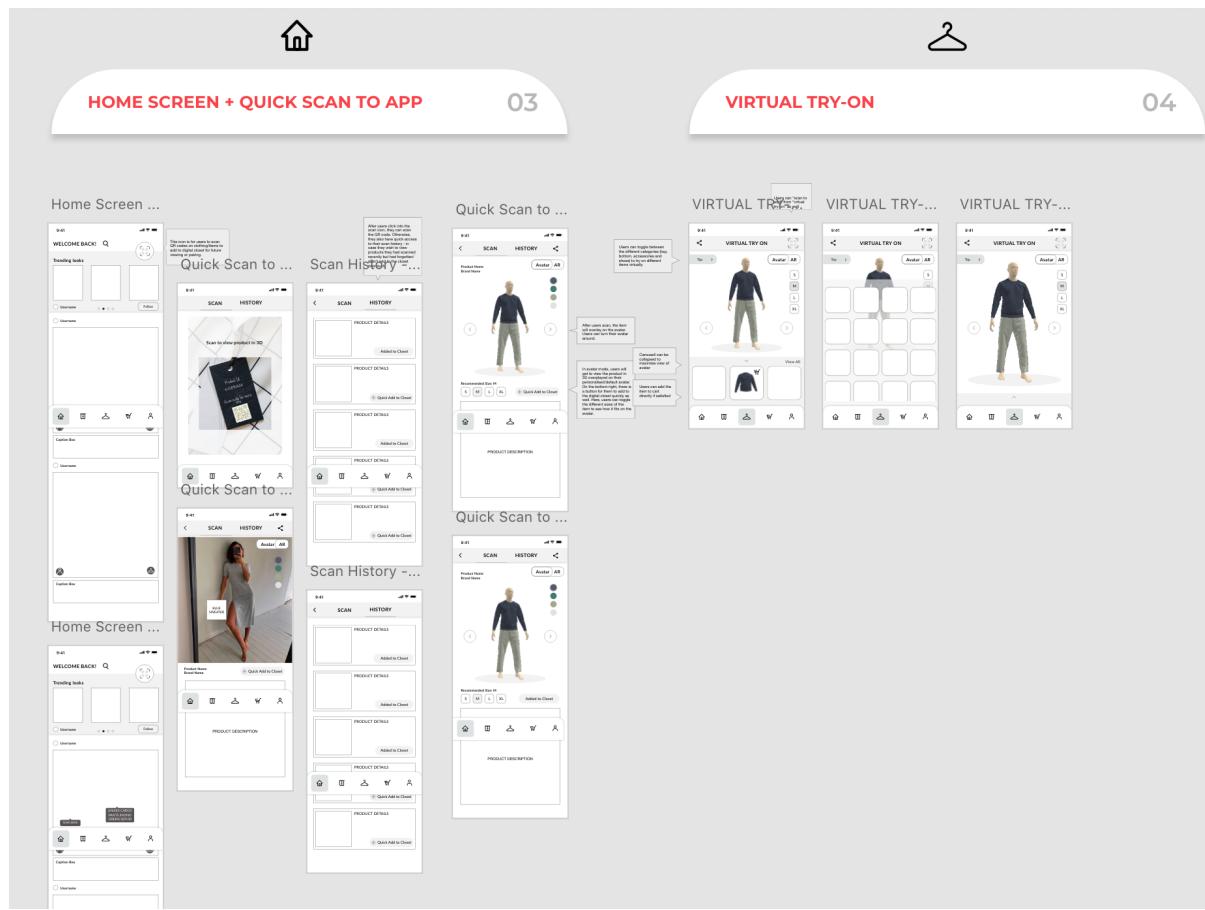
Contribute a “look”

As established earlier, the specific target audience are typically avid social media users. This allows for the potential of more social activity within this application. Considering how both interviewees follow a great number of accounts for inspiration, it might be good to include a discovery page where users of the application can explore other “looks” and even contribute a “look” themselves. Furthermore, the male interviewee also discussed the potential of having more user generated content. User generated content can come across as more genuine than sponsored content which might drive more purchases as well. One possible add-on could be importing entire looks contributed by other users to the avatar.

In sum, both the primary and secondary sources have shown that there are many untapped opportunities to enhance the offline and online shopping experience. Evidently, convenience is key for today’s consumers. Therefore, the mobile application should be designed to elevate the shopping experience and enable the user to make smarter purchases.

Low-fidelity Wireframe to Low-fidelity Prototype

A set of low-fi wireframes was created using Adobe XD as it can be converted to a low-fidelity prototype quickly for testing. Key features such as the “virtual try-on” and “scan to app” as mentioned in the design proposal were included in the low-fidelity wireframes. The low-fi wireframes did not include colours. The main goal of the wireframes was to decide where to place what. Accompanying justifications were recorded together with the wireframes.



(Low-fidelity wireframes)

To conduct usability testing, the wireframes were quickly converted to low-fidelity prototypes. Several images were included for participants to visualise the actual application better. Thereafter, specific scenarios were chosen for usability testing. These scenarios were prioritised as the key and more common flows of the application which will be elaborated in the iteration to the mid-fidelity prototype below.

Mid-fidelity Prototype

Identified Target Audience

According to a study (iPrice, 2017) on online consumers in Singapore, the majority of online shoppers in Singapore are aged 25 to 34 years old. The study also suggested that 18 to 24 range is not the largest group because of their limited spending power as students compared to the young working adults. From these findings, it is likely that spending power is a huge determinant of online consumption levels. Therefore, the target audience should be a working adult with spending power and active social media usage. These requirements will tie in with the age range of the target audience from 23 to 34 years old. The extension of the age range as compared to the one suggested in the study is made in consideration of the available interviewees and testers. Even though they are aged 23 and 24 years old, both fulfilled the requirements as they are working adults who use social media and shop actively.

Target Users

Participant 1	Operations Executive, 26 year old
Participant 2	Digital Marketer, 24 year old

The two target users selected to participate in the usability testing are aged 24 and 26-year-old working adults. Both participants use social media frequently and shop regularly, making them representative of the target users. As working adults, the scenarios presented to them are also highly relatable. The usability tests were conducted through Zoom and recorded. Their responses were also recorded (refer to Appendix B for more).

Usability Testing

The main goal of the usability test is to observe how potential users will navigate around the mobile application. During the usability tests, the participants were given scenario-based tasks to do. As mentioned, these scenarios provided some context for the participant to complete the task. The scenarios are prepared according to the typical routine of a working adult. By creating more relatable scenarios, the participants might be able to provide more accurate insights.

Goals of Usability Test

The overall goal of the usability test is to validate the usefulness of the overall mobile application as well as specific features of the application. As potential users of a virtual try-on mobile application, there are main goals participants should accomplish:

- Try on the item virtually
- Purchase the item
- Plan outfits

Therefore, task scenarios were prepared to provide the participants with a realistic context. As a working adult who shops regularly and is keen on a virtual try-on mobile application, some scenarios they encounter might include:

- Spotting a nice apparel during lunchtime
- Shopping online on the way home
- Browsing online at home
- Looking to try-on virtually to avoid long queues for fitting rooms

In addition to the scenarios, the tasks provided also included specific action words. The tasks also excluded terms shown on the low-fidelity prototype. This is to check if the icons and tasks are intuitive enough for the participants.

Usability Test Questions

Finally, the generated task scenarios for the usability test were:

Task scenario 1: It is closing the end of your lunchtime. While rushing back to office, you spot a nice top. You want to save it to review later.

Task scenario 2: You are on the way home from work. You are casually browsing through your feed when you saw a nice pair of pants. Purchase the pair of pants.

Task scenario 3: You suddenly recall the top you saved earlier during lunchtime. You iwhs to see if the product is a good fit for you. Satisfied with the fit, you decide to purchase the item.

Task scenario 4: You have reached home! You are very excited for the purchase you have just made. You want to see how the top you bought will look on you.

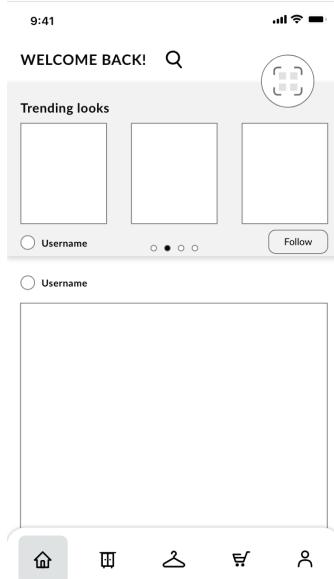
Task scenario 5: You are now getting ready to sleep. However, the upcoming days will only get busier. You want to prepare some outfits in advance to save time in the morning.

Task scenario 6: Finally!! The weekend is here! You are extremely satisfied with the top you bought. Since you have more time now, you decide to publish a post which include the details of the top.

Key Findings

Homepage

Before embarking on the task scenarios, participants were shown the homepage screen to guess what the mobile application is about. Participant 1 guessed that it was a fashion application used to browse for clothes while Participant 2 initially guessed that it was either an application for clothes or for makeup as the screen had a section titled “trending looks”. Participants were then asked to guess each icon of the tab bar from left to right (refer to Figure 1). Participant 1 went with home screen, closet, try-on, shopping cart and user profile while Participant 2 guessed homepage, wardrobe, clothes selection, cart and user profile.



(Figure 1. Homepage of the low-fidelity prototype)

When asked to guess the “Scan to App” icon on the top right, both guesses its either to scan a QR Code or a camera feature. Both also agreed that the layout was clean.

Build Avatar

In the building of a personalised avatar, Participant 1 mentioned that he was unsure of the difference between the default avatar option and the avatar shown on the screen.

Participant 2 mentioned that the building of the avatar was quite intuitive, and it was good to have the dotted lines on the avatar as a rough guide for the users.

Task Scenario 1

In the scenario given, the user was rushing back to office when he or she spotted a nice top. The user was to save the item and review it later. The task flow in mind was: Scan to app > scan the QR Code of the product > Quick add to closet. Both participants found the scan to app task quite intuitive and completed the task in the first attempt. However, Participant 1 thought the “Quick Add to Closet” button could be more prominent. Participant 2 found the button quite straightforward as it was the only call to action feature. Participant 2 mentioned that she did not expect the avatar to be wearing clothes, but on hindsight it made sense. Participants also expected to be able to zoom and rotate the avatar.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task
Participant 1	2	1
Participant 2	1	1

Task Scenario 2

In the scenario given, the user was casually browsing through the feed when he or she becomes interested in a pair of pants featured in someone's post. The user goes on to make a purchase. The task flow in mind was scroll feed > tap on product tag > product page > add to cart > view cart > checkout. Participant 1 tapped on the user tag instead of the product tag. The icon for the product tag is a clothes hanger, the same as the icon for the virtual try-on. This led to some confusion for Participant 1. Participant 2 went straight to click the product tag correctly.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task
Participant 1	1	2
Participant 2	2	1

Task Scenario 3

In the scenario given, the user wanted to check if the product is a good fit before making a purchase. The task flow in mind was digital closet > product page > virtual try-on > avatar mode > add to cart > view shopping cart > checkout. Even though both participants found it rather intuitive to complete the task, Participant 1 clicked on the wrong icon in his first attempt. Instead of the digital closet, he clicked on the personal profile and then settings. Even so, he mentioned that if he was more familiar with the application, he will not make the same mistake. Participant 1 also found it confusing to have multiple icons of the cart on one page. Both found the scan to app icon on the top right useful. Participant 2 mentioned that this scan to app shortcut might be useful as she can scan for the product quickly and see it on her avatar instead of having to queue for the fitting room. She can also easily scan from item to item.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task
Participant 1	1	2
Participant 2	1	1

Task Scenario 4

The context changes to the user being at home. The user wants to see how the top will look on him or her. The task flow in mind was digital closet > product page > virtual try on > AR mode. Participant 1 mentioned that he will use the AR mode at home in front of the mirror. In public, he will use the avatar mode. Participant 2 was not too familiar with AR so she

mentioned that she might be more reliant on the avatar mode since fit is of a top priority for her while shopping for clothes.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task
Participant 1	1	1
Participant 2	1	1

Task Scenario 5

In this scenario, the user has to plan some outfits. The task flow in mind was digital closet > plan > add new outfit > select outfit > drag outfit to the date. Both participants did not complete the task in the first attempt. This could be because both of them had not use an application or a feature to plan outfits before. Participant 1 clicked on the date on the calendar initially as he was comparing it with the calendar application on iPhone. Participant 2 clicked on the virtual try on icon instead of the digital closet. Even though both were not familiar, both mentioned that this way of dragging the outfits to plan is quite intuitive and convenient.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task
Participant 1	2	2
Participant 2	2	2

Task Scenario 6

In this scenario, the user has to publish a post which include the details of the featured item. The task flow in mind was personal > social account > add new post > share a look. Both participants managed to complete the task in their first attempt. However, Participant 1 mentioned that first time users could potentially be confused with the scan to app icon on the homepage and use that as the upload or new post button. However, Participant 1 also mentioned that this could be a one-time issue as a user is unlikely to keep clicking on the wrong icon once he or she establishes that the icon was just to scan the QR Code. Participant 2 mentioned that the upload button could be more obvious, and it is usually together on the homepage. However, Participant 2 mentioned that it is still understandable as this application at core is a virtual try-on shopping tool and not a social media application.

Participants	On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the task?	Number of attempts need to complete task

	difficult), how did you find the task?	
Participant 1	2	1
Participant 2	2	1

Overall findings from the usability test

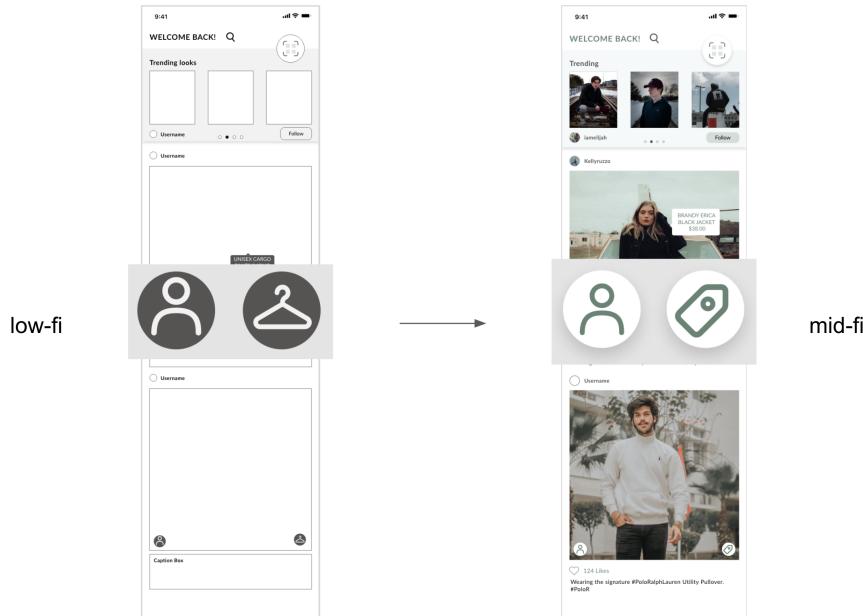
- Participants were able to identify the scan to app feature and its uses
- Participants expected and were able to navigate through the task flows
- Participants found the product tag icon problematic
- Participants found the add to cart button on the virtual try-on page problematic
- Participants were comfortable with the drag interaction for planning their outfits

Key Improvements

The iteration to mid-fidelity prototype included more colours and pictures for better visualisation. Aside, standardised fonts and buttons were introduced for consistency across screens. In addition, some key changes were introduced according to user feedback.

Change of icon for product tag feature

Participants mentioned that the product tag icon in the low-fidelity prototype could cause confusion as it is the same as the virtual try-on icon. This was a critical feedback as the virtual try-on icon is one of the main icons of the application. Furthermore, Participant 1 could only complete task scenario 2 after very obvious prompting. This was because Participant 1 clicked on the user tag icon instead of the product tag icon as he was convinced that the product tag icon (with the clothes hanger) was for the virtual try-on feature. As Participant 1 had demonstrated, the duplication of icons could prevent a user from using the product tag feature as he or she may have thought it was a virtual try-on feature. Participant 1 also suggested the use of a shopping tag as the icon instead. Even though Participant 2 did not face any problems in this task, she agreed that a duplication of icons might cause confusion for users. Therefore, the hanger icon which represents the virtual try-on feature will be replaced with the shopping tag icon for tagging products (refer to Figure 2 for the new icon).

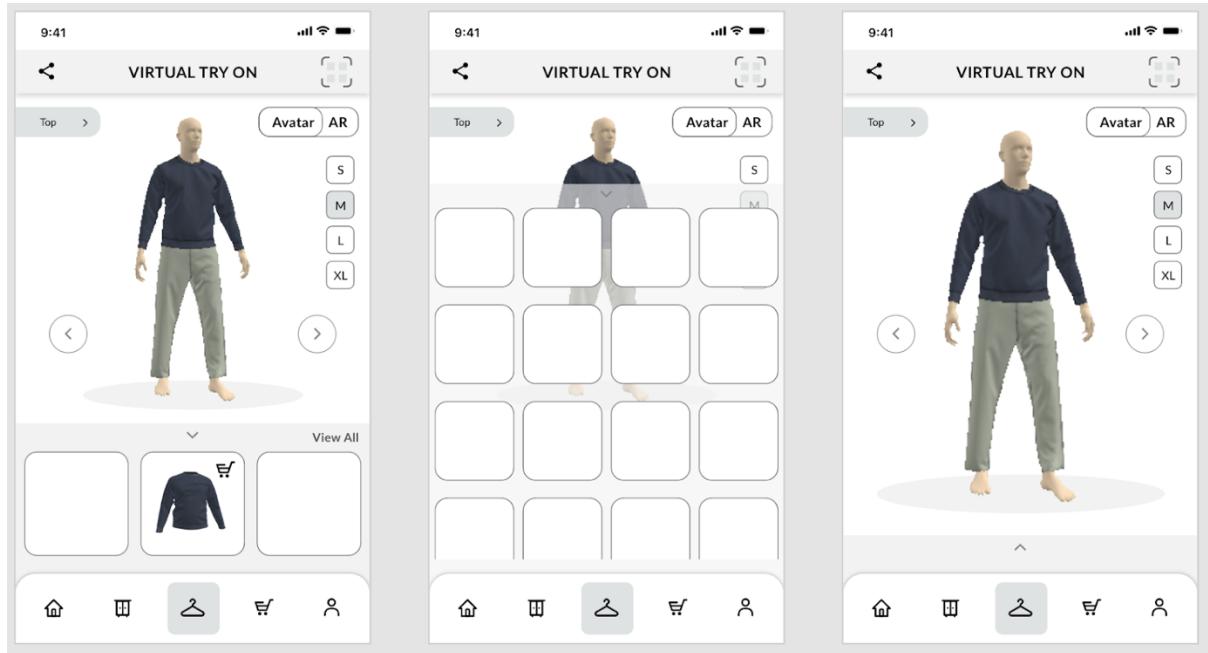


(Figure 2. Change of icon for product tagging)

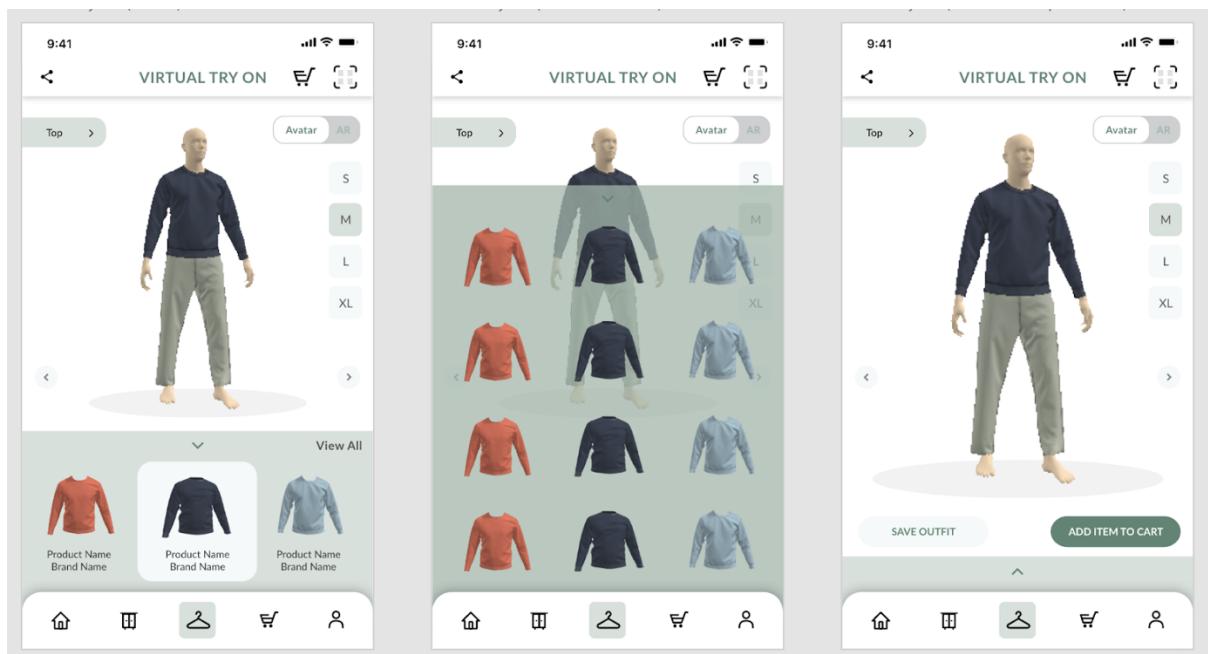
Removal of direct “add to cart” icon

Another critical incident was when Participant 1 highlighted that he felt confused because the shopping cart icon was located in the square, instead of the usual top right (refer to Figure 3). He said he only tapped on the smaller cart icon as the task specifically said to purchase something. However, he said that he did not understand what the smaller cart icon was for. The original intention of the smaller shopping cart icon was for users to make a direct “add to cart” without disrupting the virtual try-on experience. To prevent confusion, the direct “add to cart” will be removed entirely. Furthermore, it is likely that users will tap into the product page of the product instead of adding to cart since the icon is very small and of extreme proximity with the former.

Instead, it was replaced by a “add item to cart” button which states the use of the feature clearly (refer to Figure 4). An additional “save outfit” button will also be introduced for users to save the entire outfit on the avatar. Both buttons will only be visible when users collapse the view. This is because the virtual try-on feature is ultimately a tool focused on helping users visualise the fit on them. This tool is to help users make more careful purchases instead of making impulse purchases. While the additional features will provide user with the convenience to add to cart and make a direct checkout, the priority of the virtual try-on feature will still be on visualising items on the avatar, and not pushing for the user to “add item to cart”.

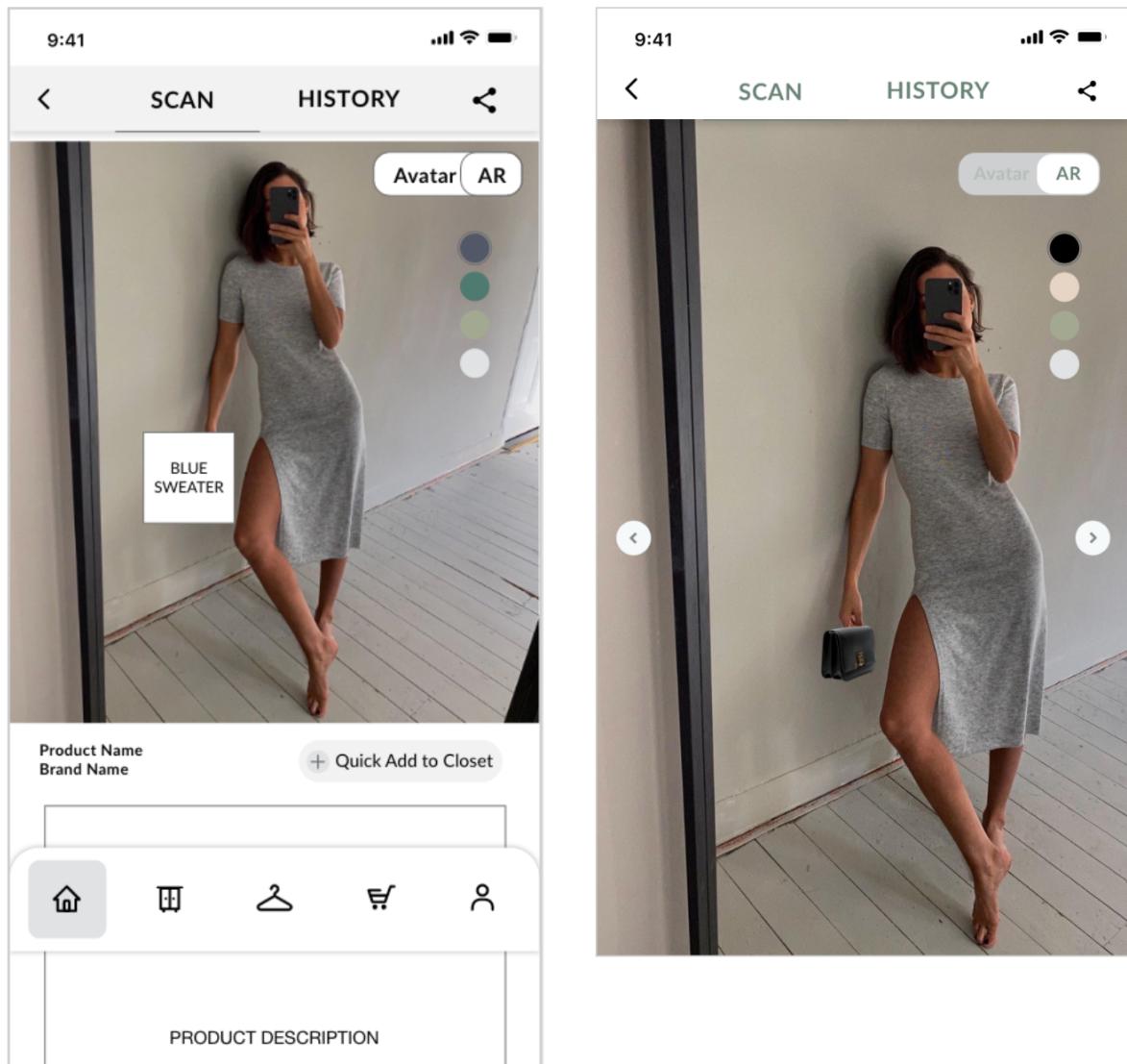


(Figure 3. Low-fidelity prototype with a direct “add to cart” icon)



(Figure 4. Mid-fidelity prototype with the “add item to cart” icon only visible in collapsed view)

Extension of screen for AR mode



(Figure 5. Comparison of AR modes (low-fi on the left and mid-fi on the right)

Aside, Participant 1 also mentioned that he is likely to use the modes depending on context. He mentioned that he will use the avatar mode when he is outside while he will use the AR mode when he is at home. Also, when the AR mode is in use, users are likely to prefer the entire screen to visualise better (refer to Figure 5 above). Therefore, in “scan to app”, the product description will only be available for the avatar mode. Since the more important icons are flushed to the right, the user can switch to avatar mode from AR mode easily to view the product details.

Minimising icons and font size

Both participants expected to be able to zoom into the personalised avatar. This meant there is a lesser need to provide them with obvious gestures as to how to zoom into, zoom out and rotate the avatars. This should be manageable if they explore the avatar page a little more.

The ability to zoom into, out and rotate will be notified through onboarding. Therefore, the side arrows have also decreased in size to provide more screen area in the avatar and AR mode. Aside, the position of the side arrows is also lowered to cater for users when they are using the phone single-handedly. Users can tap on the side button easily to rotate their product in 3D or to rotate their avatar.

Others

Aside, other minor improvements include the inclusion of the like button for users to like posts. Since the like button clashed with the previous heart icon for products the user has saved, the heart icon is replaced with a save button now. Both participants also expressed satisfaction with the minimalist layout, so the mid-fidelity strived to achieve the same as well. Also, both participants found the drag interaction in “Plan” new and useful. They thought dragging the outfits to the calendar made the process easier as a whole and for visualisation.

Therefore, the usability test findings have revealed a number of critical incidents which contributed to the iteration of the prototype. Both participants commented that the overall experience in the usability test was generally smooth and the tasks were easy. They also mentioned that the tasks were realistic. Even so, the usability test took place through an online Zoom meeting. The prototype was tested on a desktop instead of a mobile application.

From the iterated mid-fidelity prototype, a heuristic evaluation was also conducted.

Heuristic Evaluation

Heuristic evaluation was conducted in the iteration of the mid-fidelity prototype to high-fidelity prototype. This was conducted using Jakob Nielsen's 10 Usability Heuristics for User Interface Design. Since the mid-fidelity prototype was organised according to different user tasks, the heuristic evaluation will likewise be conducted according to the user task with their following screens. Furthermore, these user tasks were carefully decided upon as they are the more common tasks users will want to accomplish on the application. Thereafter, the severity will be scored in consideration of three factors suggested by the Nielsen Group.

Frequency: Is the issue encountered by users common?

Impact: Can the issue be easily overcome by users?

Persistence: Is the issue a persistent one, or a one-off occurrence?

The severity ratings are detailed as below:

- 0 - Do not agree that this is a usability problem
- 1 - This is a cosmetic/superficial usability problem
- 2 - Minor usability problem (low priority)
- 3 - Major usability problem (high priority)

4 - Usability catastrophe (critical)

Therefore, the heuristic evaluation will specify the user task or main feature, list the issues in violation or fulfilment of the usability heuristics, rank the severity of the issue before going on to provide some recommendations. Subsequently, the recommendations will be incorporated in the high-fidelity prototype.

Task 1: User scans an item to add to digital closet

Usability Heuristic / Severity	Issues or Justification / Evaluation	Recommendation
Visibility of system status Severity - 2	<p>The initial process was for the user to scan the product and wait for the product to be projected on the avatar. Meanwhile, the screen will freeze for a while. However, the user is not provided with appropriate feedback on the preparation of the product to be projected on the avatar. The user might misunderstand this as an unresponsive screen instead.</p> <p>Even so, this issue can be easily overcome by users. The scanning of the product to the application is projected to be completed within seconds. Even if the user contemplates if the screen froze, the next screen should arrive before the user restarts the application or leaves the page.</p>	Show a green tick with the text “preparing to view product in 3D ...” to inform the user that the product is being added to view in 3D
Match between system and the real world Severity - 0	Words used in the screens of this task are relatively simple and easy to get. Keywords include “scan”, “history”, and “add to closet”. As a shopping and dressing tool, allowing users to “add to closet” is signifying to the user that they can add the item digitally, to a digital closet. This is close to real-world conventions where they store an item in their physical closet.	

User control and freedom Severity - 2	<p>After clicking “add to closet”, users should notice the switch in button to “added to closet”. However, users might not realise that they can tap on the button again to “undo” or “redo” the action.</p> <p>Even so, it should be quite intuitive for the user to know that they can toggle the same button to remove the item. Along with the switch of states, there is a switch of colours and icon. The “add to closet” has a plus sign while the “added to closet” has a tick.</p> <p>Therefore, this issue should not be too common.</p>	Recommendations will not be made here unless the problem proves to be a persistent one during testing in the future.
Consistency and standards Severity - 0	Aligned with the typical process of scanning a QR Code for contactless payment, the process of scanning a product’s QR Code to add to the application follows a similar flow. In terms of scanning, users are unlikely to face any difficulties.	
Error prevention Severity - 2	<p>Users might accidentally tap on the cross on the top right while scrolling.</p> <p>However, the issue encountered by users is unlikely to be common. The “add to closet” button is significantly more prominent than the small cross on the top right.</p>	Present a confirmation message: item will be permanently deleted from scan history. This retains the convenience for users to remove an item entirely easily.
Recognition rather than recall Severity - 0	<p>Tab bar is permanently fixed. The top section which features the “scan” and “history” sections are permanently fixed as well.</p> <p>This makes the section and tab bar visible at all times. Users can also</p>	

	switch between the avatar and AR modes easily.	
Flexibility and efficiency of use Severity - 0	The avatar and AR screens come alongside with small arrow icons to signify to the novice user that the 3D product can be rotated freely by tapping on them. However, for the experienced users, they can use one finger drag to rotate their avatar. In both modes, the experienced user can pinch on the avatar or the product to zoom in and out. Users need not tailor these interactions. It depends on the user preference to view the product single-handedly or to view a certain product face quickly instead of tapping continuously just to arrive at a certain product face.	
Aesthetic and minimalist design Severity - 0	The entire application seeks to incorporate a minimalist design. The number of icons and words on the screens are kept to the minimum. For the tab bar, words depicting the icons such as "home", "digital closet", "cart" and "virtual try-on" are also not included deliberately. It is believed that users will familiarise themselves within a short period of time. The icons are quite clear as well. This was also validated by the participants during the usability test.	
Help users recognize, diagnose and recover from errors Severity - 4	Users might be scanning an invalid code while performing this task. The current mid-fidelity prototype does not provide for such a situation. This might prevent users from progressing their task since they are not provided with an alternative to return. Problems with the scanning of the code could be	A notification can appear to let the user know of the invalid code: The code does not seem to be valid. The notification should also come with an option leading the user to "Scan Again".

	very common and it is imperative that users are provided with an easy route to overcome this.	
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Task 2: User browse feed and purchase a product featured on one of the posts.

Usability Heuristic / Severity	Issues or Justification / Evaluation	Recommendation
Visibility of system status Severity - 0	There is visual feedback for the user after adding an item to cart.	
Match between system and the real world Severity - 0	The names of the pages are “shopping cart” and “checkout” which is similar to many e-commerce applications. These are definitely terms users are very familiar with and should not have a problem.	
User control and freedom Severity - 2	Similar to the evaluation above, it should be quite intuitive for users to toggle from the “add to cart” state to the “remove from cart” state. It should be intuitive enough for users to know tapping on the button can redo and undo the add to cart easily.	Recommendations will not be made here unless the problem proves to be a persistent one in future testing.
Consistency and standards Severity - 0	In the previous task, the user can tap on the “add to closet” button to undo the action. Similarly, users can tap to add or remove an item from the cart.	
Error prevention	Based on the specific measurements, the application	When selecting another size (not recommended size), the text will

Severity - 3	<p>provides a recommended size for the user. Even though there is a “smart recommendation” feature where the application recommends the user the correct size, the user might miss the recommendation and continue to purchase an item with the wrong size. Even if the user saw the message, it is possible that the user added the wrong size.</p> <p>To prevent the user from adding a wrong size to cart or to checkout, the user should be prompted that the size is different from the recommended one. This is a major usability problem as it is likely to be a persistent and common one. As the application is positioned as a shopping and dressing tool, the smart recommendation is an important feature. Therefore, the smart recommendation should be more visible to help users make informed decisions.</p>	<p>change to red and display: chosen size is not recommended). This message will also appear under product details in the shopping cart and checkout page. For the checkout page, a confirmation message would be prompted for the user to “confirm to proceed”.</p>
Recognition rather than recall Severity - 0	Icons in the screens of this interaction are all visible.	
Aesthetic and minimalist design Severity - 0	Screens follow the same consistency.	

Task 3: User navigates around the digital closet. User makes a purchase from there.

Usability Heuristic / Severity	Issues or Justification / Evaluation	Recommendation
Visibility of system status Severity - 3	When the user places an order, there is no visible progress made known for the user. This might cause some confusion.	Provide “Placing order...” screens with a loading circle
User control and freedom Severity - 4	Sub-feature: Plan While users can drag an outfit to the desired date, they are unable to undo this action. The impact of this issue is relatively large as users should be able to make changes and plan their outfits as easily and flexible as possible. Since decision-making is crucial in planning outfits, users should be able to delete an outfit as easily as it is to add.	When users are dragging an outfit, the bin icon will also be visible. This allows the user to drag to the desired date or drag to the bin to remove items from the calendar.
User control and freedom Severity - 4	Task: Making a payment Users are unable to cancel an order before making a payment. Without a cancel option, users have to go through the refund process, either in-store or return the parcels themselves which could be a lengthy process. As an application which strives to be a shopping tool, it should definitely provide for the cancel button while processing the payment.	Users are able to hit the cancel button before the payment is being confirmed. This can reduce unnecessary steps to refund.
Recognition rather than recall	Sub-feature: Recents The first thing a user can see is the recently viewed or added items in the	

Severity - 0	digital closet. This reminds the user about the last searches and items needed.	
Aesthetic and minimalist design Severity - 4	<p>Sub-features: Recents and Collection</p> <p>Users might be distracted by the small cross icon on top right of every product icon. The small cross icon is present in “recents” and “collection” pages of the digital closet.</p> <p>Furthermore, the digital closet will feature a significant number of clothing stored digitally. This means there should be a feature catered for users to select multiple apparel and delete at once.</p> <p>Therefore, the recommendation should allow the user to browse their own collection without distractions and be able to select multiple items at once. The severity of 4 is awarded as the presence of numerous cross icons can affect the user’s browsing experience. Without an improvement, the user will frequently face this persistent problem. Without a new solution, they are unable to overcome this easily.</p>	<p>Introduction of a new “select” button. This will combine the “save” and “delete” function.</p> <p>When users click “select” they will be provided with the option to save single or multiple items or delete single or multiple items. For delete, a prompt will notify the user: Are you sure you want to remove 1 item? For multiple items: Are you sure you want to remove 4 items?</p> <p>This recommendation might seem to violate the consistency and standards heuristic. This is because in task 1, users are presented with the small cross icon to delete an item from the scan history quickly. However, this feature was introduced on the assumption that the scan history is not as lengthy as the items in a user’s “digital closet”. Therefore, it is more convenient than distracting for users to clear their scan history quickly. However, when a user is in “digital closet”, they are more likely to be comparing and browsing through multiple items. The cross might then be more distracting than useful.</p>

Feature: Virtual Try-On

Usability Heuristic / Severity	Issues or Justification / Evaluation	Recommendation

Recognition rather than recall Severity - 0	The category will be shown on the top left.	
Flexibility and efficiency of use Severity - 0	The virtual try-on process can be navigated by the novice user and accelerated by the experienced ones. For the novice users, they can click the drop down of the category. For the experienced users, they can tap on the product which will show them the different selection in the product category.	

Feature: Build Personalised Avatar

Usability Heuristic / Severity	Issues or Justification / Evaluation	Recommendation
Error prevention Severity - 4	Users did not know if the measurements are valid or not. Even though this might be a one-off issue as it is more for new users who have to input their measurements and is relatively easy to overcome, the process could become a frustrating one. This might affect the chances of a first time user converting to a regular user.	Represented by red if there is an error in the measurement or green. The “continue button” will not be activated until measurements required are all in green.

Summary of key findings

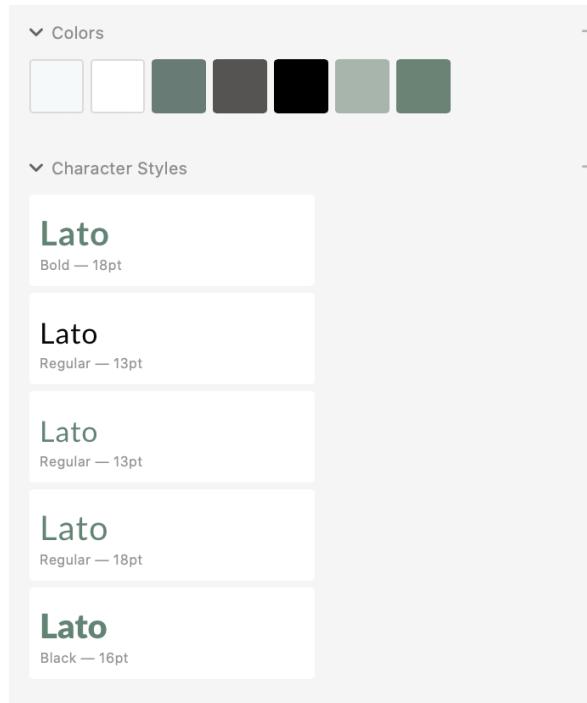
Breaking down the findings from the different tasks and features, one of the recurring violation is for the error prevention heuristic. In the mid-fidelity, there is an absence of indicators to prevent users from making mistakes. As a shopping tool, the application should strive to provide as many indicators as possible to enhance usefulness.

Aside, the usability heuristic of Help and Documentation is entirely absent. Even though participants have validated in the usability test that the prototype was quite intuitive, documentation should still be provided as each user has different abilities. The impact of each user overcoming different issues might vary vastly. Therefore, the high-fidelity prototype will incorporate a brief onboarding guide to explain the key features of what the application has to offer for new users. This will also encourage retention of new users.

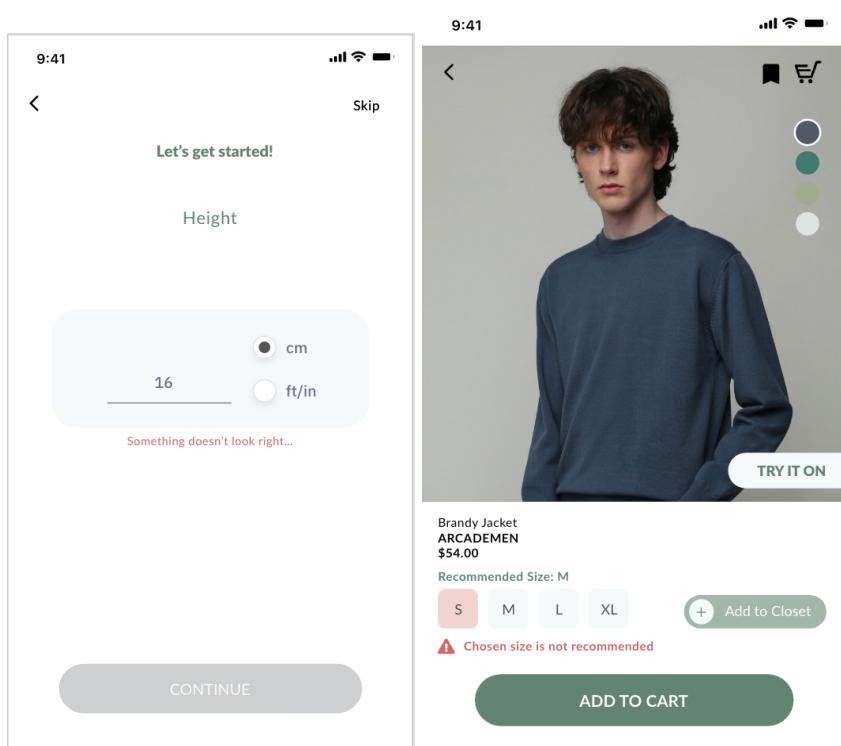
Other crucial gaps would include the absence of a delete option and a limited visibility of system status. The proposed recommendation will be used to iterate the mid-fidelity to high-fidelity prototype.

Iteration from mid-fidelity to high-fidelity prototype

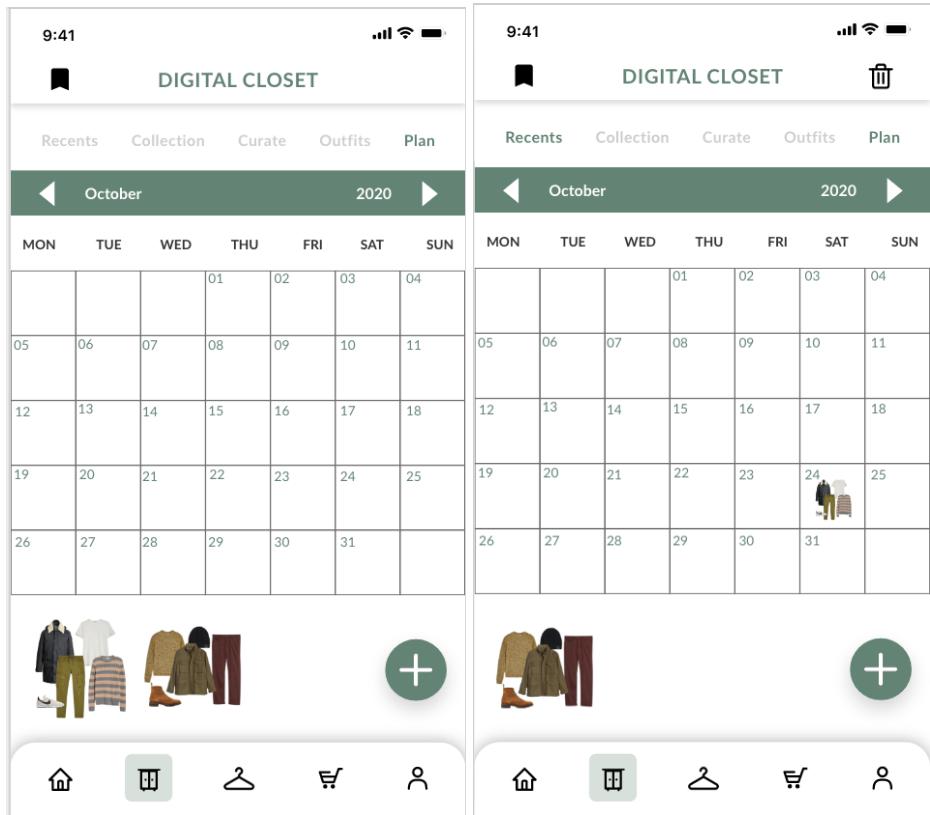
The elements in the high-fidelity prototype were designed to be as consistent as possible. A fixed set of green, black and white were used so the application looked clean and less distracting. The colours also contrasted well. Only error messages will be highlighted in red to capture the attention of the user.



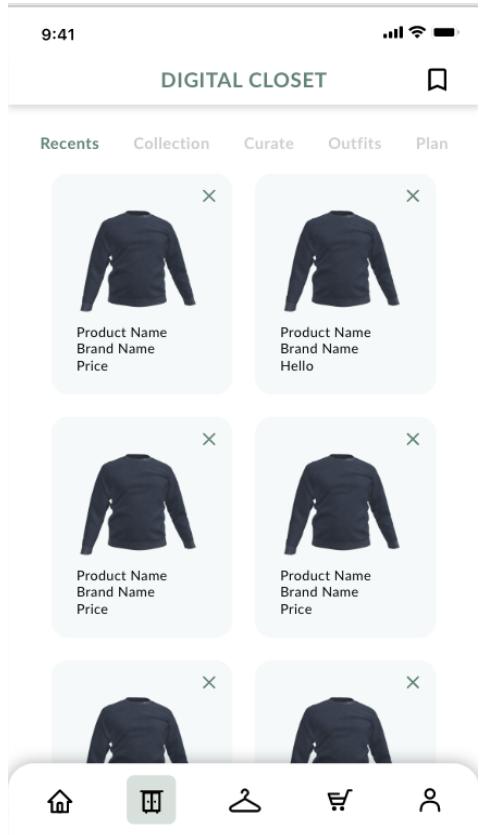
Aligned with the recommendations, the high-fidelity prototype will enhance the visibility of error messages and make certain buttons inactive. This can be visible whenever the user accidentally adds something in a size different from the recommended size. Ideally, the user should be able to toggle the on and off mode for smart recommendations if he or she is not comfortable with viewing the error messages constantly. However, since it is not a serious issue, the toggle can be included in future iterations.



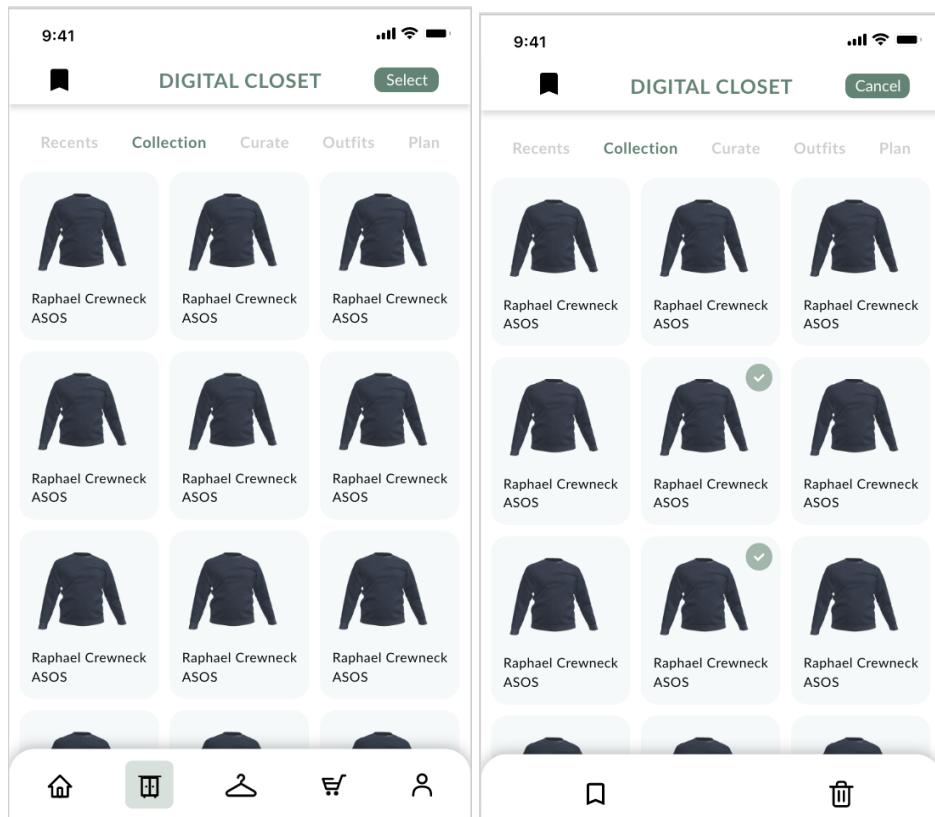
As mentioned, the absence of the delete option in Digital Closet was awarded with the severity rating of 4. In the high-fidelity prototype, users can now not only drag the outfits to the desired dates, they can also drag to the trash to remove. This allow users to plan their outfits in a more flexible manner. This is aligned with the minimalist design as it only shows the trash icon when necessary. For new users, this step is also elaborated on in the onboarding screens.



Likewise, the high-fidelity prototype also introduced the delete option for the other sections of Digital Closet. In the mid-fidelity prototype, users were expected to delete an item by tapping on the cross icon. The multiple cross icons could be seen as distracting for the user. In the high-fidelity prototype, a new “select” button is introduced to collapse the save icon and the trash icon. With the new “select” button, the user can also delete or save items faster by tapping on multiple items at once.

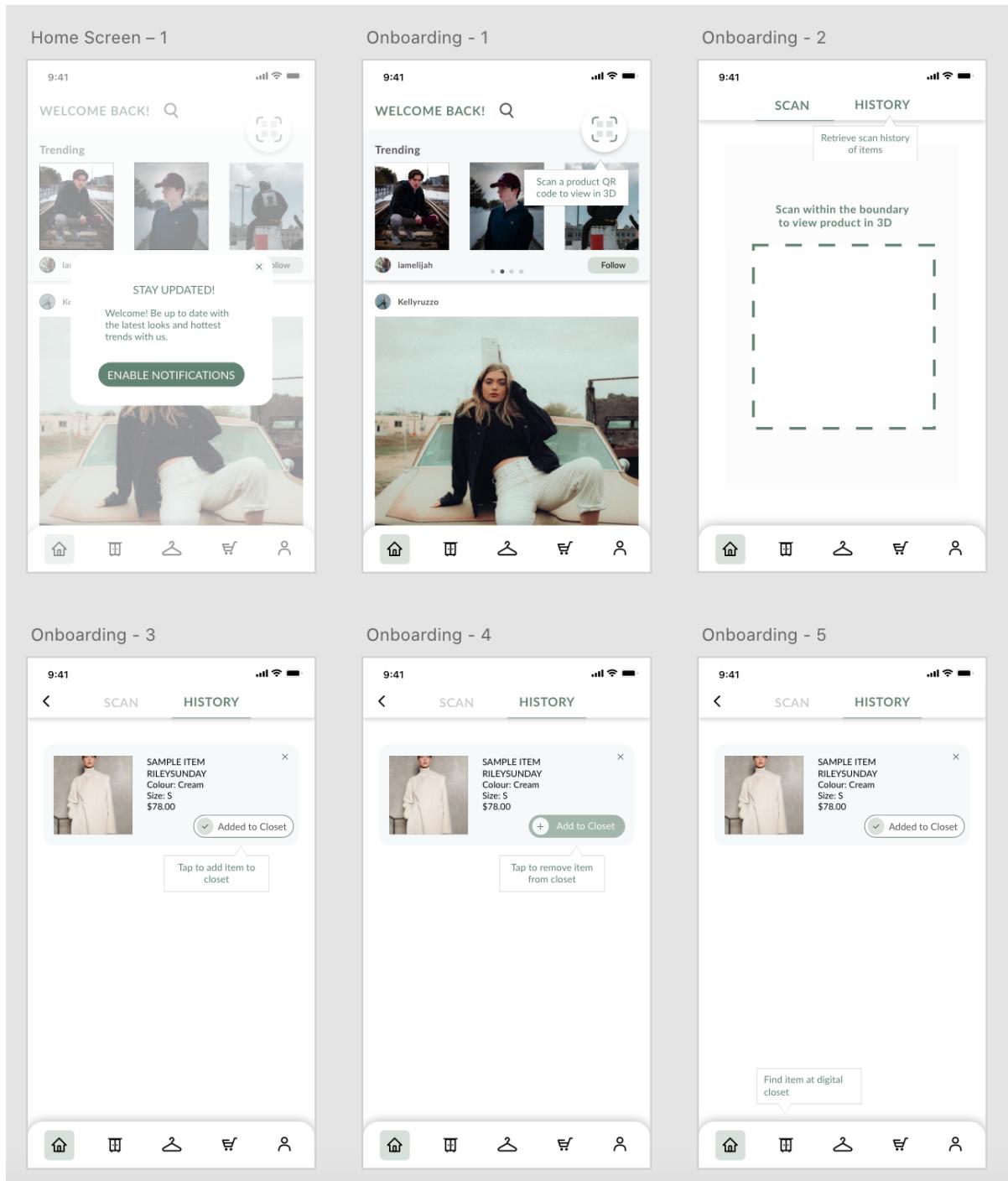


(Mid-fidelity prototype of Digital Closet - Recents)



(High-fidelity prototype after iteration)

To rectify the violation of help and documentation heuristic, the high-fidelity prototype also included a series of onboarding screens for new users. It is kept as brief as possible yet still informative enough for users to navigate around.

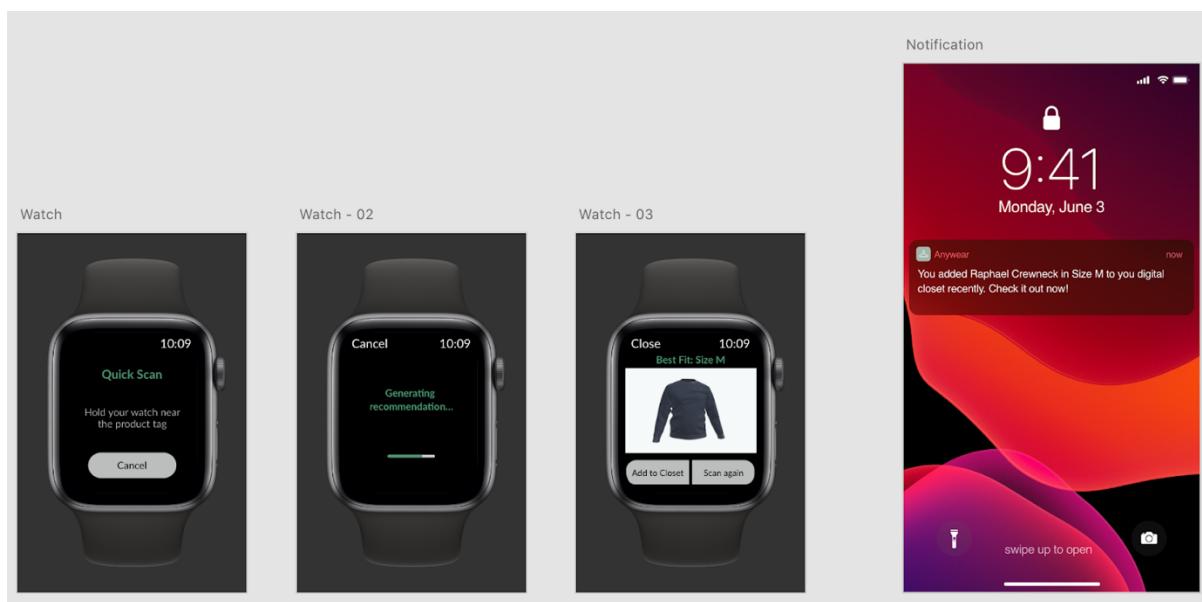


(Some of the onboarding screens featured in the high-fidelity prototype)

Aside, the design was also iterated to provide users with more feedback for example the placing order and scanning screens for direct check out and scan to add processes respectively. This was aligned with the visibility of system status heuristic.

Future Direction - Wearables

If successful, the mobile application can expand to a watch application to enhance overall mobility for the user. When shopping in-stores, users might find it more convenient to scan using a watch while juggling several items at a time. It might be useful if they are able to place the watch near the electronic tag of a product and receive smart recommendations from the application. This reduces the need for users to pick out the same item of varying sizes for physical try-on. Aside, they are able to add to their digital closet quickly and view them when they are ready to.



(potential screens for watch application of Anywear)

Conclusion and Future

Aside from enhancing the shopping experience, the proposed design enriched the experience by making it mobile. As a shopping tool which provides for social interactions, it is highly interactive. The design of the application strives to provide convenience for the user by understanding the context and potential needs. In the iteration, many critical violations of the usability heuristics were corrected to produce a viable prototype. While the process from ideation to the prototyping was very user centric, it might be useful to also look into interactions for a potential retailer. Proposed interactions can also attract retailers to provide items which have QR Codes that are compatible with this mobile application.

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Appendix 1 - Screenshots of the interview

Categories	Questions	Interviewee 1	Interviewee 2
Opening	Hi, I am Mavis. Thank you for accepting my interview. I am working on a project which requires me to understand some of your shopping habits and preferences. To narrow it down, we will be focusing on apparel and accessories shopping. To begin, I will share the aim of my interview so it is to explore some difficulties faced in shopping for clothes and accessories online and offline, to explore the difficulties of shopping without the opportunity to try on the product as well as identifying some features you, as a user, might want in a mobile app which can enhance your shopping experience		
	Please share with me your age and gender. Can you also share with me your occupation?	i am 26 years old, male and ops executive doing facilities management	I am 23 yo female, im working in corporation and doing hr and started work for around 1 year
	How much do you typically spend on for clothes? Can give a range.	\$200-\$300/month but ok it may vary, guys shoes \$150++	depends on the season depends if the collection is nice - on average \$100-\$200/month
	When was the last time you shopped for something?	yesterday,	one of two weeks ago
	What was the last item that you shopped for?	looking for long sleeve shirt (casual wear/work wear)	a dress
Introduction	Where do you usually shop from? Why?	h&m, uniqlo, zara, pull&bear - fashion, aligned to your style but usually is mobile>offline	mix of online shops, online shops that do not have retail stores - convenience being at to shop online as compared to having to go down to the physical store
	What are some of the apps/websites you use when shopping? Why?	instagram, youtube and online fashion retail - arcade, dont have a physical store but they do have a pop up have social media presence as well	- zalora app, amazon, asos, direct brand websites or zara, robinson's online version
In-store shopping	What is your typical routine when you shop in-store? (describe experience)	- try on clothes > share picture with friends and girlfriend ask them help to make a decision > give some inputs on if it looks good on you and fits your style - especially peak hour, the queue for fitting room can be quite long and quite crowded, and clothes are thrown everywhere.	- few months ago, browse through, grab some pieces and join the long queue and head inside to try the pieces - can only shop on weekends and the crowd on weekends is quite heavily so 30 minutes - 1hr - which is why user has to turn to online shopping
	what are some difficulties or drawbacks you face while shopping in-stores?	- forgetting about a product - long queues for fitting rooms - tired from trying on - current outfit doesn't match the clothes you want to buy - or the compatible ones are at home - shop in entire outfit sets - shop for basics from other shop - comparing (value for money, mostly colour and price)	- long queues - certain branches do not have sizes you want so i might have to visit another branch or i will just opt for buying that online but not all brands offer that option
Online Shopping	What is your typical routine when you shop online? (describe experience)	- u only shop online when u feel like u need new clothes, email marketing will lead u to browse - browse on instagram - who do you follow: influencers and store brands - product try on (measurements) - relaxed fit distorts the vague measurements	- after visiting the platform i will take a brief scroll to items and then i'll add to cart or open separate tabs - then i will scrutinise and narrow down to the outfits i am still interested in - looking at the interested pool again
	what are some difficulties or drawbacks you face while shopping online?	- consolidate your looks - mix and match from different retailers (even in physical store u cannot try both items) user screenshot different outfits or save on instagram (very haphazard)	- most of the time i am unable to try the clothes so i rely on the description for the material and sizes - sizes are hit or miss, different stores have different cutting - using a unique converter - sizing - i cant imagine how it looks like on me (compatible)
	when purchasing online, what are some products you left in the cart? and what are the reasons for doing so? (can refer to the app that they use frequently)	- usually delete the items because user claims he is organised - usually left in when undecided or want to get a second opinion before actually purchasing it	- clothes that are still taking longer to consider - reduce impulse shopping partially and also not 100% confident that it will fit nicely (its about both but more on visually) i worry that it is not visually compatible

	what are some sources that trigger a purchase?	- Youtube and Instagram and looking at street styles (looking at work and casualwear)	- if it looks good on a model - well photographed items on the websites
	what do you like most about these sources? why?	- convenient, see them as and when i want - can browse social media	- visualise on yourself
	out of all, which is the main source that usually drives a successful purchase. why?	- youtube have influencers and then they will put a link in the description box then i will click on the link and if i like it i will go in store to purchase it or purchase it directly	- statistics of the model gauge based on model's build and measurements and if she is of a certain height then i will scale it according to the length of the outfit
	what is your decision making process before you purchase something? (online and offline)	- 15 mins to compare across retailers, then go in-store to try it first - more options would be good, limited retailers locally - overseas have more options but its pricier bc of the shipping fee	- depends if i am considering between two pairs of skirts, i will gauge based on the length and compare it with the model build and then i will visualise how long it is and how it will fit me and i will choose the length that is more ideal
	how long does it take before you decide on a purchase usually? (e.g do you browse for a long time before u decide)	- go website, look through what want to see such as tops bottom outerwear, look at campaigns they have - usually take around 2hrs to browse through all on the weekends or after work - during working hrs, browse casually on social media and saving them to see in future	- it depends and asking friends for opinions (a few hours) - browsing takes on and off so (and i will revisit it again) - at least three hours before i finally make the checkout
	do you use social media? when was the last time you used social media? when do you usually use social media?	- yes - just now - anytime everyday, whenever i'm free	yes i do, like 5 mins ago, all day long whenever use has free pockets of time
	can you list the top few social media apps you use - in order of frequency.	- Instagram > YouTube	instagram, telegram, youtube, facebook
	what do you usually browse for/use the app for? (influencer marketing, models, outfit inspiration)	- browse outfit inspiration, saving outfits	- on the topic of shopping, recently a lot of blogshops are trying to do live try ons
	what was the last thing you browsed for?	- an academian top	- yes i believe it was some apparel
Shopping & browsing habits	do you follow any online influencers for outfit inspiration?	yes, quite a few actually. around 20 or more, use the explore page also	- yes, i follow quite a number of brands at least 10 brands and 10 influencers (aligned to style) at least 70% and 30% is of a different inspiration
	When was the last time you tried on something in-stores? What was the product? Did you purchase it?	- last week, uniqlo top, no	few months ago, couple of clothes - oh no i didn't get in because after trying them on it didn't fit that well
	why did you decide to try on the product?	- to check if it is compatible with me, try on the product see if it fits	- try on because of visual fit and measurements
Importance of product try-ons	do you switch to online purchasing after you try on the product in-stores? why?	- not exactly, i usually browse on the go (mobile) then head in stores to try on and then make my purchase from there	- sometimes i do because after trying it on, i will go back and consider again if i want the item in another colour, i'll take more time to consider or sometimes there are credit card promotions which allow me to purchase only - mix of both depending on the benefits
virtual try on	are you familiar with virtual try-ons?	not really	not familiar
	if yes, what are some virtual try-ons you have tried before? how was your experience? would you try it again?		
	if no, will you be willing to use virtual try on when purchasing something?	yes definitely, i feel like it might be useful when shopping online	willing to try virtual try on for online shopping
	potential challenges	yes useful - adding in specific measurement, but it might be a hassle to measure if they don't know how to measure	
additional functionalities	do you curate and plan your outfits in advance?	yes, i have to rush in the morning	yes definitely - im guessing its an app that i can use, i'll input the different types outfit and it will be useful if i can mix and match and plan. it takes quite long to plan our outfits. it depends so i plan the night before. - 30 minutes.
	do you compare a potential item with your existing wardrobe?	yes	this is something that will be very helpful - not just me i think it will be very useful when we shop together so we have to rack our brains on the stop. so with such a feature it would help us save a lot of time and hassle,
	do you do online payments	yes, for online gives me more payment option - actually this feature would be very useful for in-stores as well - can skip the queues	yes of course
	what are some features you would like to see in an app which complements your shopping experience? why do you want these features?	- during lunch time, see interesting outfits in-store/reality but no time to save the look for future reference	i think it will be good if the avatar can be customised according to your height and size. can drag the clothes to your avatar. just to build is fine for a start. if we can have more in-depth like showing the face then definitely open to considering it
closing	are there any issues or suggestions you have for me?	- shentonista (outfits by like normal people) - day to day outfits	- linking it together with the checkout - and linking it to social media accounts so i can post it straightaway - at times if i need opinions i will post it and do a poll and it will be useful to link it to the app and get ur friends and followers to vote
	thank participant		

Appendix B - Usability Test Findings

Themes	Guiding Questions	User 1	User 2
Opening	<i>If they face any problems, prompt them to ask what were they thinking etc</i>		
Introduction	<i>Before we begin, can you share with me your age and occupation?</i>	26 yo, ops executive	24 yo, digital marketer
Warm Up	<i>Do you shop for clothes? Where do you usually shop from? Have you done any shopping recently?</i>	yes bought a facial cleanser	clothes off shopee - last week
Introduce Prototype and begin user testing	<i>Now I'll like to share something I have been working on. It is a low-fidelity prototype. This means some of the functions may not work. Remember to think out loud when you are browsing through the app. A gentle reminder that I am testing the prototype and not you.</i>		
First Impression - homepage	<i>What do you think this app is about?</i>	fashion app, browse through clothes	clothes app or a makeup app - cus of the heading (trending looks) - build avatar - quite intuitive - good to have the dotted lines to roughly serve as a guide to what part they are measuring
	<i>For the try-on button: What do you think these features are for? (tab bar)</i>	L-R: home screen, closet, try-on (hanger) (hanger and closet icons might be confusing), shopping cart, user profile	clothes hanger, cart (shopping app) (homepage, then wardrobe, clothes selection, shopping cart, user profiles)
	<i>What do you expect when you press on the scan to app button?</i>	top right to scan a qr code or take	camera/qr code
	<i>What is the overall impression?</i>	clean layout	its quite clean layout
Intro to scenario-based questions	<i>Now, let's go through some tasks.</i>		
guiding questions: • What do you want to do? • What were you expecting to happen? • What is the system telling you? • Why has the system done that? • What are you doing now? any preferences/ features you expected?	<i>Task: It is closing the end of your lunchtime. While rushing back to office, you spot a nice top. You want to save it to review later.</i>	not sure whats the default avatar and the avatar i see on the screen	user click into scan to app function, quite straightforward to scan qr code, button is clear to lead to the action platform
	<i>Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find the process of scanning the item to app?</i>	2, quite intuitive but the issue is that the button of add to closet is too low, perhaps it could be high or more prominent, colour change - that make it stands out	1
	<i>Q2. What do you like about this feature?</i>	easy process,	yes
	<i>Q3. Was this what you were expecting?</i>	satisfied	i wasnt expecting the avatar to be wearing the clothes, but it makes sense . want to zoom in (plus/tap zoom or a finger zoom)
	<i>Task: You are on the way home from work. You are casually browsing through your feed when you saw a nice pair of pants. Purchase the pair of pants.</i>	user tapped on the user tag instead as icon is misleading, it is the same as the virtual try on icon, suggested to use a shopping tag instead	clicked hanger, then click the black tag, product page, purchase
	<i>Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how would you rate this task?</i>	1	2, (expected the add to cart button more in your face)
	<i>Q2. What kind of features are you expecting on the homepage?</i>		
	<i>If they face any problems, prompt them to ask what were they thinking etc</i>	place order and check out button to be the same consistency	fine with just looking at the tags, agrees that the icon is repetitive can be confusing.

closet>product page	Task: You suddenly recall the top you saved earlier during lunchtime. You wish to see if the product is a good fit for you. Satisfied with the fit, you decide to purchase the item.	clicked on personal profile and then settings instead - however, believes that this mistake is a one-time thing	digital closet > recents/collection > try-it on> clicked on the mini cart > place order
	Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how do you rate this task?	1	1
	Q2. What were you expecting when you tap on the try-on icon?	depends on the context - if he is on the bus/on the go, he will use the avatar. clicked on shopping cart icon. expected the shopping cart icon to be on the top right, suggested to eliminate the shortcut (confusing to have a cart there - its not smt that everyone is familiar with as usually it is located on the top right) finds the scan at the top right useful.	prefer an add to cart button for impulse buying, (or the plus sign then let the cart have a plus 1 sign)
	Q3. What were you expecting when you tap on the closet icon?	within expectations	scan to app icon is very useful because you dont have to queue for it, faster scan and check, faster to scan from one item to another
	Task: You have reached home! You are very excited for the purchase. You want to see how the top you bought will look on you.	user will use if they are in front of the mirror. space for me to overlay, probably wont do it in public.	user doesnt know what AR is - so might not know how to navigate
	Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find this task?	1	1
	Task: You are now getting ready to sleep. However, the upcoming days will only get busier. You want to prepare some outfits in advance to save time in the mornings.	user pressed the date first then get the outfit in.	user chose either closet or fitting icons > went to outfits > then plan > drag the outfit
	Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find this task?	2, user has never done this before, unfamiliar with it.	2, user will still keep it separate
	Task: Finally!! The weekend is here! You are extremely satisfied with the top you bought. Since you have more time, you decided to publish a post which include the details of the top.		
	Q1. On a scale of 1 to 5 (1 being very easy and 5 being very difficult), how did you find this task?	2, first time users could get confused with the scan to app icon instead of the share post icon.	2,expected the post button to be on the homepage/more in your face - but understands that the app is not social media-centred
Closing Questions	How did you find the overall experience?	pretty good, generally smooth,	pretty good eh
	• What was the best/worst thing about the prototype?	adding into the cart was not great from virtual try-on	best thing: true to fit 360 avatar, kind of like the planning worst thing: the trending looks (ur priority on the featured product, but not on the user). (hashtag function, will show you the people who are wearing shirts) - product based, expecting to follow more of labels than individuals.
	What most needs changing?		shopping tags
	• How easy were the tasks?	generally easy	generally easy
	• How realistic were the tasks?	quite realistic - something you would do	scenarios, pretty realistic
	Do you have any other suggestions/feedback?	not really, so far it is quite a good app - minute issues	it will be nice if the app is real
	Are there any additional features you think would be desirable?	no	no
	Do you have anything that you'd like to add or discuss?	no	can consider linking to instagram poll