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Management from the Nova School of Business and Economics.

**DIGITAL TRANSFORMATION THROUGH AUGMENTED REALITY IN ONLINE
FASHION RETAIL: HOW DO CONSUMERS RESPOND TO VIRTUAL TRY-ONS? THE
TRADE-OFF BETWEEN WILLINGNESS TO SHARE PERSONAL DATA AND THE
PERCEIVED ADDED VALUE TO THE SHOPPING EXPERIENCE RELATED TO
DIFFERENT PRODUCT CATEGORIES**

**MARKET SEGMENTATION & EXPERT INTERVIEWS: A METHODOLOGICAL
APPROACH TO RESEARCHING CONSUMER BEHAVIOUR TOWARDS VTOS IN**

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Abstract

Virtual Try-Ons have recently emerged as a new type of augmented reality application aiming at personalising the customer's online shopping experience and enabling the visualisation of unique value from the ownership of the product. As such, augmented reality has significantly impacted online fashion retail. The lack of sovereignty over personal data due to amplified data tracking represents an obstacle to the adoption of new technologies. This research explores how customers respond to virtual try-on features and analyses the trade-off between willingness to share personal data and the perceived added value to the shopping experience related to different types of products.

Keywords: Augmented Reality, Virtual Try-On, Online Fashion Retail, Conjoint Analysis, Perceptual Maps, Cluster Analysis, Data Privacy Concerns, Consumer Behaviour

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1. Introduction

In recent years, comprehensive investigations have been carried out into the realms of fashion e-commerce and technology integration. Innovation is necessary to participate in this competitive landscape. Therefore, brands started implementing new technologies such as Augmented Reality (AR). AR is a market-disrupting technology sweeping online businesses (Pillarisetty and Mishra 2022). It is expected to significantly alter customers' interaction with content by placing them in the centre of the ever-expanding virtual world (Hall and Takahashi 2017). AR alters how people perceive the physical environment and bridges the gap between online and in-person buying.

This thesis examines Virtual Try-Ons (VTOs), which is a subcategory of AR. VTOs have been widely adopted by fashion retailers, who use it to enhance the shopping experience and collect unique user data. The development of VTO technology has been aided by the popularity of filters on social media platforms like Snapchat, Instagram, and Messenger. These filters have improved the accuracy and realism of facial recognition, machine learning, and 3D modelling techniques, making VTO technology more effective and user-friendly (Kwiecień 2021).

The COVID-19 pandemic greatly impacted the e-commerce boom and increased the significance of online shopping. Retailers have been searching for ways to elevate the online shopping experience by offering higher levels of personalisation at every touchpoint of the customers' journey. They have adopted personalisation strategies by converting insights into recommendations tailored to customers' preferences. When executed well, personalisation aids in developing meaningful connections with customers and enables a more relevant and pleasing online shopping experience ("What's Working in AR & VR 2021 | WARC" 2022).

Customers' privacy concerns and perceptions of the e-commerce platforms' reputation influence the decision-making process for online purchases. Customers' concerns about privacy are generally negatively correlated with their attitudes towards VTOs and their corresponding purchase intentions with AR-based technologies (Eastlick, Lotz, and Warrington 2006). In response, companies active in e-commerce are employing data scientists to improve personalisation and gather insights into the data collected. Hence, these insights strongly depend on the customers' willingness to disclose personal information (Gouthier et al. 2022). However, the topic needs to be further explored to understand how privacy concerns change in different scenarios related to different types of products and VTOs.

The purpose of this thesis is to investigate customer responses towards VTO technology and their perceptions of the experience for different product types. Additionally, the study aims to determine whether there is a trade-off between the willingness to share personal data and the perceived value of the VTO experience for different types of products. Lastly, the study explores how preferences and perceptions differ across segments and identifies the ideal features of the VTO for eyewear.

To conduct this research, a preliminary survey was developed to gather insights on customer responses to VTO features. Five expert interviews were conducted to identify factors and attributes to evaluate customer perceptions. An exploratory data analysis and a perceptual map analysis were performed to gain an understanding of customers' perspectives and the positioning of the products. Furthermore, a brand-specific conjoint analysis was carried out to evaluate the potential trade-off between data sharing and the perceived added value of the VTO experience. A K-means cluster analysis was performed based on the results of the preliminary survey to create consumer segments for this market. Finally, a choice-based conjoint analysis was performed to

determine the optimal experience for eyewear VTOs and provide recommendations for eyewear brands considering or offering a VTO experience to their customers.

In order to gain a greater understanding of this thesis, it is essential to provide a detailed overview of each chapter and its interconnections. Chapter 2 offers a background to the topic, with a discussion of AR technology and its application to the personalized online shopping market, the concept of VTO and its various features. It also addresses the issue of data privacy. Chapter 3 delves into the literature review. This chapter analyses previous research that has been conducted on the topic, providing insightful factors that need to be taken into consideration when studying consumer behaviour towards a VTO feature. This allowed for a topic narrowing and the identification of specific factors for perceptual mapping, attributes, and corresponding levels for conjoint analysis. Next, Chapter 4 summarises the main inputs gathered from expert interviews that allowed us to confirm the previously summarised insights from literature research. These interviews were conducted with technology and industry experts, providing perceptions from both sides. Chapter 5 analyses general insights from the preliminary survey and, alongside literature and expert interviews, provides a basis for the most relevant factors to test. At the same time, it allows for customer clusters, discussed in Chapter 8. Chapter 6 incorporates an exploratory general data analysis and an analysis of perceptual maps. Both allow for conclusions on customer perceptions of the feature according to different tested factors, the positioning of products and their associations with the same factors. The first general data analysis serves as a complementary study for the perceptual mapping and is included within the perceptual maps since it uses data from the same study, follows the same rationale of factors, and aims to answer the same questions. Chapter 7 explores customers' preferences through a brand-specific conjoint analysis that aims to focus the customers' attention on data sharing explicit needs, allowing for the interpretation of the trade-off between willingness to share data and the perceived added value of the online shopping experience.

Chapter 8 addresses the creation of cluster segments based on the data retrieved from the preliminary survey, focusing on the age demographic and behavioural data collected. Finally, Chapter 9 provides clear recommendations on the ideal features of the experience of virtually trying on eyewear, through a choice-specific conjoint analysis.

2. Background

The global fashion e-commerce market, which encompasses the sale of apparel, footwear, eyewear, bags, accessories, jewellery, and cosmetics through online channels, has seen significant growth in recent years. According to ReportLinker (2022), the market value reached nearly \$700 billion in 2021 and is expected to surpass this number by the end of 2022, reaching over \$1.2 trillion in 2025 (Alsop 2022). Clothing, accessories, and footwear account for the largest e-commerce sector worldwide, with a market value amounting to nearly \$759.5 billion in 2021 (Orendorff 2020). Key factors contributing to this growth include globalisation, progress in digitalisation, and the increase in internet and smartphone usage. Additionally, the COVID-19 pandemic has created a conducive environment for the growth of e-commerce fashion marketplaces, as Berg et al. (2020) described as “a perfect storm”.

The retail industry and the corresponding shopping experiences are changing due to the extensive usage of digital technologies (Caboni and Hagberg 2019). Advanced technologies with a higher degree of interactivity enhance the overall shopping experience and contribute to the customers’ willingness to purchase products. As a result, the point of sale becomes a new immersive place where digital technologies merge with traditional elements and enable a distinctly personalised and interactive atmosphere (Caboni and Hagberg 2019). Therefore, increasing all activities in the digital world where companies communicate and engage with clients in new ways is a crucial adaptation need (Berg, Stander, and Vaart 2020).

This thesis examines the use of Augmented Reality (AR) in e-commerce as a means of enhancing the online shopping experience. AR technology overlays virtual data or a virtual world on top of the real-world surroundings, augmenting the users' perception of their environment (Hayes 2020). It simply augments a world that exists and can still be perceived to some extent (BigCommerce 2022). AR is a technology that "combines real and virtual objects in a real environment, runs interactively and in real-time, and registers real and virtual objects with each other" (Azuma et al. 2001). It aims to provide tools that can help replace the lack of touch and feel in any online activity (Caboni and Hagberg 2019), while there is growing evidence that consumers benefit from AR in e-commerce (Hayes 2020).

VTO systems provide an experience that resembles trying on clothes similarly to when in a physical store, while reducing the perceived risk often associated with regular online shopping (Pillarisetty and Mishra 2022). The feature provides the capability of sensory and tactile evaluations (Beck and Crié 2018) and improves the customer experience in various ways. This technology displays items on the users' body and tracks their movements through the device's camera. By creating a more interactive way of shopping, VTOs increase the entertainment correlated to the online shopping experience (Kim and Forsythe 2008). Customers can now try on a product before purchasing it from any location, having the benefit of being in the comfort of their homes without feeling the pressure of sales assistants (Schell 2021). Additionally, customers can sense interaction with actual products, visualising the fit with their accessories while also being able to consult with friends. Consecutively, they can enjoy a personalised shopping experience and save time (Kwiecień 2021).

In order to create vivid experiences for customers, the usage of digital technologies has been rising. VTOs can further be differentiated into distinctive forms. For the purpose of our research, two types of technology were examined, namely (i) Avatar VTOs and (ii) Self-recording

VTOs. These provide a more personalised and engaging shopping experience for customers while also providing retailers with unique user data and insights. A consideration of Virtual Mirror VTOs has been included in our study, although it is not subject to a more detailed analysis. These technologies are changing how the fashion industry operates and providing new opportunities for retailers and designers to connect with customers.

Virtual avatars are becoming increasingly popular in the retail industry, as they provide a higher level of image interactivity and enable customers to see themselves in different bodies (Genay, Anatole and Hachet 2022). Virtual avatar technology, as described by Lee, Fiore, and Kim (2006), allows the consumer to choose from a range of avatars with different genders, body shapes, and heights. With the use of this technology, users can experiment a variety of front and rear texture-mapped product image combinations. Customers can utilise technologies such as body scanners to quickly and accurately generate 3D representations of themselves, allowing them to virtually try on apparel and accessories to visualise how they would look on their bodies. One company that is pioneering the use of virtual avatars in the retail industry is Drapr, a 3D avatar and e-commerce start-up recently acquired by GAP Inc. Drapr's technology allows customers to create 3D avatars of themselves and try on clothing in a virtual environment, providing a unique and engaging shopping experience (Grothaus 2021).

Self-recording VTO are a type of VTO technology that uses a video or picture of the user to show how clothes and accessories would look on them. This technology allows customers to record themselves on a camera-equipped device, such as a smartphone or laptop, and see a realistic virtual representation of the product overlaid on their live video. It further provides a more personalised and engaging shopping experience, as customers can see how the product would look on their own bodies (Retter 2022).

The implementation of such a VTO feature in the online shopping experience is most common for eyewear and has been implemented by several brands (e.g., Ray-Ban, Zenni Optical, Mister Spex, Quay Australia, Michael Kors). Eyewear brand like Zenni Optical and Quay Australia have implemented self-recording VTOs to enhance customers' online shopping experience. Customers can obtain product recommendations by recording themselves on the video, which leads to a 3D 180-degree scan of the face. More accurate sizing and fitting recommendations can be obtained by sharing the pupillarity distance or using a (credit) card as a measurement tool by placing it on the forehead (Zenni Optical 2019; Quay Australia 2022). Another example of a VTO application in the eyewear category is Michael Kors, which used Facebook to allow consumers to try on sunglasses through the app virtually.

Brands like Body Labs and 3DLOOK have created blended reality systems that allow customers to visualise themselves wearing a specific product in a virtual setting. 3DLOOK introduced the “YourFit” app that integrates AR clothing try-on with size and fit suggestions (3DLOOK 2022). While there are few applications of the VTO feature in the apparel category, several fashion brands have tested Snapchat's apparel try-on tool. An example of this is Farfetch with Virgil Abloh's Off-White collection, which enabled users to virtually try on a jacket that they could buy directly through Snapchat. In addition, some fashion clothing brands (e.g., Prada, Farfetch) have implemented the VTO feature as a social media filter on Snapchat. Correspondingly, Prada tested the hands-free VTO, where users could virtually try on clothing and change product colours by using swiping hand gestures (Farfetch 2022; Prada 2022).

Technological improvements in AR-based augmentation for footwear enabled the application of the VTO feature in the shopping experience of various fashion brands (e.g., Nike, Gucci, Farfetch, Converse). Nike's “Nike Fit” app uses self-recording VTOs to provide sizing recommendations by scanning the customers’ feet and allowing them to visualise the product as if

they were trying it on in real life. Gucci has also implemented VTO technology in their app to allow customers to try on their Ace sneakers line virtually (Kwiecień 2021).

Virtual mirrors are a type of technology that simulates a mirror by showing the user's image on a screen. These virtual mirrors act as virtual fitting rooms and use a combination of radio frequency identification (RFID) technology and augmented reality (AR) technology to allow users to try on clothing and accessories in a virtual environment. Once the customer brings a piece of clothing in front of the virtual mirror, it scans and records the image of the item. The mirror then creates a virtual representation of the user wearing the item and displays it on the screen. The virtual clothing can be adjusted to the user's size and shape in real-time, providing a highly personalised and engaging experience. Virtual mirrors have been used by retailers such as H&M. H&M uses virtual mirrors in selected COS stores to track which products customers bring into the fitting rooms and offer personalised products and styling advice (Nishimura 2022).

Overall, these different types of VTOs provide unique and engaging experiences for consumers, allowing them to try on clothes and accessories without having to physically visit a store. This can be particularly useful for online retailers, as it allows customers to make more informed purchasing decisions and can help to increase customer satisfaction and loyalty.

3. Literature Review

This chapter presents a comprehensive examination of current literature on VTO technology in online fashion retail. It explores consumer perceptions and engagement with VTOs, as well as providing an overview of studies on attitudes towards augmented reality (AR) in the context of online fashion. The chapter also delves into the use of applied marketing analytics techniques, including perceptual mapping and conjoint analysis, to identify key attributes and characteristics of VTOs. Additionally, it employs a post hoc segmentation approach to analyse customer behaviour related to VTO usage and data sharing. The chapter aims to provide a

comprehensive understanding of the current state of VTO technology and its impact on the online fashion retail industry.

3.4. Segmentation

As customers are inundated with a vast amount of information on a daily basis, they increasingly desire a more personalised purchasing experience that begins with advertising and continues throughout the customer journey. Due to the rise in online purchases, it is critical for businesses to identify potential customers and understand their purchasing preferences. This has led to various attempts to create typologies of online customers from different perspectives. The first step in the market segmentation process is selecting the appropriate segmentation method. This section defines market segmentation and examines the segmentation approach that is utilised to successfully divide consumers and assess their behavioural attributes towards using VTOs and their willingness to share personal data.

Market segmentation is the practice of dividing a market into distinct groups of consumers with similar needs or characteristics (Kotler and Armstrong, 2012). According to Kotler and Armstrong (2012), businesses often divide the market into smaller groups of consumers with similar characteristics through a process known as market segmentation. This allows them to tailor their products and marketing strategies to better meet the needs and preferences of these specific groups. However, not all market segments are equally useful, and it is important for businesses to focus on meeting the specific needs of different market segments (Kotler and Armstrong, 2012). For instance, in the automotive industry, customers who prioritise comfort and size over price may make up a specific market segment that could be targeted with tailored marketing initiatives. Similarly, according to Beane and Ennis (1987) each segment might theoretically be selected as a market target with a unique marketing strategy.

Furthermore, Camilleri (2017) distinguishes market segmentation as a customer-focused strategy that may be used in practically any market. Businesses might find new market segments by investigating the hierarchy of factors that customers would weigh when picking a brand (Kotler and Armstrong 2012). Market segmentation assumes that different groups of customers need to be targeted with different pricing, promotions, distributions, or any combination of marketing strategies (Camilleri 2017). Hence, creating data-driven customer personas is a crucial next step in gaining knowledge of key customers and target audiences, assuming target audiences are established (Grayson 2022). Data-driven customer or buyer personas are semi-fictional depictions that highlight the main characteristics of a subset of a target market based on information that has been gathered from customer research and/or other analytics platforms (Grayson 2022).

For the purpose of our research, market segmentation was employed to conduct the clustering analysis as it is more beneficial in providing greater detail for creating our customer personas for using VTOs. Furthermore, according to Wind (1978), segmentation techniques may be divided into *a priori* and *post hoc* techniques, as well as descriptive and predictive techniques. The segmentation strategy known as *a priori* is when the number and kind of segments are predetermined, meaning that no prior completion of any statistical analysis is required and is mostly based on judgment, prior experience and secondary data (Wind 1978). Contrarily, *post hoc* segmentation establishes segments by grouping consumers according to a set of pertinent attributes without knowing the kind or a resultant number of segments beforehand (Wind 1978). *Post hoc* approaches base segment definitions on data analysis findings (Rudelius, Walton and Cross 1985).

In our research, *post hoc* customer segmentation was employed, as according to relevant literature, it is widely known for research that is conducted for marketing purposes. It also renders a method that utilises data gathered from consumer surveys and other sources and leverages traits and/or demographics to establish homogeneous consumer groups while also revealing the way in

which customers view a specific type of product or service category (Foedermayr and Diamantopoulos 2008). Age, gender, income, hobbies, values, attitudes, and other demographic and psychographic segmentation characteristics are among the most predominant in literature (Goyat 2011).

Furthermore, various clustering techniques could be utilised in *post hoc* segmentation. As an illustration, the SPSS system offers the Two Step Cluster, K-means Cluster, and Hierarchical Cluster methods. These employ several algorithms designed to offer a specific categorisation. One of the most often utilised *post hoc* market segmentation techniques is K-means clustering (Ferreira Lopes 2012). K-means is a data grouping technique that aims to maximise data similarity within a cluster and reduce the similarity of data between clusters (Nainggolan et al. 2019). The K-means algorithm clusters data based on the cluster centre point (centroid) that is closest to the data (Nainggolan et al. 2019).

In this thesis, the K-means clustering method was utilised due to the quickly process of large amounts of data (Dachyar, Esperanca, and Nurcahyo 2019), and its algorithm is frequently used to design appropriate marketing strategies and accurately identify valuable customers (Wu et al. 2020). Along with the K-means technique, the elbow technique was further deployed. The elbow technique calculates the average score for each value of K and performs K-means clustering on the dataset using a range of K-values (Nainggolan et al. 2019). This approach offers suggestions by choosing cluster values and then adding the cluster value to be utilised as a data model in identifying the optimal cluster (Nainggolan et al. 2019). For instance, a study conducted by Bandyopadhyay, Thakur, and Mandal (2020) used the K-Means clustering technique to successfully segment customers that have purchased clothes with the facilitation towards fulfilling their purchase requirements. The deployment of the K-means method for customer segmentation in this study rendered an effective way to help businesses in the fashion retail industry develop a

successful, scalable, and sustainable online e-commerce business (Bandyopadhyay, Thakur, and Mandal 2020).

In the literature, the K-means clustering method was also employed as the foundation in a study for maximising strategy improvement in mall customer segmentation (Pradana and Hoang 2021). By using the K-means clustering method, customers were successfully segmented into five clusters based on the correlation between their spending scores and annual income, which also helped determine which of the five clusters should be targeted (Pradana and Hoang 2021).

A further study by Dachyar, Esperanca, and Nurcahyo (2019) attempted to offer some practical advice to Indonesian local fashion e-commerce based on customer segmentation to increase consumer loyalty. Comparably, customer clustering was performed using the K-means method to segment customers of three Indonesian fashion e-commerce platforms (Dachyar, Esperanca, and Nurcahyo 2019). According to the findings, five customer segments were identified in three local Indonesian fashion e-commerce brands, which helped establish a new approach to preserving consumer convenience and providing exceptional customer service.

3.4.1. Consumer profiles

Relevant demographic and behavioural attributes were assessed to make the post hoc segmentation applicable to our research and successfully divide consumers based on their behavioural patterns. In order to validate and use these descriptors for the quantitative surveys in our research, the relevance and importance were firstly evaluated by using a qualitative technique, namely expert interviews and market research on VTO services used in the online fashion retail industry.

First, the demographic attributes that could potentially be correlated to customers' attitudes towards VTOs were examined. In regards to age, a recent interview of 18 participants by NetGuru (Stepaniuk 2022) found that less than 50% of consumers worldwide exhibited an interest in utilizing the technology. The following age groups replied to the results about their interest in using VR or AR in the clothes category, respectively: 18-24 (52%), 25-34 (50%), 35-44 (45%), 45-54 (44%), and 55+ (34%). Similar results are shown in a Gartner report, where it is noted that demand for AR/VR features is being driven by millennials and Gen-Z, with 30% of them saying they want more from their online purchasing experiences compared to only 14% of previous generations (Gartner 2020).

It is important to note that the literature on gender and consumer perceptions towards VTOs in the online fashion industry is limited, and there is no clear evidence of a correlation between gender and consumer behaviour in this context. However, a study by González, Meyer, and Toldos (2021) suggests that men and women may use different decision-making processes when it comes to purchasing personal items, with women being more influenced by contextual displays and emotional value assessments. Additionally, there is no clear evidence that income status is associated with consumer perceptions and behaviour towards VTOs in the online retail fashion industry. These findings highlight the need for further research on this topic in order to better understand the factors that influence consumer behaviour towards VTOs in the online fashion industry.

Moving forward to the psychographic attributes, the likelihood of purchasing a virtually tried-on item was assessed. According to a survey conducted by Vertebrae, amongst 346 United States (US) consumers, seven out of ten customers (almost 69%) who tried out the technology purchased the item they virtually tried-on. Those who tried VTO but did not buy anything, either got it from another store or were still debating it (Mileva 2021).

Moreover, the frequency of VTO usage was evaluated. A US survey of 1,993 adults found that, when compared by generation, the adoption of technology is much more disparate (Maake 2021). Virtual fitting rooms were used by 45% of Millennials and 2% of Boomers, respectively, whereas 42% of Gen-Z, 19% of Gen-X and 1% of Boomers have used augmented reality when shopping (Maake 2021).

Another essential attribute that was examined was the reasons for which consumers use VTOs. According to the Consumer View study surveying 2,949 US adults aged 18+, 46% noted that they used VTOs to accurately identify an item's size, thus helping them determine whether it is suitable for them (National Retail Federation 2020). Another reason why customers use VTOs is because they can visualise different personalisation options through AR to create products that match their personality and style (National Retail Federation 2020). This opinion was also confirmed through interview experts conducted in Chapter 4. Furthermore, 47% of consumers believe that convenience is vital, and 61% are willing to pay more for a convenient service. Online sizing, a variety of delivery options, and free returns all contribute to an optimal experience and may lead to brand supporters among customers (Expert Commentator 2020). The McKinsey Returns Management Survey revealed that 25% of clothes purchased on e-commerce sites were returned, and with the 35% increase in e-commerce in 2020, the rate of returns is the highest it has ever been (Ader et al. 2021).

In addition, the comfortability of using VTOs for certain product categories was assessed. Findings from the same survey showed that nearly 70% of respondents said VTOs for eyewear were the most useful for influencing their buying decisions (Mileva 2021). Clothing came in second at 52%, followed by hats and caps at 44%, footwear at 27%, wallets and backpacks at 21%, cosmetics at 27%, jewellery and watches at 26%, and other things at 8% (Mileva 2021).

The attribute of practicality and interactivity associated with VTOs was also explored. A study by Deloitte and Snapchat found that Gen-Z and millennials are 71% more likely to utilise AR regularly than Gen-X and boomers. According to the study, older generations are over 20% more likely than younger ones to believe that AR is primarily useful. (The Wall Street Journal 2021). Furthermore, the study found that the primary motivation for using AR today is its interactivity; 76% of consumers intend to utilise it as a practical tool in their daily lives (The Wall Street Journal 2021).

Another attribute assessed was data privacy concerns of current and potential VTO users. According to the literature, privacy is at odds with personalisation and achieving personalisation requires some loss of customer privacy (Günes, Sanli and Ergün 2015). Since the most popular method for VTOs is based on virtual fitting rooms, where multiple cameras are utilised to recognise a user's body and posture before rendering an item of clothing on the user's likeness, user privacy may be jeopardised because some users may be hesitant to stand in front of cameras in a fitting room (Günes, Sanli and Ergün 2015). Therefore, users are concerned about the information gathered about their motions and positions while looking at their smartphones while virtually trying on products. Lastly, 82% of internet shoppers want to touch and view an item before making a purchase, according to results from a survey of 1,000 customers regarding their hesitation toward VTO services (Fedorenko 2022).

Taking everything into consideration, shopping motives are often categorised in the literature in various ways, such as utilitarian and hedonic motivations, with the latter being the most frequently used category (Childers et al. 2001). Hedonic consumers are known to purchase primarily for pleasure, amusement, and stimulation, unlike utilitarian shoppers, who are frequently described as efficient, logical, and task-driven (Childers et al. 2001). Furthermore, according to Rohm and Swaminathan (2004), based on their shopping motivations, consumers may be

categorised into four categories, namely: store-oriented shoppers, variety seekers, convenience shoppers, and balanced buyers. According to the authors, convenience shoppers are motivated by online shopping convenience. Customers in this group only sometimes want their purchases right away. The variety seekers are more interested in finding a selection of goods from different brands and merchants. Unlike the variety seeker, balanced buyers are motivated by seeking information online. Moreover, the balanced buyer, as opposed to the variety seekers schedule their purchases in advance. Lastly, the store-oriented shopper is more likely to engage in social contact and wants access to their purchases immediately. Customers in this group prefer an in-store atmosphere over an online marketplace.

The typology proposed by Rohm and Swaminathan (2004) can provide a useful framework for analysing the behaviours and preferences of different groups of consumers for inline shopping. This typology is employed in our study since it focuses on online buying behaviour and because the four categories identified by Rohm and Swaminathan (2004) are comparable to those found in other academics' studies (Rohm and Swaminathan 2004; Moe 2003; Childers et al. 2001).

4. Preliminary Interviews: Experts

Expert Selection and Interviews

The following chapter focuses on the initial stage of our methodological approach to researching consumer behaviour towards VTOs in the online fashion retail industry. It involves conducting expert interviews with professionals knowledgeable in the areas of AR technologies and the fashion retail industry. The goal of these interviews is to gather valuable insights and information to inform the subsequent stages of the study, including perceptual maps and conjoint Analysis. The chapter provides a comprehensive overview of the interview process, including participant selection, interview questions, and response analysis. This research aims to gain a better

understanding of consumer motivations and experiences with VTOs in order to develop more effective marketing strategies.

This section begins by outlining the interview formats used and the main categories around which the questions were built. This interview format was applied to all interview scripts, based on the types of experts who participated in the interviews: those who had a direct connection with using VTOs for their businesses as a service, those who had a technical background in software involved with the VTO technology, and a subject matter expert with more than 14 years of executive level experience in the fashion industry. As a result, the focus of the following section is to assess the qualitative feedback from the interviewees, which provide specific information about the added value of VTOs and their effectiveness in the current online retail fashion market.

4.1 Methodology

This phase was performed between September 2nd and October 9th, 2022. The interviews were conducted in-person and virtual (Zoom, WhatsApp, Teams) with five experts in the AR and AI field, the fashion industry sector, and VTO technology, each of which lasted 20-45 minutes. LinkedIn and the Nova SBE website were used to come across the experts interviewed. Those platforms were chosen because they would increase our chances of choosing a varied sample of people due to their extensive network and variety of potential contacts. Through LinkedIn, we were able to look at industry trends in the AR field related to fashion and search for individuals working in the field or developing such technology. Specifically, the following experts were interviewed: (i) a virtual reality developer, (ii) an expert in the area of clothing VTOs, (iii) a fashion industry subject matter expert and (iv) two experts in the area of eyewear VTOs.

The virtual reality developer is an advanced Software Engineer, specializing in Extended Reality (XR) development, and is passionate about utilizing a multitude of hardware technologies

to create immersive, non-conventional XR experiences. The fashion industry subject matter expert is currently an Associate Professor at Nova SBE within the School and the MBA and has 14 years of executive experience for companies such as the L'Oréal Group and Bull Portugal. Furthermore, the expert in the area of clothing VTOs is the founder of CLO-Z, a real-time virtual try-on technology for clothes. The technology precisely tracks the entire human body in 3D using front/back cameras on mobile and desktop. Furthermore, the expert in the area of eyewear VTOs is the VP of Digital Solutions at Modern Optical. With experience in the optical industry for over twenty years, this expert has pioneered a project of a virtual try-on suite of services to help the independent emerge into this quickly growing segment of the market. Lastly, the second expert in the area of eyewear VTOs is the founder and CEO - TRYME virtual try-on solutions, a platform independent solution, that makes virtually trying on eyewear easy on any device. TRYME face AR technology allows a real-time seamless AR experience.

A series of qualitative interviews with experts were carried out as part of our study on consumer behaviour towards VTOs. Qualitative interviews are a valuable research method for studying consumer profiles and assessing influential factors (Baker and Edwards 2017). Expert interviews were chosen to be conducted because they are a common qualitative interviewing technique that aims to gain insights into a particular sector of activity (Döringer 2021). Expert interviews provide unique insights into expert knowledge, structural settings, and the processes that drive change in a particular system (Döringer 2021). These insights are valuable for our study on VTOs and their impact on consumer behaviour.

Additionally, a semi-structured interview approach was followed for interviews with experts. Semi-structured interviews are the most commonly used type of qualitative data source (DeJonckheere and Vaughn, 2019). This approach involves a flexible interview structure that allows for two-way communication between the researcher and the participant. This method

allowed us to ask follow-up questions, seek further information, and make comments to gather unstructured data and explore the experts' thoughts and beliefs about VTOs and customers' willingness to share their data for a more personalised shopping experience. This approach enabled us to gather valuable insights from the experts and inform our analysis of VTOs and their impact on consumer behaviour.

The script for the experts (see Appendix 12.1.1, Table 15) concentrated on (i) their opinion on their market perceptions, (ii) VTOs added value to customers' shopping experience, (iii) product categories with VTO features that have the most potential, (iv) the reasons preventing customers from using VTOs (v) data privacy concerns related to the use of VTOs, (vi) limitations of VTOs, (vii) and future outlook.

In more detail, since experts are people who have exclusive access to certain individuals or decision-making processes or who oversee developing, implementing, or controlling a solution in a particular field of action (Meuser and Nagel 1991), we inquired about the expert's market perceptions. With this in mind, the aim was to obtain a summary of how experts believe customers view the various market competitors and what criteria they may use to compare VTO services amongst different product categories. A further point of focus was to ask the experts how they believe VTOs add value to the customer's shopping experience, as it was essential for our research to understand whether that positively influences their chances of using the service to have a more personalised shopping experience and their perception of certain brands. Moreover, relevant research indicates that many customers refrain from utilising VTOs due to concerns about data privacy; hence, the objective was to comprehend these issues and any underlying reasons why users are hesitant to share their data for VTOs. Regarding the limitations of VTO services, according to Capgemini's "Digital Transformation Institute" survey (Fedorenko 2022), 62% of customers say they want Artificial Intelligence (AI) to be more human-like and 49% of the same cohort believe

they would have a higher connection with a retailer or brand if such a thing were to happen. Lastly, we inquired about the future prospects of VTOs to evaluate the study's effects both from an academic perspective as well as from an industry-specific perspective and to obtain knowledge about upcoming trends and on how current technologies and digital transformation strategies can improve customers' online shopping experience.

4.2 Results

The findings of our thorough investigation, and insights obtained from the experts interviewed, are discussed in what follows.

Virtual Reality Developer: To enhance our knowledge of the technical aspect of VTOs in today's online fashion retail sector, an interview with a VR software developer was conducted. The expert suggested that VTOs are usually introduced for users to virtually try-on products before purchase. He noted that customers value the fun and interactive side of VTO since it keeps them entertained and increases chances of customer loyalty and engagement as opposed to whether they can apply the product on their body for correct sizing and fitting. Regarding product categories with high potential using VTO, the expert suggested that clothing items such as upper garments and bottoms have the highest potential for usage and revenue creation for retailers, primarily through social media filters such as Snapchat and Instagram. However, the expert advised that there is a lot of potential for improvement in the hardware of the technology, which is used as a means for VTO features, as the quality of smartphones and cameras, in general, are not in the best shape to support this technology. This is directly related to customers holding back from using VTOs due to privacy concerns, for which the expert noted that customers are almost always hesitant to share personal data. However, once they start using this new technology, they are expected to recognise the added value in their online shopping experience.

Fashion Industry Subject Matter Expert: The subject matter expert confirmed that VTOs provide an added value to the customers' shopping experience in the sense that it is an efficient service with an excellent way to measure a person for clothing, but highlighted that if the result is not great, it can lead to customer dissatisfaction, and it may even work against the brand. Furthermore, the expert implied that VTOs should only be used for certain product categories, as for some that require precision, such as make-up and clothing, the results could be much better. Specifically, the expert's thoughts on VTOs, namely for eyewear, were positive since, with the interpretation of the shape and colours of the face and eyes, more accurate product estimations can be generated. She proposed VTOs through the use of an avatar rather than the real self as it would be a more beneficial way of checking if colours match customers' preferences and sizing and would also aid in avoiding product returns. The expert ultimately noted that a more interactive and humane experience is always preferred over a technology-based shopping experience.

Expert in the area of clothing VTOs: The expert confirmed that the usage of VTO in the online fashion retail world does add value to the customer's shopping experience. That is by (i) enhancing their online shopping experience both pre- and post-purchase, (ii) reducing returns as most of the VTOs serve as a size estimator in order to minimise chances of product returns and (iii) giving an estimation and a first impression of what the clothes will look like on the customer. Therefore, VTOs give additional value to products with a sense of customisation and personalisation provided by a high-quality digital experience. As for product categorisation, the expert highlighted that the upper garments (t-shirts, sweaters, jackets) are very high in demand at the moment, and so are pants, excluding jeans. When it came to the hesitation of customers from using VTO services, the expert suggested that some customers do not want to engage in an online shopping experience because they prefer shopping in-store where they can feel the materials of products and try them

on in person. Moreover, the expert suggested that some hesitation in using VTOs stemmed from the complexity of the return process due to potential unprecise fitting and sizing recommendations rather than the complexity of the VTO itself as a service.

Expert 1 in the area of eyewear VTOs: The expert 1 in the area of eyewear VTOs confirmed that the visual representation of how eyewear products would look on customers adds value to their shopping experience. At the same time, the lack of it renders one of the most frequent reasons to abandon products in their online shopping carts. The expert's opinion on what customers value the most regarding VTOs was the fitting and styling recommendations of eyewear products, which adds to the customer's convenience and saves them a trip to the physical store. According to the expert, the number one ranking category for VTOS was eyewear products, followed by the product category of cosmetics, where VTOs are used for make-up products and footwear, obtaining a third place in product popularity for VTOs. Regarding the reluctance to use VTOs from a customer perspective, the expert hinted that some users had expressed concerns about forgetting to turn the camera off on their personal computers, which could present a potential risk and create privacy concerns for them. However, it was suggested that the number of people that do not want to give access to their cameras is decreasing.

Expert 2 in the area of eyewear VTOs: It was deemed essential to gather an additional opinion from another eyewear VTO expert as the product category's popularity was well-signified in the literature review. According to the eyewear VTO expert 2, VTOs add value to the customer experience by reducing product returns, adding a positive virtual experience for customers and bridging the knowledge gap of realistic product visualisation. VTOs also contribute 40% more catalogue usage of products and 60% more product page usage of VTO, hinting at the service's usefulness. Moreover, the expert suggested that popular product categories that VTOs can be

successful are eyewear, make-up and footwear. There was one differentiating insight derived from the eyewear VTO expert 2 compared to the other regarding what is holding customers back from using VTOs. The expert responded that customers need to become more familiar with this kind of technology since it is not widespread in the fashion industry yet. Furthermore, some people may need clarification about this technological solution's actuality and the visualisation accuracy of the products they try on through VTOs.

The expert interviews provide valuable insights into the technical aspects of virtual try-on (VTO) technology, as well as the benefits and challenges associated with its implementation in the fashion industry. The experts interviewed noted that VTO technology offers several advantages to fashion retailers, such as providing a fun and interactive online shopping experience, reducing the number of product returns, and accurately displaying the visual characteristics of products. However, there is a belief amongst the experts that there is room for improvement in terms of recommendation quality and personalisation, and that customers may have concerns about data privacy and the practicality of using the technology via camera-equipped devices. These findings highlight the importance of staying current with advancements in VTO technology and addressing customer concerns about data privacy. The results of the expert interviews are utilised in our research to inform the development of surveys and other research methods to explore consumer behaviour towards VTO technology in greater depth, and to formulate recommendations for fashion retailers that are tailored to the current consumer behaviour patterns and address concerns about data privacy.

5. Preliminary Survey: General Insights

The following chapter covers the analysis of insights obtained from a preliminary survey on Virtual Try-On (VTO) feature, the survey aimed to understand customers' perceptions and preferences towards VTOs, and to use this information to create clusters and conduct perceptual mapping and conjoint analysis. The chapter begins with a discussion of the research methodology and concludes with an examination of the results obtained from a sample of 228 respondents.

5.2 Results

Sample characteristics

The following results were based on a sample of 228 respondents. Of these 228 respondents, 61% are female, 38% are male, and one preferred not to specify their gender. When considering age distribution, the majority of sample was found to be between 17 and 25 years old, accounting for 53% of respondents, followed by the age group of 26 to 35, with 19%, then by 46+, with 15%, and 36 to 45, with 14% (See Appendix 12.2.2, Figures 13 and 14). As for the income level of the sample, the results do not seem relevant for the present research since 28,9% of the sample chose the option “*Prefer not to say*”. Nevertheless, most of the respondents who revealed the total annual household income (before tax and deductions but including any benefits/allowance) presented an income level “*Bellow 10,000€*”, representing 19,2% of the sample. This result might be related to the high percentage of young respondents that belong to the age group 17 to 25 years old. This income level is followed by “*Above 50,001€*”, accounting for 17,9% of the sample. (See Appendix 12.2.2, Figure 15).

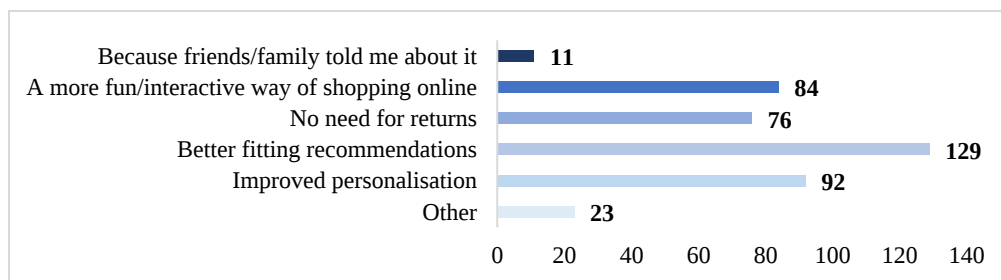
When analysing the sample's online shopping frequency, the most common frequency reported was “*Monthly*”, accounting for 30,2% of the sample. Next in line was “*Occasionally*”, with 25,4%, followed by “*Seasonally*”, with 23,6%. “*Weekly*”, “*Never*”, “*Yearly*” and “*Daily*”

were the least chosen options accounting for 7%, 6,6%, 5,7% and 1,3%, respectively (See Appendix 12.2.2, Figure 16). These results allowed for a great analysis of potential new customers for the online fashion retail industry, if they considered that VTOs can bring more benefits to their experience, as well as a better understanding of the main problems identified by the already regular online shopping customers.

Finally, when asked about the type of fashion products the respondents buy online, and allowing for the possibility of choosing one or more options, “*Top clothing/upper garments*” was the main chosen option, with 181 clicks. This was followed by “*Bottom clothing*” (139 clicks), “*Footwear*” (122 clicks), “*Accessories, including jewellery, handbags, etc.*” (105 clicks), “*Underwear/swimwear*” (80 clicks), “*Eyewear*” (55 clicks), “*None*” (19 clicks) and “*Other*” (4 clicks). These results showed the high presence of upper garments and footwear in the online fashion industry and some relevance of eyewear in the same industry (See Appendix 12.2.2, Figure 17).

Preliminary Survey Results

Figure 1: What are the main reasons for using a virtual try-on when shopping online? (Choose 1 or more options)



In a survey of 228 respondents, 73,7% (168 respondents) had never used a VTO before. The other 36% of the answers stated to have used a VTO before. Most of this percentage used it occasionally, divided into three smaller groups dedicated to: sometimes, seasonally, or often.

However, 53,5% of respondents indicated they would consider using a VTO to improve their online shopping experience in the future, and 32,9% of respondents answered “*Maybe*”. The last part is dedicated to 13,6% of respondents who would not consider using the VTO in the future. The main reasons to shop online are presented below in Figure 1. Many respondents chose “*Better fitting recommendations*” (129 clicks), “*Improved personalisation*” (92 clicks), and a “*More fun and interactive way to shop online*” (84 clicks).

The results showed that 55% of respondents see additional value in brands or fashion retailers that offer a VTO feature, with 87% of this group preferring to use the feature on the brand's website or app. This group consisted of 87% of the 55% (See Appendix 12.2.2, Figure 22). Next, the causes that restrain respondents from using VTO features were evaluated. The biggest group consists of “*Data privacy concerns*” (79 clicks). Other reasons were the “*Lack of human interaction*” (49 clicks), and “*Bad quality recommendations*” (48 clicks). However, (21) respondents mentioned that something else was holding them back from using a VTO (See Appendix 12.2.2, Figure 23). The overall usefulness of a VTO feature for finalizing is further explored in the cluster analysis (Chapter 8). Additionally, respondents had to fill in the likelihood of sharing their measurements, uploading a photo of themselves, or recording a part of their body to a platform using the VTO feature. The respondents were “*Very likely*” to share their measurements (36,4%). In contrast, when the respondents expressed the likeliness to record themselves, 33,8% stated they were “*Very unlikely*” (See Appendix 12.2.2, Figure 21).

The extent of distrust in how data will be processed is stopping respondents from using a VTO feature, resulted in an average rating of 3,31 on a scale from 1-5, where 45% rated between the 4 and 5 (See Appendix 12.2.2, Figure 28) This is discussed thoroughly in Chapter 8. Next, we analysed for what products the respondents were more likely to accept the data privacy terms and

conditions without carefully analysing them. The results showed that “*Footwear*” (138) and “*Eyewear*” (90) are the products where the respondents were more likely to accept privacy terms and conditions without further research. “*Upper garments*” collected (69) answers, and the option “*None*” was selected (39) times (See Appendix 12.2.2, Figure 30).

The survey also had the intuition of gathering information related to the different types of products the group chose to explore: (i) upper garments, (ii) footwear, and (iii) eyewear. In this sense, the respondents were asked to rank the three types of products, according to “*Willingness*” and “*Usefulness*” to virtually try them on. When considering willingness, footwear was the first choice of respondents. This conclusion is drawn given that although eyewear was chosen more times as a first choice, footwear was very close to the same result, and on top of that, it was the least chosen segment as the last choice. Upper garments were mostly chosen as a second and third options. The latter represented the majority of choice of respondents for upper garments. This means that the following order represents willingness to virtually try on these products: (i) eyewear (ii) upper garments and (iii) footwear (see Appendix 12.2.2, Figure 31). As for usefulness, eyewear was chosen as the first option for most of the respondents, followed by upper garments, and, finally, footwear, which also represented the majority of the last choice of the respondents (see Appendix 12.2.2, Figure 32).

As for comfortability in virtually trying on the different types of products, the respondents show different levels of comfort according to the different body parts they would be required to share. The overall analysis of results showed that respondents were the most comfortable with virtually trying on shoes; 48% of the respondents chose “*Very comfortable*”, when asked “*How comfortable would you feel to virtually try-on shoes?*”. Eyewear was the segment that followed, gathering 38% of “*Very comfortable*” respondents, and upper garments were the product for which respondents seemed to be less comfortable with virtually trying on, knowing that the most chosen

option was “*Somewhat comfortable*”, with 29% of respondents. Nevertheless, these results showed great potential for the three products in the universe of VTOs since most respondents seem comfortable engaging with this feature (see Appendix 12.2.2, Figures 33 to 35). These questions of the survey are also further explored in Chapter 8. When asked if virtually trying on the different products would help the respondents to decide more easily when shopping online, the results, as expected, were similar when asked about the ranking of products by the usefulness of the VTO. In this sense, the majority of respondents answered “*Yes*” for upper garments (44%) and eyewear (62%), and the majority of respondents answered “*Maybe*” for footwear (37%). Still, 32% of the respondents answered “*Yes*” for the footwear segment (See Appendix 12.2.2, Figures 36 to 38).

This survey highlights the great availability for customers to interact with this technology, although the majority of them has never tried a VTO before. It is fundamental to understand which features would allow for greater willingness to interact and which product category would suit this new market better.

6. Perceptual Maps

This chapter examines customers' perceptions of virtual try-on (VTO) features for various products by conducting exploratory data analysis and perceptual map analysis. The focus was on critical factors affecting the perceived value and data privacy concerns of VTO. The perceptual mapping analysis generated three maps to visualize customers' perceptions. The first map highlights the most critical factors, the second map visualizes the products and their characteristics, and the third map groups the products based on customers' perceptions of all factors. The methodology and demographic characteristics of the sample are discussed, followed by a comprehensive analysis of the results and the insights gained.

7. Conjoint Analysis

The previous chapter explores customers' responses to VTOs, by analysing their willingness to use the feature and disclose personal data along with their perceptions about its usefulness, quality of recommendations, user-friendliness, and interactivity. This chapter addresses privacy concerns to understand the relationship between customers' willingness to share data and the perceived added value of using a VTO feature. By enabling individuals to choose between different privacy settings that, in exchange, offer different online shopping experiences, we evaluated the level of personalisation that makes individuals risk disclosure of personal data to benefit from a more personalised experience. Firstly, the chapter presents the methodology behind the choice of attributes and respective levels. The methodology is followed by the analysis of the results, which are divided into two sections: the analysis of the sample and the analysis of segments derived from the original sample.

7.1 Methodology

Attributes and Levels

The group identified a gap in the literature regarding customers' willingness to disclose personal data to obtain a personalised online shopping experience. There is a knowledge gap on how these changes relate to different product types. Taking that into consideration, the main goal of our conjoint analysis was to research the direct trade-off between the detailed data the customers needed to share to take advantage of the different types of online shopping experiences.

The participants were presented with data privacy concerns in the previous analysed surveys, although the focus was not directly related to this concern. However, in this survey, the respondents faced a more conscious choice when discussing data sharing.

As mentioned before, the choices of attributes were related to the literature review and the conducted expert interviews, not only in the technology industry but also in the fashion industry. Our final decision included three attributes: (i) *“Product Type”*, (ii) *“Online Shopping Experience”*, and (iii) *“Data Privacy”*. The group acknowledged that attributes (ii) and (iii) are endogenous variables, as it is only possible to provide an online shopping experience by having to share the related data. In this case, we faced simultaneity between variables, knowing that not only does the variable *“Data privacy concerns”* causes the variable *“Online shopping experience”*, but the opposite is also happening (Glen 2020). Nevertheless, the choice of keeping them separate in the conjoint survey was made because it would be the only way to examine and answer our research question. We were able to make further conclusions on the research topic by presenting the respondents with the specific data necessary to share to provide a personalised online shopping experience. This could only be taken into account if each potential online shopping experience was

linked to an attribute that, at each level, required increasing data-sharing steps as personalisation increased.

The chosen attributes and corresponding levels passed through different reviewing stages. The first attempt survey was sent to a smaller sample of respondents to ensure comprehension and good respondent friendliness. Some suggestions were accepted, such as the inclusion of images to make the online shopping experiences more visual, assuring more respondent attention while filling out the survey. After this first revision stage, the survey was then shared with the thesis advisor and with this feedback, the group formulated the final survey design. The final survey provided clear instructions for the respondents to be aware of the different types of online shopping experiences, generating awareness which would lead to making informed decisions.

Due to the identified gaps in the literature review (See Appendix 12.4.1, Table 19) on the comprehension of consumer behaviour towards different types of products, we included the first attribute, namely, “*Product Type*”. Further research on this topic would be beneficial for the online fashion retail industry. With the insights from expert interviews, we established that some products might be more relevant than others when focusing on a VTO experience. The highlighted product types (levels) were chosen due to their relevancy in the current market, and their market potential. The literature review showed the significance of (i) “*Eyewear*” in this industry due to the diversity of brands that already offer this service and also because it is perceived as one of the market segments with more utility for customers. (ii) “*Footwear*” was chosen for the same reason as eyewear; various brands offer this service, and this segment seems to have great potential, according to the literature. The last product, (iii) “*Upper Garments*”, was chosen due to the necessity of including different body parts to have the possibility to explore consumer sensitivity according to what would need to be shared with the application/website. Insights from a VTO

technology expert predict that this segment will have great potential in the future of VTOs in online fashion retail.

The second attribute, “*Online Shopping Experience*”, was chosen as it allows participants to compare online shopping options, leading to conclusions on customers’ response towards the usage of VTOs. The levels were selected with the above considerations in mind and the literature review, namely: (i) “*Regular online shopping*”, (ii) “*Personalised online shopping through shared measurements*”, (iii) “*Personalised online shopping with an avatar*”, and (iv) “*Personalised online shopping with VTO*”, using the user’s body image as these were the leading online shopping experiences from previous research analysis.

Customers are required to accept certain data-sharing settings to obtain the full personalised experience on online fashion platforms. These data-sharing settings commonly include mandatory cookies, which need to be accepted to obtain the benefits of platform functionality and better site navigation. Customers are presented with the option of only accepting some cookies, such as personalisation of cookies, which enables platforms to track when the customer visited the site and provide customised advertisements on other sites (Stradivarius 2022). According to Zara (2022), Fit Analytics, higher personalisation in terms of product recommendations based on shared body measurements, requests access to the following: customer fit profile, fit finder user ID, the shop user ID, the purchase and return data, event data and technical data (browser type and version, operating system, device name, IP address). Essential cookies store customer’s fit finder preference for 360 days, while non-essential cookies store customer information for 90 days, allowing the platform to generate recommendations or advertising services and general analytics. (Zara 2022).

VTOs are categorised as a higher-level personalised online shopping experience that requires a higher amount of data disclosure. According to platforms using VTO features, customers using a VTO feature are required to grant access to their device’s camera and consent to capturing

and storage of personal images. Using cookies, the platform collects personal data, including a body scan, birthdate, gender, device identifier information, IP address, date, and time stamp of the session. (Quay Australia, 2022; Farfetch 2022).

The last attribute, “*Data Privacy*”, was chosen considering the user’s privacy concerns and the need to evaluate the trade-off between willingness to share data in exchange for the perceived added value to the user’s online shopping experience, as explored in Chapter 3. This attribute is entirely related to the user’s online shopping experience preference. Therefore, they turn into one single attribute presented separately in the survey to increase users’ awareness of data sharing related to the different online shopping possibilities. The levels were selected accordingly to assure that the respondents would make conscious choices regarding their data privacy concerns and perceived added value. The relationship between “*Online Shopping Experience*” and “*Data Privacy*” can be found in Table 8, presented below.

Table 1: Endogenous Variables and correspondents

Experience	Online Shopping Experience	Data Privacy
1	Regular Online Shopping	Accept mandatory cookies
2	Personalised online shopping based on shared measurements	Accept mandatory cookies, share personal measurements
3	Personalised online shopping with an avatar	Accept mandatory cookies, share personal measurements, upload a picture
4	Personalised Online Shopping with Virtual Try-On	Accept mandatory cookies, terms & conditions VTO, give access to camera

In the conjoint analysis survey, the order of attributes was chosen as follows: (i) “*Product Type*”, (ii) “*Data Privacy*”, and (iii) “*Online Shopping Experience*”. This order was consciously chosen considering the customer’s journey. The first step is the need to buy a product, therefore, the product comes first. Secondly, the group chose “*Data Privacy*”, in order to focus the

respondent's attention on his/her concerns. Lastly, with data privacy concerns in mind, the most suitable "*Online Shopping Experience*" for the customers is presented to them.

Initial Survey Setup: Conjoint.ly

As stated before, as part of the review stage, the survey was sent to a smaller sample of respondents, and we received positive feedback about the survey being intuitive and easy to follow.

Conjoint.ly was the chosen platform due to the ease of use for both the group and respondents' perceptions. This platform provides advanced tools that are beneficial for a deeper conjoint analysis. For our study, a brand-specific conjoint was selected. The choice-specific conjoint would only allow for limited restrictions, and we wanted to have the possibility of selecting all the correct combinations of attributes and levels. Since "*Online Shopping Experience*" and "*Data Privacy*" are endogenous variables, several restrictions within these two attributes needed to be made (See Appendix 12.4.1, Table 20).

The survey layout consisted of three sections: (i) the introduction, where the group explained how the survey would work, and the different online shopping experiences were presented. (ii) the choices were generated randomly according to the necessary restrictions the group selected, and (iii) three additional questions to gather information from the characteristics of the sample, including gender and age, and an opened ended question to get insights from the consumer's perspective about VTOs. An overview of the survey design can be found in Appendix 12.4.1, Figure 62. Regarding the design of the survey, an option allowing the respondent to choose none of the presented experiences was made available. The number of choices of different online shopping experiences presented at the same time was set to four, allowing the chosen four levels to appear simultaneously. Each respondent was required to make 12 choices. In "*Product Type*" and "*Online Shopping Experience*" the group chose correspondent images to each level, creating a more realistic experience. An overview of the survey layout is found in Figure 7, below.

Figure 2: Layout of the choice sets within Conjoint.ly

	Experience A	Experience B	Experience C	Experience D	
Product Type	Upper garments 	Upper garments 	Eyewear 	Footwear 	
Data Privacy	Accept mandatory cookies, share personal measurements, upload a picture	Accept mandatory cookies, terms & conditions of VTO, give access to camera	Accept mandatory cookies, share personal measurements	Accept mandatory cookies	✗ None of the above
Online Shopping Experience	Personalized on-line shopping with an avatar 	Personalized on-line shopping with Virtual Try-On 	Personalized on-line shopping based on shared measurements 	Regular online shopping 	

Pre-Test and Data Collection

As mentioned in this chapter, a pre-test of the survey was made with a small sample of respondents to assure clarity and respondent friendliness. After receiving the feedback, some changes were made, such as the inclusion of images in “*Product type*” and “*Online shopping experience*”. The survey was open from October 11th, 2022, to October 22nd, 2022. The distribution channels used were the group members’ social media accounts (Instagram, Facebook, LinkedIn), and family and friends’ social media groups (Messenger, WhatsApp, Email). To gather more responses, the group distributed the survey to different research groups on Facebook and other websites, such as Survey Circle.

7.2 Results

Sample Characteristics

This analysis was based on 130 responses, and the group focused on two demographics: age and gender. The sample is divided into 65,1% women, 34,1% men, and 0,8% who preferred not to specify their gender. The majority of the sample (71,4%) belongs to the age group between

17 and 25 years old, followed by 16,7% of respondents between 26 and 35, 4,8% between 36 to 45, and 7,1% with 46 years or more years old (See Appendix 12.4.2, Figures 63 and 64).

Conjoint Analysis Results

The analysis presented below was based on the report provided by the Conjoint.ly software, and it includes the preferred data privacy settings, the respective online shopping experience preference, and the relevance per attribute and levels. The data was based on all responses of the sample, which were considered as good to include in the analysis by the same software, as well as the responses from the age segments that we created, to identify differences of availability to engage with the feature in exchange for more data sharing.

General Analysis

Data Privacy/Online Shopping Experience Preference

The output given by Conjoint.ly encompasses the preferred online shopping experience given the preference for data sharing. Considering that, and through the analysis of Figure 8, one can derive the data shown in Table 9, presented below. The figure reflects the medians for each data privacy/online shopping experience through the diamonds presented on each violin. The violins represent the estimated distribution of data, considering minimums and maximums. The highest median is found in “*Accept mandatory cookies*”, valued at 7,5, meaning the online shopping experience customers prefer the most would be “*Regular online shopping*” (1). This experience is followed by “*Personalised online shopping through shared measurements*” (2), with a median of 6,9. These two experiences are the only ones that present a positive median value, meaning they are the most preferred by the respondents. Although the medians are very close, “*Personalised online shopping through shared measurements*” (2) encompasses customers on the far left that show lower preference for this experience, as when compared to the minimum and

maximum value of “Regular online shopping” (1), where the distance from the median is smaller both in the far left and far right, resulting in higher preference for regular online shopping (1).

Figure 3: Data Privacy/Online Shopping Experience Preference (based on average responses)

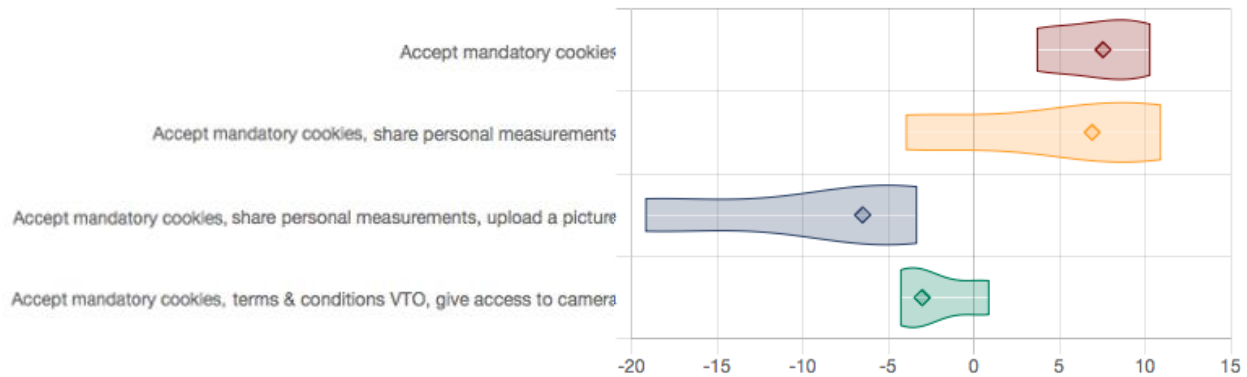


Table 2: Data Privacy/Online Shopping Experience Preference Descriptive Statistics

Data Privacy/Online Shopping Experience	Minimum	Median	Maximum
1	3,7	7,5	10,3
2	(3,9)	6,9	10,9
3	(19,2)	(6,5)	(3,3)
4	(4,3)	(3)	0,9

Ranked list of concepts/Product Preference

Aiming towards the objective of understanding consumer behaviour towards different types of products, we focused on three product types: (i) eyewear, (ii) footwear and (iii) upper garments. From our analysis, the highest value perceived for VTO usage was for the upper garment product category.

More specifically, the options shown in Appendix 12.4.2, Table 21 serve as a list of every potential combination shown to respondents and sorted by their top choice profiles. There are 12 rankings in total that indicate the added value to the customer’s experience. The top 3 rankings were examined as they are comprised of positive values, which would inherently serve the

objective of our study in exploring the added value of VTOs, used in specific product categories, for the customer's online shopping experience. The rating is based on the relative effectiveness of the combined levels, which enables customers to identify the best choice they favour above other alternatives. In order to get a more personalised online shopping experience with shared measurements, it was discovered that many individuals were willing to use VTOs for upper garments while accepting mandatory cookies and sharing personal measurements. This was also ranked in first place with a median of 10,9, according to respondents' preferences. Footwear was ranked second with a median value of 10,3, accompanied by a regular online shopping experience, where the customer would have to accept only the mandatory cookies. The third highest ranked product category was, once again, upper garments. However, in this case, the customer would have to accept mandatory cookies only to obtain a regular online shopping experience with a median of 7,5. The last preferred experience was ranked sixth, in the product category of upper garments with a median of 0,9, where the customer would have to accept mandatory cookies, terms & conditions for VTOs and give access to their device's camera in order to have a more personalised online shopping experience with a VTO feature.

Attribute Importance

As stated before, the developed conjoint analysis encompasses two different attributes that count as one single attribute, corresponding to "*Data Privacy/Online Shopping Experience*" since they are endogenous variables. As these attributes are related to the "*brand preference*" part of the Conjoint.ly report, it is expected that only one attribute will be left and that its relative importance accounts for 100%. In this sense, "*Product Type*" has a total influence on the choice of customers, allowing for a deeper understanding and responding to the question of how the product type influences consumer behaviour, hence bridging the gap identified in the literature review.

Relative Importance by Level

The level partworths are calculated relatively, meaning that the inclusion of another level in the “*Product Type*” attribute would influence the percentages presented in Table 10, shown below. These same values are retrieved based on the average preferences of the sample respondents, knowing that the highest values correspond to the highest preferences. In this sense, the negative values correspond to the lowest preferred experiences, and the sum of all positive values should be equal to the sum of all the negative values.

Table 3: Partworth utilities of all the experiences – Product Type

Attribute	Levels	Experience 1	Experience 2	Experience 3	Experience 4	Average across experiences
Product Type	Upper garments	5,6%	42,3%	40,0%	58,5%	36,6%
	Footwear	47,2%	15,4%	(60,0%)	(17,1%)	(3,6%)
	Eyewear	(52,8%)	(57,7%)	20,0%	(41,4%)	(33,0%)

When looking at the average across experiences in Table 10, it is noticeable that upper garments are the highest preference of the respondents. This happens because it is the only positive value (36,6%), which is followed by footwear (-3,6%) and eyewear (-33%). This shows that eyewear and footwear, which present negative values, are less preferred products for all online shopping experiences on average, and eyewear holds the place explicitly for the least preferred level. Nevertheless, it is crucial to analyse which experience the customers would be more likely to engage in, given their preference for upper garments. Table 10 shows that “*Personalised online shopping with VTO*” (4) is the experience for which the customers seem to have higher preferences for this level (58,5%).

It is now important to understand customers’ preferences for “*Online Shopping Experience*” per “*Product Type*” in more detail. As already mentioned, upper garments is the most preferred level, and the optimal experience for this segment, according to the sample’s data, would be the

VTO. In contrast, the least optimal experience for this level would be “*Regular online shopping*” (1) (5,6%), associated with “*Accept mandatory cookies*”. When analysing the second level, footwear, the optimal online shopping experience for the sample would be “*Regular online shopping*” (1) (47,2%). The reasoning might be explained by the fact that customers do not perceive so much added value in increased personalisation for this segment, as explored in Chapter 5. In contrast, the least optimal online shopping experience for this segment would be avatar, experience 3, (-60%), which also reflects the same reasoning of the optimal experience. Finally, concerning eyewear, the optimal experience for this level is avatar, experience 3, (20%), associated with “*Accept mandatory cookies, share personal measurements, and upload a picture*”. In contrast, the least optimal is personalised online shopping based on shared measurements, experience 2, (-57,7%), associated with “*Accept mandatory cookies, and share personal measurements*”. This analysis gives insights into the optimal and less optimal online shopping experience, considering all experiences and levels, for the sample’s respondents, and the summary of these conclusions are presented in the following Table 11.

Table 4: Optimal experience for each level

	Product Type Levels		
	Upper garments	Footwear	Eyewear
Optimal	Experience 4	Experience 1	Experience 3
Least optimal	Experience 1	Experience 3	Experience 2

It is now essential to focus on the ideal product type for each experience. Looking at Table 11, one can infer the conclusions presented on Table 12 below. For “*Regular online shopping*” (1), the optimal product is footwear (47,2%), while the least optimal is eyewear (-52,8%). For “*Personalised online shopping through shared measurements*” (2), the optimal product is upper garments (42,3%), while the least optimal is eyewear (-57,7%). For “*Personalised online shopping*

through avatar” (3), the optimal product would also be upper garments (40,0%), and the least optimal is footwear (-60,0%). Finally, for “*Personalised online shopping through VTO*” (4), the optimal product would also be upper garments (58,5%), while the least optimal is eyewear (-41,4%). This shows the relevance of upper garments for all experiences, except for the first one, meaning more personalisation is extremely valued for this market segment. In contrast, eyewear is not favoured in any personalised online shopping experience or in regular online shopping.

Table 5: Optimal level for each experience

	Experience Levels			
	1	2	3	4
Optimal	Footwear	Upper garments	Upper garments	Upper garments
Least optimal	Eyewear	Eyewear	Footwear	Eyewear

Segment Analysis

Data Privacy/Online Shopping Experience Preference

When analysing “*Data Privacy/Online Shopping Experience*” preference, it is clear that the behaviours per segment differ (see Appendix 12.4.2, Table 22). Although “*Regular online shopping*” (1) is the highest preference for the age group between 17 and 25 years old, one can infer that the major influence for this experience to be the highest preferred is the age group between 36 and 45 years old, knowing that their minimum (14,6) is higher than the maximum of every other age group for this experience. In contrast, the age group between 26 and 35 years old is the one that influences the median of the whole sample to decrease, knowing that the median of this age group is 3,7, with a minimum of -2,0.

By analysing the data per segment for “*Personalised online shopping through shared measurements*” (2), it is noticeable that the age group with 46 or more years old is the one that influences the increase of the all-sample median. However, all the other age groups also seem to

perceive this experience as positive, meaning it is also part of the most preferences for all age groups, alongside regular online shopping (1). In contrast, the age group that pushes this median down is the age group between 36 and 45 years old, with a median of 1,8 and a minimum value of -6,2 (see Appendix 12.4.2, Table 22).

The last two experiences present negative median values for all age groups, meaning they are the least preferred experiences for these segments. Nevertheless, it is also interesting to understand which age groups perceived them as better, although still in a negative sense than others. “*Personalised online shopping through avatar*” (3) seems to be better perceived by the age group between 26 to 35 years old. However, it is the least preferred option for this group when compared with the rest of the experiences (-3,0), and its maximum is still a negative value (-1,8). The age group between 36 to 45 years old presents the lowest median of all segments and experiences in experience 3 (-12,3). Nevertheless, the lowest minimum value can still be found in the age group with 46 or more years old (-23,8) (see Appendix 12.4.2, Table 22).

Finally, “*Personalised online shopping through VTO*” (4) is the second least preferred option for all segments. However, the segment in between 17 to 25 years old is the one segment that is bringing the median value for the whole sample down (-3,8), with a minimum value of -5,3, showing a very low preference, which would not be expected given the fact that younger generations tend to be more tech-savvy. Nevertheless, the age group between 26 to 35 years old is the one that seems to be keener to engage in this experience. However, they still perceive it as one of the least preferred when compared to all the others, presenting a median value of -0,2, and a maximum value of 3,0 (see Appendix 12.4.2, Table 22).

Ranked list of concepts/Product Preference

For respondents aged between 17-25 amongst 90 observations, upper garments ranked first with a median value of 11,5, where the customer would have to accept the mandatory cookies and share personal measurements to get a more personalised with shared measurements online shopping experience. Second ranked is the footwear category, where the customer would be required to only accept the mandatory cookies to have a regular shopping experience. This has a median of 11. Third ranked-once again upper garments with a median of 8,1. Similarly to the above experience refers to regular online shopping (See Appendix 12.4.2, Table 23).

The group segment of 26–35-year old's (N=21), ranked the upper garment category first but also showed an inclination towards footwear. With a median value of 8,5, upper garments were most preferred. The customer would have to accept the mandatory cookies and share personal measurements to get a more personalised experience with shared measurements. For the same personalised online shopping, footwear ranked second with a median of 6,9. Third-ranked once again footwear, but this time with a median of 4,5 for regular online shopping.

The group of 36–45-year-olds amongst 6 observations, was the only segment that ranked the eyewear amongst their top three products. That is, footwear was in first place with a median value of 19, where participants would have to only accept the mandatory cookies in order to have a regular shopping experience. Eyewear was ranked second with a median of 15,2 and would entail the same data privacy sharing settings as above for the same outcome of a regular online shopping experience. Lastly, once again, for a regular online shopping experience with the only requirement of accepting mandatory cookies, upper garments ranked third with a median value of 14,5.

The last age group segment examined were individuals over the age of 45 (N=9). This group portrayed almost identical behavioural preferences to the segment of 26–35 years old. That being said, upper garments ranked first with a median value of 14, and footwear ranked second and third with 9,8 and 9,6 medians, respectively. Regarding the footwear product type preference, first

ranked the more personalised online shopping experience with shared personal measurements where the customer would have to accept the mandatory cookies and disclose personal measurements, while third-ranked just a regular online shopping experience with the acceptance of mandatory cookies only.

Relevance Important by Level

Regarding the optimal online shopping experience for each product type per segment, the analysis of choice preference (see Appendix 12.4.2, Table 24) shows that the tendencies are the same for each age group, meaning the results are the same as the previous section. However, the respondents between 26 to 35 years old (N=22) show a slight difference regarding online shopping, with the lowest preference for eyewear. Every segment considers “*Personalised online shopping based on shared measurements*” (2) as their least preferred option, except for this prementioned segment, which seems to have less preference for “*Regular online shopping*” (1) (see Table 13). Nevertheless, the difference between both experiences is minimal, “*Regular online shopping*” (1) is rated as -62,7%, while “*Personalised online shopping based on shared measurements*” (2) is rated as -62,3%. The slight difference in age groups might be explained by the fact that age group 1 (17-25) accounts for 71,4% of the sample (93 respondents), while all the other segments account for less than 30 respondents.

Table 6: Optimal Experience for each level per segment

Age segment	Level	Experience	
		Highest Preference	Lower Preference
17-25	Upper Garments	4	1
	Footwear	1	3
	Eyewear	3	2
26-35	Upper Garments	4	1

	Footwear	1	3
	Eyewear	3	1
36-45	Upper Garments	4	1
	Footwear	1	3
	Eyewear	3	2
46+	Upper Garments	4	1
	Footwear	1	3
	Eyewear	3	2

Goodness of fit

The statistical test known as “goodness of fit” evaluates how well sample data fits a distribution from a population having a normal distribution. Accordingly, the goodness of fit aims to assess how well the survey report describes the participants' responses. The goodness of fit results from our report indicated that 51.3% of survey participants found satisfaction in the options available, which translated into “*medium fit*”. According to Conjoint.ly, a strong goodness of fit with a pseudo-R2 value over 65% reveals that respondents have distinct feature preferences. A score of under 45% shows that the respondents' selections are more arbitrary due to poor goodness of fit. Hence, our results indicate that respondents do not have very clear preferences for features provided in the survey, but their preferences are not completely arbitrary either. Furthermore, 4.5% of participants' answers consisted of “*None of the above*” answers, meaning these participants were not satisfied with the options available in the survey.

In conclusion, this analysis shows that when exposed to specific data disclosure needs, the respondents tend to prefer the online shopping experience that requires fewer steps, and is less personalised, which translates into “*Regular online shopping*” (1). This shows that personalisation is less valued, considering that the trade-off between willingness to share personal data and perceived added value to the online shopping experience does not exist for most respondents. Nevertheless, upper garments is the top market segment for all the presented personalised online shopping experiences “*Personalised online shopping through shared measurements*” (2),

“Personalised online shopping through avatar” (3), and *“Personalised online shopping through VTO”* (4). In contrast, eyewear is the least preferred, followed by footwear.

8. Consumer segmentation: Cluster analysis

The chapter presents a cluster analysis to evaluate customer perceptions and preferences towards Virtual Try-On (VTO) technology in online shopping. The analysis considers customer segments' interactions with the VTO feature, including privacy concerns and overall perceived usefulness. The results of the analysis will create customer profiles based on age demographics, a crucial aspect in understanding the impact of technology on different age groups. The cluster analysis is based on data collected from a preliminary survey.

9. Conjoint Analysis: Recommendations for VTOs for eyewear

This chapter examines the eyewear segment to provide clear recommendations of the ideal VTO experience for brands, as this product had the best customer response in both the preliminary survey (Chapter 5) and perceptual maps (Chapter 6). The literature review revealed the great potential of this segment and the insights gathered from experts (Chapter 4) reinforced the decision to analyse eyewear in more detail. The fact that it was the least preferred product type in the first conjoint analysis may be attributed to the fact that fewer people tend to shop online for eyewear (55 clicks) in comparison to upper garments (181 clicks) and footwear (122 clicks), as derived from the preliminary survey. (See Appendix 12.2.2, Figure 17).

This chapter starts with the methodology, explaining the rationale behind the choice of attributes and levels and the choice of the placement. Finally, it presents the results of this smaller study based on a sample of 100 respondents.

9.1 Methodology

Based on the literature review, expert interviews, and prior results from this thesis, the analysed attributes and levels were chosen in a similar manner to Chapter 7.

Attributes and Levels

This survey aimed to study the importance of the different VTO features and how customers perceive them. By creating different combinations of possibilities, we can identify the most desirable type of personalised online shopping experience through VTO for eyewear. As already mentioned, the choice of attributes and correspondent levels is related to the literature review, expert insights, and results from the previous surveys that were analysed. Differently from the previous conjoint analysis, this one does not encompass endogenous variables, allowing for a greater understanding of the relative importance of attributes in the respondent's choice. This analysis was made to be simpler than the previous one, assuring respondent friendliness. The three attributes and corresponding levels may be found in Appendix 12.6.1, Table 26.

The first attribute, "*Type of VTO*," was included due to the necessity of providing the different possibilities of personalisation through VTO in order to guarantee user's awareness. Literature review led us to create two levels for this attribute: (i) "*Personalised avatar based on measurements and picture*," and (ii) "*VTO recording of yourself*". The second attribute, "*Where to use VTO*," was included due to the need to evaluate customers' preference of VTO platform, acknowledging that social media filters are essential when analysing AR in the online fashion retail industry. In this sense, the group included three levels: (i) "*Mobile Application*," (ii) "*Brand's Website*," and (iii) "*Social media filter (Snapchat/Instagram)*". Taking into account the findings from the literature review and expert interviews, the last attribute of the user experience questionnaire was "Purpose of Experience", which had two levels - (i) "Fun and Interactivity" and

(ii) “Picking the right product (size/fit)”. This was due to the need to focus on the user experience for success and the current technology trends of brands striving to provide a fun experience rather than recommending the perfect size. In the conjoint analysis survey, the order of attributes was the same as presented above: (i) “*Type of VTO*,” (ii) “*Where to use VTO*,” and (iii) “*Purpose of Experience*”. This order was considered in order to explore the customer’s journey and highlight the ideal features of the VTO.

Initial Survey Setup: Conjoint.ly

The reasons that led the group to choose the software Conjoint.ly were the same as the ones explained in Chapter 7, although in this analysis, we chose to use generic specific conjoint, acknowledging that no restrictions to combinations were needed and the inexistence of brands.

The survey layout was designed with four sections: (i) introduction, where the group presented the different types of VTO and the data privacy associated with each one of them, (ii) two questions that aimed to confirm the respondent was aware of the needed disclosure of data for each experience, (iii) randomly generated choices with no restrictions on combinations, and (iv) additional questions on demographics, such as age, gender, self-esteem, and frequency of online shopping (See Appendix 12.6.1, Figure 76). The survey was designed in the same template as the previous one, allowing the respondents to select a “*None of the above*” option. The number of VTOs for eyewear presented at the same time was set to three, and the number of choices each respondent had to make was 12. “*Type of VTO*” and “*Where to use*” levels were associated with images to increase respondents’ friendliness. An overview of the survey layout can be found in Appendix 12.6.1, Figure 77.

Pre-Test and Data Collection

The survey was open from the 19th of November to the 23rd of November 2022. The distribution channels used were the same as those already mentioned in the previous chapters, including social media accounts (Instagram, Facebook, LinkedIn), family and friends' social media groups (Messenger, WhatsApp, Email), and different research groups on Facebook and websites such as Survey Circle.

9.2 Results

Sample characteristics

This conjoint analysis was based on 100 responses, following the sample size advised by the utilised platform, Conjointly. Two demographics were part of the survey: (i) age and (ii) gender. The sample is divided in 58,6% women, 41,4% men, and 0% preferred not to specify their gender. The majority of the sample (59,6%) belongs to the age group between 17 and 25 years old, followed by 28,3% of respondents between 26 and 35, 6,1% between 36 to 45, and 6,1% were 46 years old or more (See Appendix 12.6.2, Figures 78 and 79).

Conjoint Analysis Results

The analysis focused on the preferred VTO experience for eyewear, as well as the relevance per attribute and levels. The data was based on all responses of the sample, which were considered as valuable to include in the analysis.

Attribute importance

The first part of the analysis was the evaluation of the attribute importance. Moreover, it focuses on how important each attribute is relatively to the other attributes across customers, considering that each consumer values different product attributes. As mentioned in the methodology there are three main attributes; (i) “*Type of VTO*,” (ii) “*Where to use VTO*,” and (iii) “*Purpose of experience*.” The attribute (ii) “*Where to use VTO*” was the attribute with the most

importance (50,1%). Next is the attribute (iii) *“Purpose of experience”* which shows an importance of (25,9%). Last there was the attribute (i) *“Type of VTO”* which shows an importance of 24,0%. All the values sum up to 100%. These results showed that the survey respondents have a strong opinion about where to use the VTO and brands should keep this in mind when offering a VTO experience for eyewear (See Appendix 12.6.2, Figure 83).

Average preference for levels per attribute

Table 14 displays the average customers’ preferences for each level of an attribute compared to the other levels. The values in the table are centred around 0, with positive values indicating a higher preference and negative values indicating a lower preference.

Table 7: Preferences for levels relative to other levels

Attribute	Levels	Preference
Type of VTO	Avatar based on measurements and picture	(9,0%)
	VTO recording of yourself	9,0%
Where to use VTO	Mobile Application	15,9%
	Brand's Website	19,3%
	Social Media Filters (Snapchat/Instagram)	(35,2%)
Purpose of Experience	Fun and interactivity	(13,8%)
	Picking the right product (size/fit)	13,8%

The first attribute shows that the preferred level was (i) *“VTO recording of yourself”* with 9% rather than an (ii) *“Avatar based on your measurements and picture”*. We interpreted this as medium high level of preference. The second attribute was *“Where to use VTO”* and consists of three levels: (i) *“Mobile application,”* (ii) *“Brand’s website”* or (iii) *“Social media filter (Snapchat/Instagram).”* The preference of the respondents was to have the VTO experience for eyewear on a *“Brand’s website.”* This level scored 19,3% which is a high score of preference. Secondly, the respondents prefer that the experience is hosted on a *“Mobile app”*, with 15,9%.

Social media is not a popular platform with a very high negative score (-35,2%), which showed a high dispreference.

The final attribute, “*Purpose of experience*,” showed that potential customers have the preference of a brand’s focus on the level (i) “*picking the right product*” rather than (ii) “*fun and interactivity*.” In e-commerce, customers potentially care to reduce the perceived risks of shopping online. They cannot physically examine the products. (Do et al., 2019). Therefore, when shopping online they aim for the right product. Another explanation might be the frequency of the product purchased. Eyewear is not a product that is bought frequently. This makes the tendency of buying the right product higher.

Distribution of preference for levels per attribute

The chart presents the distribution of preferences for various levels within each attribute across customers considering that each consumer likes (slightly or greatly) different levels (See Appendix 12.6.2, Figure 84). The graph shows the percentage for which respondents picked a level compared to the other attribute levels. Within the attribute “*Type of VTO*”, 63,5% of the respondents preferred the “*VTO recording yourself*”. The second attribute, “*Where to use the VTO*,” 46,9% preferred the “*Brand’s website*” followed by the use of a “*Mobile Application*” with 39,2%. Together they formed a significant majority. When interpreting these results, we concluded that our respondents are not looking for Fun and interactivity, so the last level “*Social Media*” is not preferred by them. The last attribute was the “*Purpose of experience*,” and, as previously mentioned, the majority (67,5%) preferred “*Picking the right product (size/fit)*” over “*Fun and Interactivity*”.

Ranked list of some product concepts as preferred by customers

To understand the consumer preferences towards a VTO for eyewear, Conjoint.ly ranked a list of value per attribute. More specifically, the options shown in Appendix 12.6.2, Table 27 serve as a list of every potential combination that was shown to respondents and sorted in accordance with their top choice profiles. There are 12 rankings in total that indicate the added value to the customer's experience.

We can conclude that the highest value was added by the combination of levels; *"VTO recording yourself,"* on a *"Brand's website"* with the purpose of *"Picking the right product (size/fit)"* with 20,1. In the case of eyewear, it was interesting how hedonic values were perceived as less important when comparing to other products. The second experience customers valued highly was the combination mentioned above but instead of using the *"Brand's website"* the option of the *"Mobile application"* was used and valued at 18,5. Combinations with the third level of *"Where to use the VTO"*, which was the *"Social Media filters (Snapchat/Instagram)"*, it was only mentioned on the 9th place with a negative value to customers of -5,9.

Next, we change the *"Type of VTO"* to *"Personalised avatar based on measurements and picture."* The levels with the most value in this case are *"Brand's website"* and the purpose of *"picking the right product (size/fit)."* This combination is still valued relatively high with 11,5. When the type of VTO changes to *"Mobile application"* the value of the experience drops to 9,9. Lastly, we will discuss what combinations brands should not focus on. This includes the combinations *"VTO recording of yourself"* when used on *"Social media filters (Snapchat/Instagram)"* with the purpose of *"Fun and Interactivity."* Respondents valued this combination with a negative -19,1. The worse combination possible is with the type of VTO *"Personalised avatar based on measurements and picture"* when hosted on *"Social media"* with the purpose of *"Fun and interactivity"*. Customers did not value this combination.

Goodness of fit

Goodness of fit results derived from our report indicated that 57.7% of survey participants found satisfaction in the options available, which translated into “medium fit.” Only 8.7% were not satisfied with options available in the survey, choosing the “*None of the above*” option.

Additional questions

In order to validate whether the usage of a VTO feature outweighs the costs of data disclosure, we asked participants about their preferences. The options available were “*Avatar based on measurements and picture*,” “*VTO recording of yourself*,” “*Both*,” and “*None*.” The majority of the respondents find both the avatar and the VTO self-recording option as beneficial consisting of 38,4%, while 31,3% prefer VTO self-recording, and only 21,2% selected avatar based VTO. Lastly, 9.1% of the respondents selected that they would not select either of the 2 options which outweigh the costs of data disclosure. Furthermore, we examined the frequency of participants’ online purchases. The options presented to them ranged from “*Daily*,” “*Weekly*,” “*Monthly*,” “*Seasonally*,” “*Yearly*,” “*Occasionally*,” and “*Never*.” The most selected option was “*Monthly*” online purchases at 34,3%, followed by the second highest selected option of “*Weekly*” purchases at 27,3% (See Appendix 12.6.2, Figures 80 and 82).

We also assessed the mediating role of self-esteem in the VTO feature selection process for customers’ online shopping experiences. This question was structured using a star rating technique where the users could rank attributes on a 5-star scale. The rating employed stars which indicated consumer preferences ratings of their self-esteem, with 1 star indicating the “*Very low*”, whereas 5 stars the “*Very high*” option. The mean value of the sample is 3,8 and the median value is 4, which means that of the 100 respondents, 51,5% selected their self-esteem ranking at 4 starts

indicating “*High*” self-esteem. This was followed by 22,2% of respondents ranking their self-esteem at “*Moderate*” with 3 stars. Moreover, 19,2% of respondents expressed “*Very high*” self-esteem at 5 stars. Lastly, very few of the respondents had “*Low*” self-esteem, 6.1%, and “*Very low*” self-esteem at 1% (See Appendix 12.6.2, Figure 81).

In conclusion, it is evident that customers place a significant importance on the platform of the VTO option available to them. Furthermore, the placement accessibility for eyewear VTOs is an essential determinant for the type of VTO customers intend to select as well as the purpose of using this technology. The selection of VTO self-recording option is often contingent upon whether customers are well aware of the explicit data disclosure required for their other option, namely a personalised avatar VTO. One explanation could be that customers care to lessen the perceived risks associated with online shopping. This supports our hypothesis that when customers are reminded about the privacy disclosure, they tend to perceive a higher privacy risk and, as a result, are less likely to share their personal data. Furthermore, our inquiry about customers’ self-esteem allowed us to understand its association with VTO type selection. As we discovered a correlation between high self-esteem in this sample of respondents and the fact that most respondents chose the “*VTO recording of yourself*” as their preferred VTO feature, selection of low self-esteem would result in choosing the “*Personalised avatar based on measurements and picture*” option.

10. Discussion

10.1 Limitations and Further Research Opportunities

The following chapter examines the research limitations and suggests possible directions for future research.

Literature Review: It is well-documented that the implementation of video recording technologies, or VTOs, in the fashion retail industry is a relatively new phenomenon. As such, the available

literature on the topic is limited, and most research on advanced technology in online retail does not specifically focus on consumer behaviour and the perceived added value of VTOs from a customer's perspective. This may make it challenging to conduct a comprehensive literature review on the topic. However, conducting interviews with experts in the field or examining related research on advanced technology in online retail can provide valuable insights into the use of VTOs in the fashion industry. Further research on the topic is necessary to gain a deeper understanding of the impact of VTOs on consumer behaviour and the perceived value of these technologies.

Our research examined consumer behaviour and the perceived added value of the VTOs towards three specific types of products: (i) upper garments, (ii) footwear, and (iii) eyewear. However, this resulted in a few complications when preparing the literature review. Although VTOs apply to many different product categories, more research is needed when focusing on the products themselves. We interviewed and connected with experts who specialised in VTOs for the respective product categories to gain more insights and information that was not available through other sources, such as literature. However, we acknowledge that further research into other product categories that offer VTOs is highly recommended to gain more insights about the added value per product.

Expert Interviews: When conducting the expert interviews, we gathered opinions from various stakeholders in the VTO industry. Most of these participants were from technology companies, which yielded valuable insights. We managed to receive input from an expert in the area of eyewear VTOs with direct affiliation to the fashion retail industry but were unable to do so for the product categories of footwear and upper garments. This is a common challenge when attempting to engage with industry experts (Bogner, Littig, and Menz 2009). A way to address this issue is to assign one person in the group to be responsible and entirely dedicated to connecting

and networking with fashion industry experts in case a greater time frame is available to develop our thesis.

Sample: One further limitation identified in our research is that the data gathered from our survey is susceptible to sample size bias. While we distributed our surveys through a wide range of networks and social media channels, the sample only represents a small portion of the overall population. As Rahman et al. (2013) explain, sample bias can lead to incorrect conclusions and underperforming prediction models and can also impact a study's external validity. To address this limitation in future research, we recommend establishing more specific research questions and carefully selecting a representative sample from the population of interest. For example, distributing the survey to Portuguese individuals within a specific age range who have used VTOs could reduce bias and increase the generalizability of the study. This can help ensure that the sample is representative of the studied population and can improve the generalizability of the study's findings.

One significant issue arising from the limitation of sample size bias is the impact on the clusters formed from the data obtained from our conjoint analysis. Because participants were divided into smaller groups (clusters), some of these clusters had a sample size of less than 30. A sample size of less than 30 is not considered sufficiently large to accurately forecast population characteristics such as the mean and standard deviation, which reduces the value of the analysis. To address this limitation in future research, we could distribute the survey to specific age groups to ensure that each target group has at least 30 participants, which would improve the validity and reliability of the data.

Additionally, the uneven distribution of respondents by gender in the preliminary survey (61.7% female and 38.3% male) can also pose a limitation and impact the results obtained. To avoid this limitation in future research, we could keep track of respondents who wish to participate

in our surveys and target remaining genders once the desired or sufficient number of male respondents has been achieved. This would help ensure a more balanced and representative sample, which would improve the generalizability of the study's findings

Another limitation of our research is the high proportion of participants who had not previously been exposed to VTOs. In the preliminary survey 73.7% of respondents had not tried a VTO feature and relied on their imagination to answer the survey questions, which may not always be accurate or adequate for research purposes. In future research, it would be more beneficial to obtain results from participants who have used VTOs, as it is a relatively new technology that is expected to continue evolving. To achieve this, it would be necessary to focus on more defined groups of participants and create a survey specifically targeting individuals who have experience with VTOs. This could improve the validity and reliability of the study's findings and provide a more comprehensive understanding of the impact of VTOs on consumer behaviour.

Perceptual Maps: Upon conducting the perceptual maps, we encountered two limitations in our research. The survey which provided the data for the perceptual maps measured six factors. One of those factors was “*Data privacy concerns*” and was measured on the same scale and direction as the other factors. Furthermore, the other factors, “Quality of recommendations”, “Interactivity”, “Usefulness”, and “User-friendliness”, are all measured in the same positive direction and should be contradictory to the “*Data privacy concerns*”. To address this issue, we reversed the factor “*Data privacy concerns*” scale from 1-5 to 2-4.

Secondly, the factor analysis performed to present the perceptual map derived a cumulative variance of 1. This indicates that our model is not suitable for the research we conducted, as it is not possible to achieve a perfect model. Factor analysis is typically used to reduce the number of variables to one or a few factors that explain the variables. In our model, there is only one item for

each variable, so reducing the number of variables is not possible. Further statistical research into this topic could lead to a better understanding of the cumulative variance in this model.

Conjoint Analysis: When conducting the conjoint analysis, more limitations were revealed. Firstly, the respondents exhibited a status-quo bias, focusing their attention on what they are accustomed to purchasing online instead of making the most rational choice (Kahneman, Knetsch, and Thaler 1991). When participants were only considering eyewear, they tended to perceive more value in VTOs for this product than the others, as was shown in both the preliminary survey and perceptual maps analysis. This limitation could be addressed by including an introduction in the survey explaining to the participants that they should make unbiased decisions in the survey they are about to take part in, specifically to connect products with VTO technology rather than online shopping.

Another limitation related to the conjoint analysis is the choice of a brand-specific conjoint analysis. This method was employed in our analysis due to its ability to select all the accurate combinations for respondents, considering that the attributes “*Online shopping experience*” and “*Data privacy concerns*” are endogenous variables. Restrictions were implemented within these two attributes to generate only valid outcomes. These restrictions limited the data insights gathered and made the results less constructive. Different outcomes and opinions were gathered when comparing the surveys to the conjoint results. This could be due to the limitation of the survey set-up, or perhaps survey participants did not value eyewear as much as in the other surveys. Therefore, a second conjoint analysis was conducted to address the previous limitations.

10.2 Findings and recommendations

The following section provides a summary of key research findings, as well as recommendations for retailers and brands offering or considering the implementation of a VTO

feature. It is organised according to the stages of the research process and the types of analyses performed.

Expert interviews suggested that a VTO feature offers a (i) fun and interactive shopping experience, (ii) reduces the number of product returns and (iii) adequately displays product visual characteristics. However, there is a consensus that more advanced technology is required to improve recommendation quality and personalisation.

How do customers respond to VTOs?

The preliminary survey revealed that most participants have not yet used a VTO, but they demonstrated a willingness to try the technology. This is likely due to the fact that VTOs are still in the early stages of implementation and are only being utilised by a few brands. It has been established that quality of recommendations, personalisation, and interactivity are the primary drivers for customers to use VTO feature. This has been supported by experts' opinions. Moreover, customers have been shown to perceive a higher value in brands that offer VTO services, indicating that it is a beneficial investment for fashion retailers. Our analysis revealed that customers were hesitant to use VTO features due to data privacy concerns. Privacy was perceived as a risk, associated with distrust in how the data is being processed. This finding is in line with research conducted by Ivanov, Mou, and Tawira (2022), who argued that privacy concerns negatively affect the adoption intention towards a VTO. Additionally, Ariffin, Mohan, and Goh (2018) suggested that customers' intentions to make online purchases are adversely affected by perceived risk, particularly security risk.

The underlying motivations for customers to supply personal information to marketers in order to facilitate the understanding of their needs and preferences through data collection remains uncertain (White 2004). Our analysis revealed a lack of clarity regarding the information customers are willing to provide to use a VTO feature. The preliminary survey indicated customers are more

likely to share body measurements or their picture than to record themselves. This finding can be applied to the study conducted by Feng and Xie (2018), which correlated privacy concerns to customer's desired viewing condition (e.g., self-viewing or other viewing). Viewing oneself wearing a product is likely to result in higher degrees of perceived intrusiveness and more negative app sentiments among users with significant privacy concerns than viewing others.

Additionally, our analysis demonstrated that the lack of human interaction, and the inadequate quality of recommendations contribute to customers' reluctance to use VTOs. This raises an intriguing point that, while fitting recommendations are a primary motivator for customers to use VTOs, the poor quality of these recommendations can be a deterrent. Conversely, Baytar, Chung, and Shin (2020) argued that VTOs augmented with AR technology yielded accurate sizing and colour information compared to a physical try-on of a dress. Additionally, it was noted that clothing's visual characteristics and compatibility with other items were satisfactorily predicted, resulting in a favourable attitude towards AR and the actual dress, as well as an increased intent to purchase. Therefore, we suggest that further research be conducted on customer's satisfaction with the quality of VTO recommendations. We believe that there is potential for improvement in the development of VTO recommendations, in order to provide more accurate suggestions and a smoother experience.

How do customers perceive VTOs related to different products?

In order to gain insight into how customers perceive the VTO experience regarding different types of products, 5 impacting factors were evaluated. It was concluded that factors such as “*Usefulness*”, “*User-friendliness*”, “*Interactivity*”, and “*Quality of recommendations*” had a positive impact on customers’ perception of VTOs and are closely related to the perceived added value to the online shopping experience. Our findings support the research of Pantano, Rese, and Baier (2017), which showed direct influence of perceived usefulness and enjoyment on attitude

towards AR, highlighting the hedonic and utilitarian value of the technology utilised in the shopping experience. Furthermore, our findings are in accordance with the research of Plotkina and Saurel (2019), which concluded a direct influence of hedonic (e.g., perceived enjoyment) and utilitarian value (e.g., perceived usefulness, perceived ease of use, perceived convenience) on customer's attitude towards the technology used. Additionally, Yang and Wu (2009) reached a similar conclusion, indicating that vividness and interactivity are determinants of telepresence that have significant impact on hedonic and utilitarian value. Contrarily, the factor "*Data privacy concerns*" negatively influences customers' perceptions to virtually try on different products. This is in accordance with Harborth (2019), who noted that social consequences, privacy, security, and the lack of additional value through the use of AR are key considerations for the adoption of new technologies. Correspondingly, Poushneh (2018) argued that when AR technology violates the desire of personal data privacy or delivers unsatisfactory augmentation quality, customers are less likely to use AR.

Our perceptual map analysis revealed the associations of the specified factors and the product categories under consideration: i) eyewear, (ii) footwear, and (iii) upper garments. It has been concluded that customer perceptions of eyewear are positively associated with a range of factors, including "*Usefulness*," "*User-friendliness*," "*Quality of recommendations*" and "*Interactivity*." Eyewear is the highest ranked product category for VTOs amongst all factors due to its positive influence on the respondent's attitudes. This suggests that customers perceive the feature to be of value to their online shopping experience, leading to increased willingness to use the feature. This finding is consistent with the findings of Pantano, Rese, and Baier (2017), which noted a positive customer's attitude for eyewear. Furthermore, our research revealed that customers have significant data privacy concerns regarding virtually trying on upper garments, compared to the other two product categories. Customers had generally neutral to positive attitudes towards the

rest of the factors, ranking this product category as second. The reluctance of customers can be attributed to the high degree of body exposure and recognition needed when using this feature for upper garments. Footwear VTOs were perceived as the least useful and interactive in terms of providing customers with a user-friendly shopping experience and quality of recommendations. This product category was found to be the least associated with factors that positively influence customers' online shopping experiences, thus not providing additional value. Additionally, this product category was rated low on data privacy concerns, which can be explained by the fact that customers perceive data sharing of their feet as less intrusive, making them less reluctant to share such information.

Is there a trade-off between willingness to share personal data and the perceived added value to the shopping experience related to different types of products?

A key finding retrieved from the first conjoint analysis is that respondents tend to be more reluctant towards the usage of VTOs (avatar and recording), when they are faced with the realisation of the amount of data, they need to disclose to benefit from a personalised experience related to different products. Hence, the cost of data disclosure outweighs the perceived added value (benefit) of the experience. This is in line with the privacy calculus theory (Culnan and Armstrong 1999), which describes the disclosure intention as the outcome of an evaluation of perceived risks and benefits. Consequently, we posit that customers' data privacy risks outweigh the perceived benefits of the personalised experience. When customers are presented with clear data sharing requirements, they tend to have a lower perception of value from personalisation compared to when asked about VTOs in a more general context. Our findings suggest that high data privacy concerns lead to a decreased willingness to engage with AR technology compared to other online shopping experiences, such as regular online shopping and personalised online shopping utilising shared measurements.

Our results indicated that AR-based experience was not the most preferred, yet it is possible to draw conclusions regarding the optimal product categories for each experience. Upper garments constituted the optimal product type for both personalised avatar try-on and self-recorded VTO. Footwear was the least desirable product category for personalised avatar try-on, whereas eyewear was the least desirable product category for self-recorded VTOs. It is essential to investigate the underlying rationale behind the fact that eyewear was determined to be the highest-ranked segment in the preliminary and perceptual maps surveys yet was deemed to be the least preferred option for most online shopping experiences explored in the conjoint analysis. Recalling Appendix 12.2.2, Figure 17, it is evident that eyewear is the least procured online shopping item, garnering only 55 clicks out of a sample of 228 respondents. Conversely, upper garments are the most popular online shopping item, with 181 clicks.

The finding of our conjoint analysis demonstrates that upper garments are the most popular item across 3 of the 4 presented online shopping experiences, which conflicts with the results of our previous analysis, which identified eyewear as the top product segment in terms of customer preferences. Additionally, eyewear has been correlated with positive attitudes towards AR usage and purchase intentions in the literature. Consequently, we posit that the respondents were affected by the *status-quo* bias, focusing their attention on what they are used to buy online instead of the most reasonable choice (Kahneman, Knetsch, and Thaler 1991). Our preliminary analysis showed that participants usually shop online for upper garments, which could be a factor influencing their choices in the conjoint survey. Additionally, when asked about each product category separately, participants demonstrated a higher value recognition for VTOs with regards to eyewear. Consequently, we believe that this supports the *status-quo* bias. Our research has revealed that two major aspects shape customers' attitudes and preferences towards VTOs. Firstly, customers are less willing to use VTO technology when they are confronted with an explicit data sharing requirement.

Secondly, the *status-quo* bias can be associated with customers' decision making towards online shopping with AR-based technology. Further research is suggested to further explore these findings.

How do preferences and perceptions differ across customer segments?

Our research indicated that the most appropriate demographic for the VTO market are individuals aged 26-35 belonging to Cluster 5. This customer segment is named Liberal Gen Y, since they have lower distrust in data, higher comfort in virtually trying on all products, and generally perceive the highest usefulness in the VTO feature. A distinct characteristic of this specific segment is that they make online purchases on a weekly basis, meaning that technology renders a significant part of their daily life, which could also explain their low distrust in the use of their personal data. The trust in their data privacy is directly related to the perceived usefulness of the VTO, which, for this case, is very high. This customer segment can be described as having hedonic values which are defined as more subjective, and fulfil purchases primarily for pleasure, amusement, and stimulation (Childers et al. 2001), with the potentiality of increased enjoyment of the shopping experience.

A secondary cluster that can be taken into consideration is Cluster 4, namely the Liberal Gen Zs. The segment comprises individuals aged between 17-25 who shop seasonally. A further point of differentiation is that this segment perceives VTO technology as useful and has the lowest distrust in data privacy amongst all clusters. The higher levels of perceived usefulness of VTOs correlate to the lower levels of distrust in data privacy. Similarly, to the Liberal Gen Ys, these customers can also be characterised as having hedonic values, which encompasses potential entertainment and enjoyment of the shopping experience (Babin, Darden, and Griffin 1994).

We believe that it would be considerably more beneficial to target this market group that is likely to be interested in VTO technology amongst different types of products and open to sharing

the personal data for a more personalised online shopping experience, rather than a very large audience. According to our research, the specific customer segment that companies should avoid targeting with their VTO technology are the Sceptics, which belong to Cluster 2. These shoppers are between 36 and 45 years old, shop online occasionally, perceive VTOs as somewhat useless, and show the highest distrust in data privacy. This group of customers can be further classified as utilitarian shoppers, who are typically regarded as effective, logical, and task-driven (Childers et al. 2001). Hence, using a VTO would make their shopping experience less effective, as more unnecessary features would be added towards their shopping journey. As we have thoroughly examined the trade-off between data privacy and the perceived usefulness of VTOs, it is only prudent for a company to avoid this certain customer segment.

What are the ideal features for a VTO when trying on eyewear?

As previously mentioned in Chapter 9, the second conjoint analysis performed aimed to assess the ideal VTO experience when trying on eyewear in order to provide recommendation to online fashion retailers. However, we discovered that the platform in which customers can use VTOs also plays an important role in their decision to use the feature for eyewear during their online shopping experience. More specifically, when taking into consideration all the attributes examined; type of VTO, placement of the VTO, and the reason for which participants would use it, the most valuable experience combination was VTO recording yourself, in a brand's website and for picking the right product for eyewear. Again, we acknowledge the difference between participant's disclosure behaviour. Our preliminary survey showed a higher preference for uploading a personal image for a personalised experience compared to recording themselves to use the VTO. However, when respondents were highly aware of the explicit data disclosure needed for the customisation of an avatar, which requires an upload of a personal picture, customers tend to choose the VTO recording option. The reasoning behind this may be due to the fact that the storage

of data is perceived to be higher in this specific case, rather than a real-time scanning of the body, which confirms our reasoning that when reminded about the privacy disclosure, customers perceive higher privacy risk and their willingness to share personal data decreases.

We believe that this further represents a meaningful insight to customers' self-esteem. Furthermore, we correlate high self-esteem in this sample of respondents to the fact that the majority of respondents selected their preferred VTO feature as the "*VTO recording of yourself.*" On the other hand, if participants had low self-esteem, the selection of the "*Personalised avatar based on measurements and picture*" would have been selected. This explanation derives from a belief that participants with higher self-esteem would feel more comfortable seeing themselves on a screen and hence virtually trying on clothes. This can be correlated with expert's opinion about customer's desire to look their best when engaging with advanced technology shopping experiences. Customers with lower levels of self-esteem could be hesitant to use VTO recordings of self. Hence, they would prefer the personalised avatar option, since they would sense a better version of themselves. Furthermore, this corresponds with the research conducted by Merle, Senecal, and St-Onge (2012), which argued that body esteem and perceived VTO self-congruity play a crucial role in directly or indirectly increasing hedonic and utilitarian value, which increases purchase intention. Body-esteem has been proven to positively influence self-congruity and confidence fit. A lower level of body-esteem has been correlated with viewing a VTO self negatively, consequently resulting in perception of VTO as less congruent. Hence, we conclude that further research should be done on the topic of body-esteem and VTO personalisation option. Moreover, retailers should target specific segments that are open to such technology, considering the body-esteem factor.

Recommendations to online fashion retailers

- 1) The placement used for a VTO feature greatly impacts whether customers are willing to use the technology in their shopping journey. From our results, the brand's website is the most preferred platform for the use of VTO. This might relate to the fact that customers often prefer to buy directly from the brand if given the option. Furthermore, a brand's website is 57% more likely than a retailer's to be where customers begin their online shopping journey (Zorzini 2015). Therefore, we strongly encourage online retailers that are using or are planning to use VTOs, to do so through their brand website to attract more customers and achieve maximum customer satisfaction.
- 2) We highly recommend that brands use the “*VTO recording of yourself*” option to personalise a customer's online shopping experience. According to Eyewear VTO experts (Chapter 4), eyewear is not exactly a product for which customers make an impulse buying decision but requires careful consideration. Customers need a visual representation of how the eyewear would look on themselves because it improves overall customer satisfaction which can positively influence the customer's perception of a brand. Providing the option “*VTO recording of yourself*” will achieve exactly this goal.
- 3) Moreover, according to the upper garments VTO expert (Chapter 4), this category shows great potential for VTO usage in the future, as demand for a more personalised online shopping experience is highly anticipated by customers. However, from our preliminary survey analysis we found that there is great potential to improve the online shopping experience by establishing a more precise VTO technology for upper garments since fitting recommendation and sizing is as not as precise as in eyewear (See Appendix 12.2.2, Figure

- 36). Offering VTOs for upper garments will be beneficial for fashion retailers as they could differentiate themselves from competitors by providing a unique experience.
- 4) Brands should focus on providing sufficient VTO technology that will supply accurate and personalised fitting and styling recommendations. Results from the second conjoint analysis present that for the most optimal experience combination, the reason to use a VTO for eyewear products is to pick the right product. This was also confirmed by an Eyewear VTO expert, who suggested that fitting and styling recommendations play an essential role in the customer journey. They help customers in their decision-making process and offer convenience since customers are still trying to determine their style. Therefore, allowing them to use VTOs immensely contributes to finding out what they like the most about themselves.
- 5) On a last note, individuals who adhere to more liberal ideologies frequently distinguish themselves from other customers by selecting products with distinctive features and are more interested in trying out new products (Ordabayeva 2018). Therefore, we strongly advise retail fashion companies that already use VTOs or are planning to implement this technology for their brands, to target Liberal Gen Ys and potentially Liberal Gen Zs, due to the potential of these two segments.

Conclusions

Based on our findings, customers show an inclination towards a regular online shopping experience when given the option to choose between a highly personalised VTO experience and a regular online shopping experience. When presented with the data sharing requirements of a personalised shopping experience, customers perceive a decreased added value due to heightened awareness of data disclosure. Our conjoint analysis revealed that regular online shopping was the most preferred experience, followed by personalised shopping through shared measurements. This

indicates a negative correlation between data disclosure and the perceived added value of the personalised experience when customers are reminded of the data they must disclose. Concurrently, they generally present a positive attitude towards VTOs. The product category that generates the highest ratings in terms of usefulness, quality of recommendations, interactivity and user-friendliness of the experience is eyewear. The product category associated with the greatest data privacy concerns is upper garments, and the one with the lowest is footwear. The product category that customers choose is upper garments. This can be explained by the *status-quo* bias and the way it influences their attitude and preferences towards VTO. When they are presented with all possible product categories, they choose the one they would more frequently buy online. The cluster that is more likely to virtually try on the different product categories examined is the Liberal Gen Y. These individuals are aged between 26-35, make online purchases on a weekly basis, with lower distrust in data, higher comfort in virtually trying on all products, and generally perceive the highest usefulness in the VTO feature. Lastly, customers tend to disclose fewer personal data when exposed to explicit data sharing requirements, opting for less personalised options. However, in the case of avatar, where sharing a personal picture is required, and with awareness of picture being stored, they tend to choose self-recording VTO, although more data sharing steps are required. Hence, the optimal VTO experience for eyewear comprised of using a self-recording VTO option, on the brand's website, with the objective of picking the right product.

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12. Appendix

12.1 Expert Interviews

12.1.1 Questions

Table 8: Interview Questions: Experts

Questions	Expert Industry
1. Do you believe that the feature adds value to the customer's shopping experience? In what way?	Technology; Fashion
2. Do you believe that VTOs positively influence the customer's perception of the brand?	Technology; Fashion
3. Would your opinion change if we were still in the pandemic?	Fashion
4. Could you give us an estimate of how many platform visitors try out the VTOs? How many sales happen through a virtual try-on?	Technology
5. Can you elaborate on what the platform does and why the focus on eyewear with VTOs?	Technology
6. What do you think customers value the most when it comes to VTOs?	Technology; Fashion
7. In your opinion, what is preventing customers from using VTOs?	Technology; Fashion
8. Have you thought of any ways/strategies that you can use to increase customer's willingness to use VTO?	Technology
9. Which product categories do you think have the most potential when it comes to VTO feature?	Technology; Fashion
10. What data are customers required to share to use a VTO? How is that data being used?	Technology
11. How would you evaluate the VTOs potential to improve the online shopping experience?	Technology
12. What is your perspective on the future of VTOs?	Technology; Fashion
13. Research showed that data privacy concerns hold customers back from using VTOs. Is your company addressing this issue in any way? How do you prevent data loss?	Technology
14. What was the main purpose of introducing the VTO?	Technology
15. What did you focus on the most in offering the VTO experience to the customer?	Technology
16. How did technology progress from AI to AR?	Technology
17. What is a virtual try-on in terms of technology? What are the main characteristics?	Technology
18. What are the current limitations of the technology of the VTOs? What needs to be changed to prevent all the limitations of the experience?	Technology
19. What did you focus on the most in terms of technology when creating a VTO feature?	Technology
20. Do you think that a technological progress in the feature can increase customer's willingness to use a VTO?	Technology
21. What kind of progress/change can be done?	Technology

22. Do you think the VTO feature is more suitable to the luxury fashion industry?	Fashion
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12.2 Preliminary Survey: General Insights

12.2.1 Survey Setup

Table 9: Preliminary Survey Questions

Digital transformation through Augmented Reality in online fashion retail: Virtual try-ons We are MSc students (in Management & Business Analytics) from Nova SBE, doing a survey as part of our master thesis. We are conducting a study about digital transformation through AR in online fashion retail, specifically through virtual try-ons. Our goal is to find out how willing users are to share their data in order to have a customised online shopping experience through virtual try-ons, also depending on the type of products. Many brands are shifting to more personalised ways of online shopping experiences by offering virtual try-on feature. Virtual try-on is the way a customer can “try-on” a product through mobile or other devices equipped with a camera, using AR technology. The survey will take approximately 8 minutes to complete. It is completely Thank you!		
Sections	Question	Answers
SECTION 1 - VIRTUAL TRY ON	1. How often do you use a virtual try-on feature when shopping online for fashion products?	1. Never 2. Occasionally (for specific occasions) 3. Sometimes 4. Seasonally 5. Often
	2. Would you consider using a virtual try-on feature to improve your online shopping experience again or in the future?	1. Yes 2. No 3. Maybe
	3. What are the main reasons for using a virtual try-on when shopping online? (choose 1 or more options)	1. Improved personalisation 2. Better fitting recommendations 3. No need returns 4. A more fun/interactive way of shopping online 5. Because friends/family told me about it
	4. Do you see additional value in brands or fashion retailers that offer virtual try-on feature?	1. Yes 2. No 3. Maybe

	5. What is stopping you from using a virtual try-on feature? (choose 1 or more options)	1. Privacy concerns 2. Bad quality recommendations 3. Do not want to engage with new technology 4. I do not find it useful 5. Lack of human interaction (compared to shopping in person) 6. Complicated to use 7. Nothing is stopping me 8. Other
	6. Rate the overall usefulness of using a virtual try-on for a purchase	 1. Not at all; 5. Very much
SECTION 2 - DATA PRIVACY	7. How likely would you share your measurements to a platform using a virtual try-on feature?	1. Very likely 2. Somewhat likely 3. Neither likely nor unlikely 4. Somewhat unlikely 5. Very unlikely
	8. How likely would you upload a photo of yourself to a platform using the virtual try-on feature?	1. Very likely 2. Somewhat likely 3. Neither likely nor unlikely 4. Somewhat unlikely 5. Very unlikely
	9. How likely would you record a part of your body to use a virtual try-on feature?	1. Very likely 2. Somewhat likely 3. Neither likely nor unlikely 4. Somewhat unlikely 5. Very unlikely
	10. To what extent is distrust in how your data will be processed stopping you from using a virtual try-on feature?	 1. Not at all; 5. Very much
	11. Imagine you want to virtually try-on a new product. Which platform would you feel most comfortable using?	1. Social Media (Instagram, TikTok, Snapchat, Facebook, etc.) 2. Brand website or app
	12. For which product would you more likely accept data privacy terms and conditions, without carefully analysing them? (Choose one or more options)	1. Upper body clothing (tops, jackets, hoodies) 2. Footwear 3. Eyewear 4. None 5. Other
SECTION 3 - SPECIFIC PRODUCT	13. Rank these products by WILLINGNESS to virtually try on:	1. Upper garments 2. Eyewear 3. Footwear

	14. Rank these products by USEFULNESS to virtually try on:	1. Upper garments 2. Eyewear 3. Footwear
	15. How comfortable do you feel to virtually try-on upper body clothing?	1. Very comfortable 2. Somewhat comfortable 3. Neither comfortable nor uncomfortable 4. Somewhat uncomfortable 5. Very uncomfortable
	16. Do you think that virtually trying-on upper body clothing would help you decide more easily when shopping online?	1. Yes 2. No 3. Maybe
	17. How comfortable do you feel to virtually try-on footwear?	1. Very comfortable 2. Somewhat comfortable 3. Neither comfortable nor uncomfortable 4. Somewhat uncomfortable 5. Very uncomfortable
	18. Do you think that virtually trying-on footwear would help you decide more easily when shopping online?	1. Yes 2. No 3. Maybe
	19. How comfortable do you feel to virtually try-on eyewear?	1. Very comfortable 2. Somewhat comfortable 3. Neither comfortable nor uncomfortable 4. Somewhat uncomfortable 5. Very uncomfortable
	20. Do you think that virtually trying-on eyewear would help you decide more easily when shopping online?	1. Yes 2. No 3. Maybe
SECTION 4 - DEMOGRAPHICS	21. What is your gender?	1. Female 2. Male 3. Prefer not to say
	22. How old are you?	1. 17-25 2. 26-35 3. 36-45 4. 46+
	23. What is the total annual income of your household (before tax and deductions, but including any benefits/allowance)?	1. Below 10,000€ 2. 10,001€ to 20,000€ 3. 20,001€ to 30,000€ 4. 30,001 to 40,001€ 5. 40,001 to 50,000€ 6. Above 50,001€ 7. Prefer not to say

	24. How often do you shop online?	1. Daily 2. Weekly 3. Monthly 4. Seasonally 5. Yearly 6. Occasionally (for a specific occasion) 7. Never
	25. What type of fashion products do you buy online? (choose 1 or more options)	1. Footwear 2. Clothing (tops) 3. Clothing (bottoms) 4. Underwear/Swimwear 5. Eyewear 6. Accessories (Jewellery, Handbags, etc.) 7. None 8. Other

12.2.2 Results

Figure 13: What is your gender?

Female	140
Male	87
Prefer not to say	1



Figure 14: How old are you?

17-25	120
26-35	43
36-45	31
46+	34
Prefer not to say	0



Figure 15: What is the total annual income of your household (before tax and deductions, but including any benefits/allowance)?

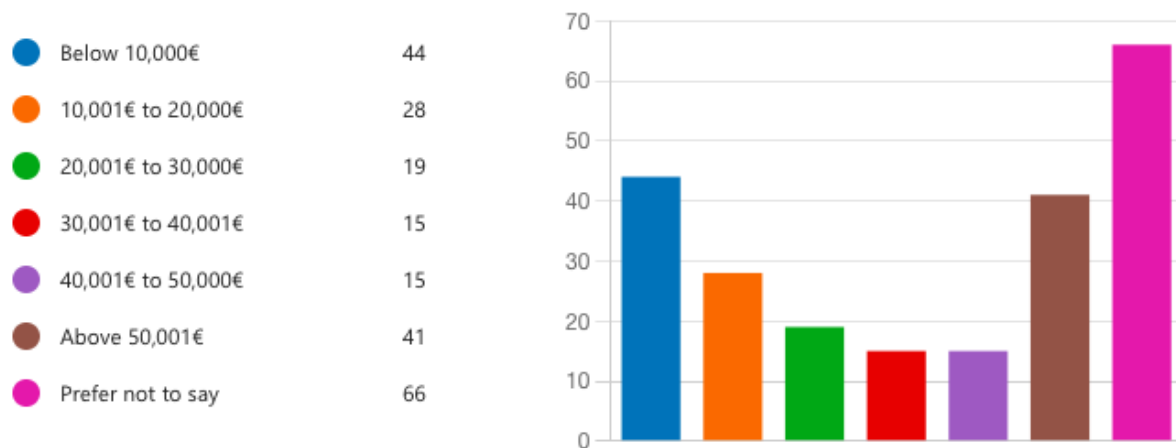


Figure 16: How often do you shop online?

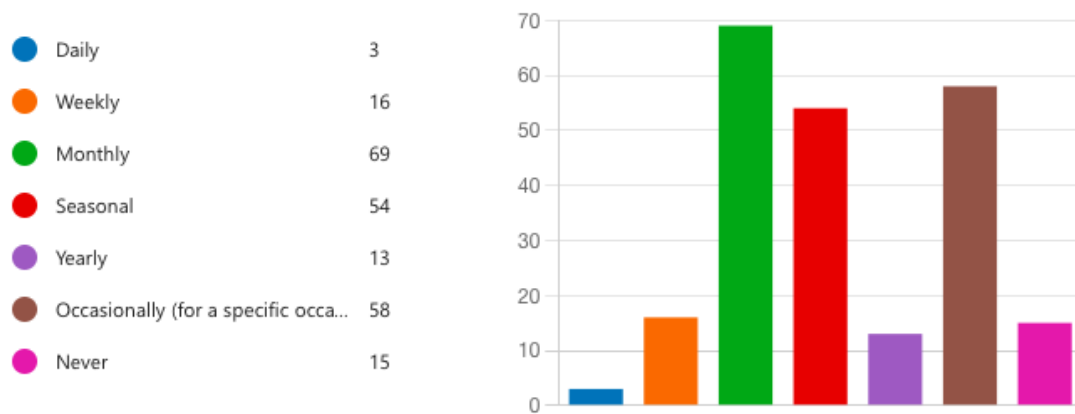


Figure 17: What type of fashion products do you buy online? (choose 1 or more options)

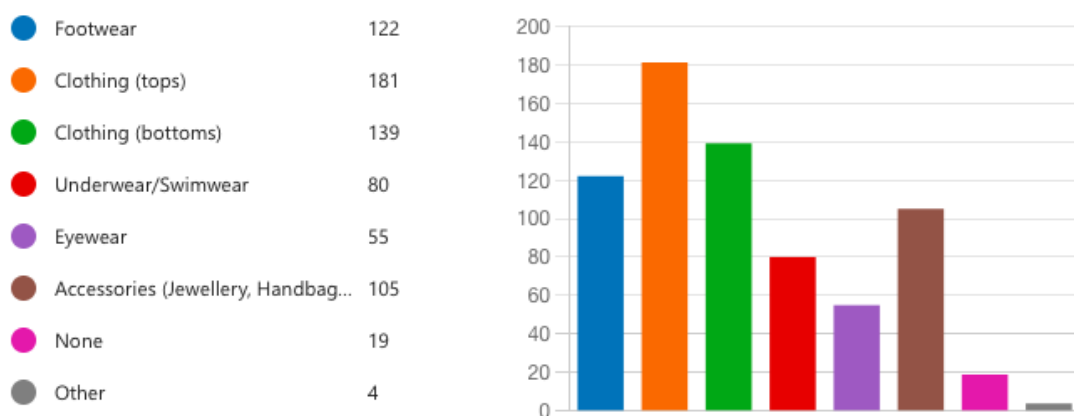


Figure 18: How often do you use a virtual try-on feature when shopping online for fashion products?

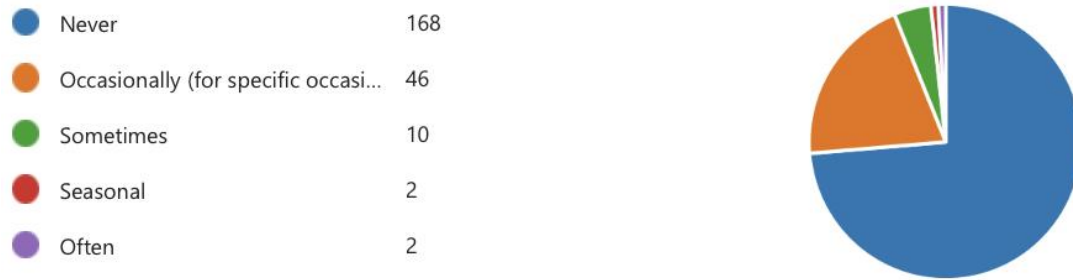


Figure 19: Would you consider using a virtual try-on feature to improve your online shopping experience again or in the future?



Figure 20: What are the main reasons for using a virtual try-on when shopping online? (choose 1 or more options)

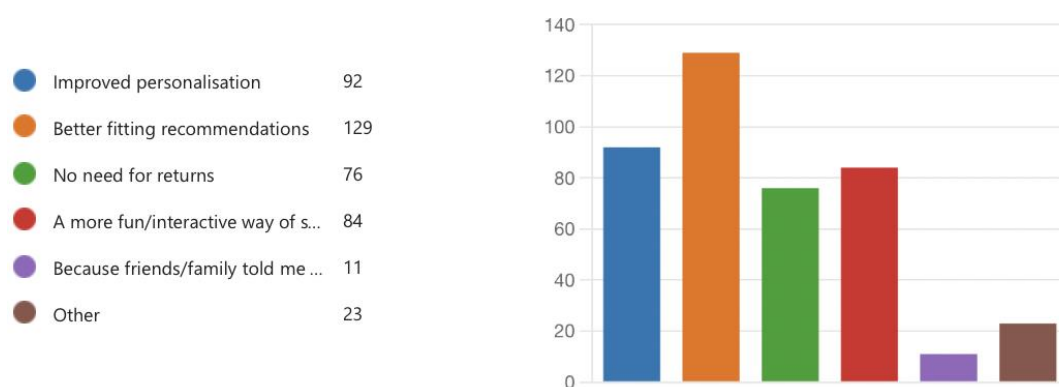


Figure 21: How likely would you upload measurements/photo/recording on a platform to use a VT0?

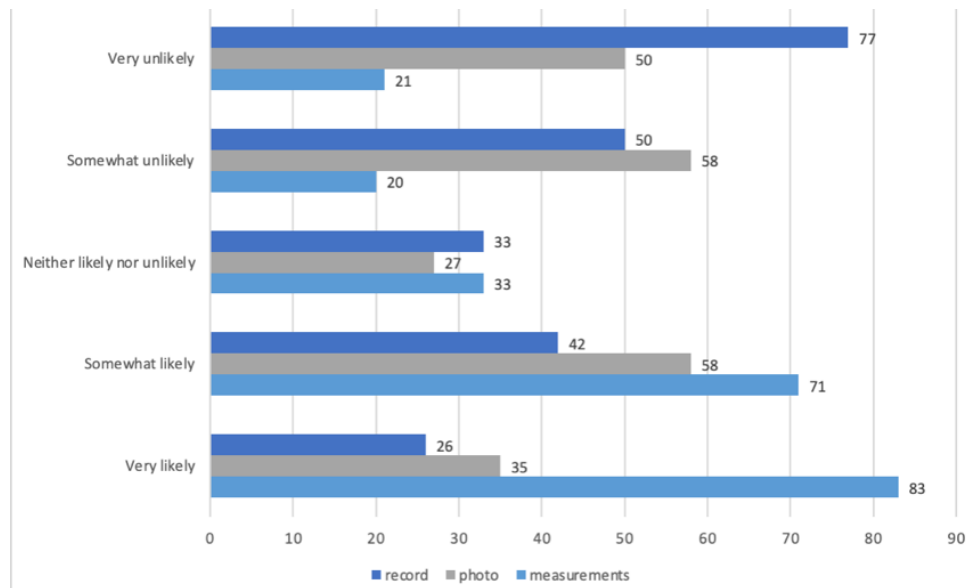


Figure 22: Do you see additional value in brands or fashion retailers that offer virtual try-on feature?

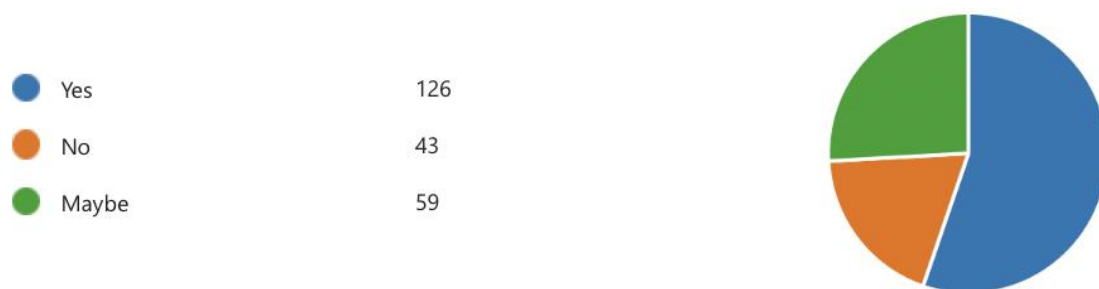


Figure 23: What is stopping you from using a virtual try-on feature? (choose 1 or more options)

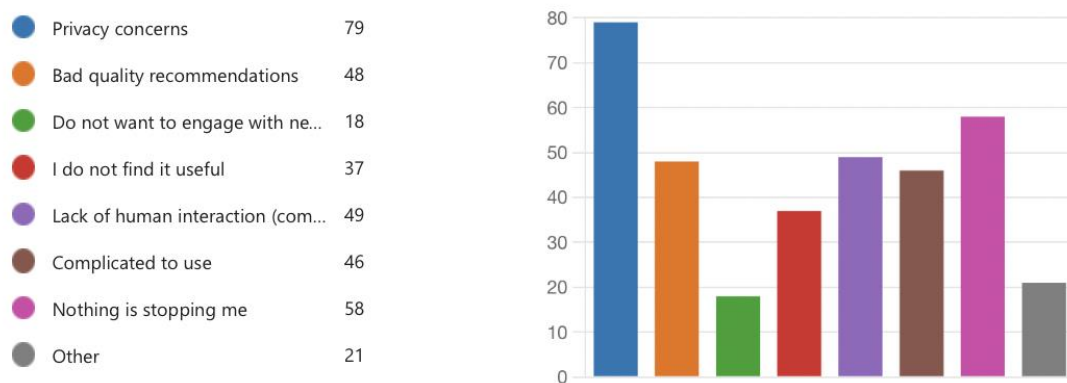


Figure 24: Rate the overall usefulness of using a virtual try-on for a purchase (1 - not at all useful, 5 - very useful)

3.36
Average Rating

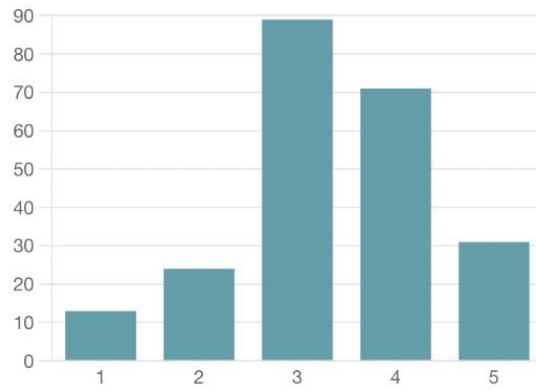


Figure 25: How likely would you share your measurements to a platform using a virtual try-on feature?

Very likely	83
Somewhat likely	71
Neither likely nor unlikely	33
Somewhat unlikely	20
Very unlikely	21



Figure 26: How likely would you upload a photo of yourself to a platform using the virtual try-on feature?

Very likely	35
Somewhat likely	58
Neither likely nor unlikely	27
Somewhat unlikely	58
Very unlikely	50



Figure 27: How likely would you record a part of your body to use a virtual try-on feature?

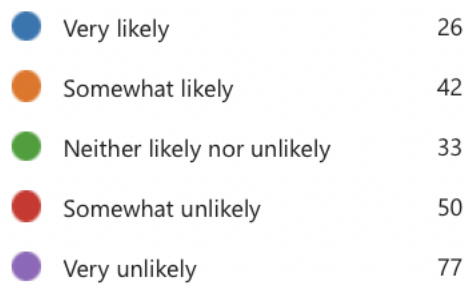


Figure 28: To what extent is distrust in how your data will be processed stopping you from using a virtual try-on feature? (1 - not at all, 5 - very much)

3.31
Average Rating

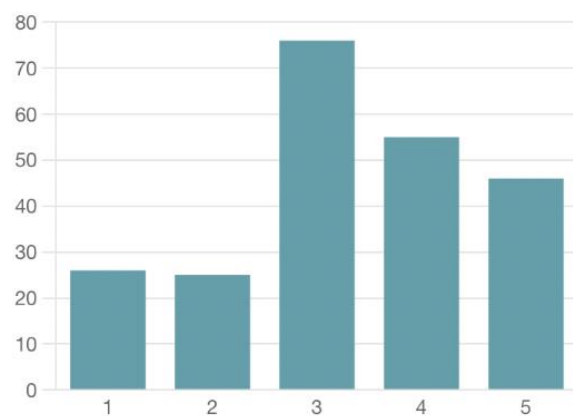


Figure 29: Imagine you want to virtually try-on a new product. Which platform would you feel most comfortable using?

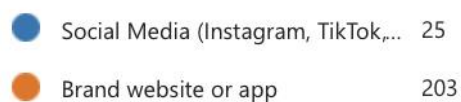


Figure 30: For which product would you more likely accept data privacy terms and conditions, without carefully analysing them? (Choose one or more options)

Upper body clothing (tops, jack...	69
Footwear	138
Eyewear	90
None	39
Other	8

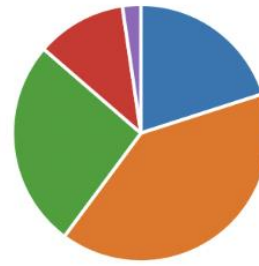


Figure 31: Ranking list of options: willingness to virtually try on by product

Rank Options

- 1 Footwear
- 2 Eyewear
- 3 Upper garments

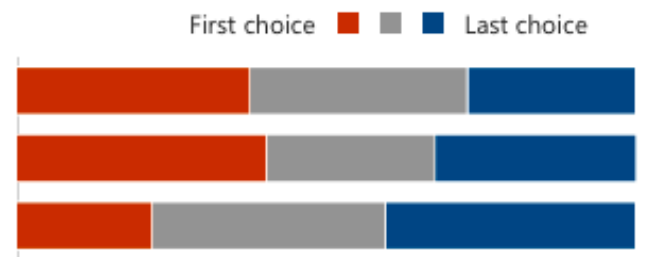


Figure 32: Ranking list of options: usefulness to virtually try on by product

Rank Options

- 1 Eyewear
- 2 Upper garments
- 3 Footwear

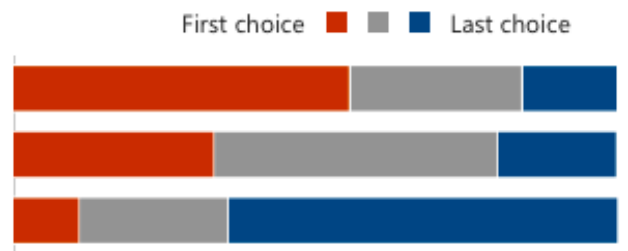


Figure 33: How comfortable are you to virtually try on upper body clothing?

Very comfortable	46
Somewhat comfortable	65
Neither comfortable nor uncom...	54
Somewhat uncomfortable	36
Very uncomfortable	27



Figure 34: How comfortable are you to virtually try on footwear?

Very comfortable	109
Somewhat comfortable	69
Neither comfortable nor uncom...	19
Somewhat uncomfortable	12
Very uncomfortable	19



Figure 35: How comfortable are you to virtually try on eyewear?

Very comfortable	86
Somewhat comfortable	68
Neither comfortable nor uncom...	23
Somewhat uncomfortable	30
Very uncomfortable	21



Figure 36: Do you think that virtually trying-on upper garments would help you decide more easily when shopping online?

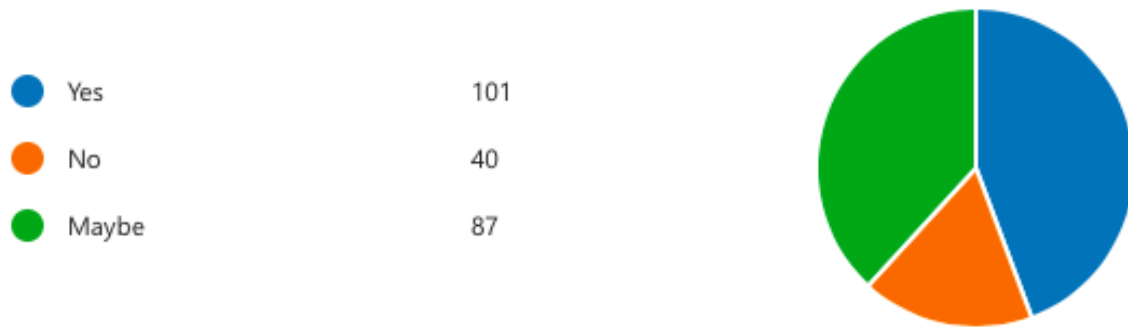


Figure 37: Do you think that virtually trying-on footwear would help you decide more easily when shopping online?

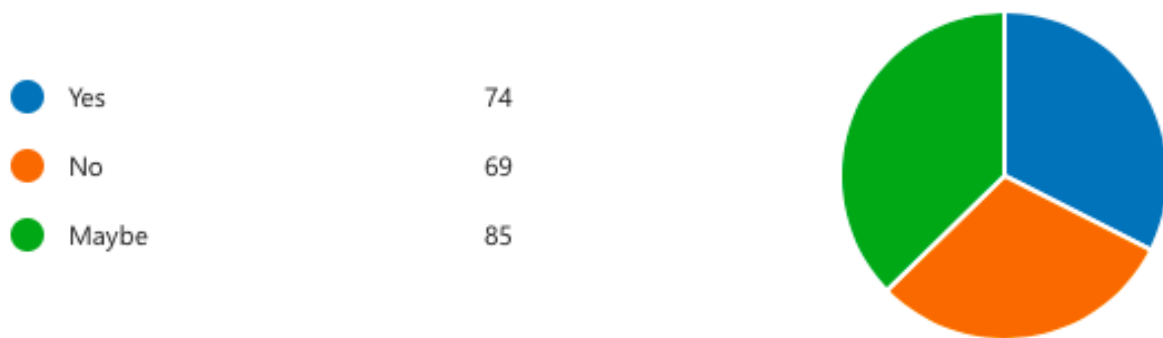
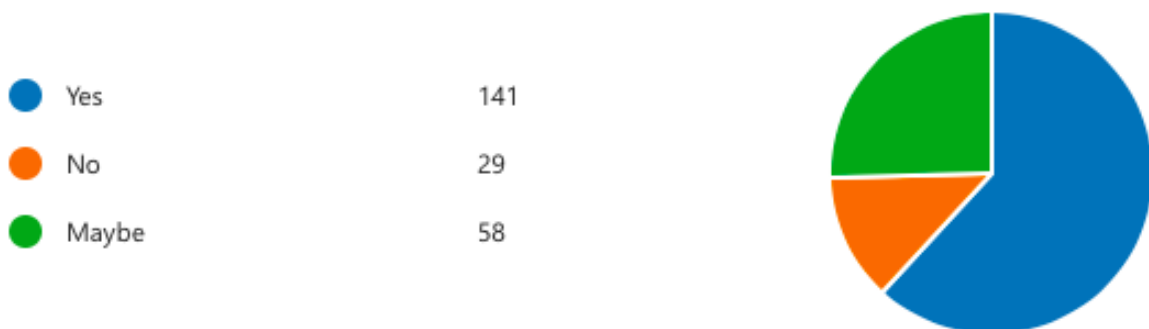


Figure 38: Do you think that virtually trying-on eyewear would help you decide more easily when shopping online?



12.4 Conjoint Analysis

12.4.1 Survey Setup

Table 10: Overview of Attributes and Levels

Attribute	Levels	Source
1) Product Type	• Upper garments • Footwear • Eyewear	Heller et al. 2019 Zak 2020 Pantano, Rese, and Baier 2017 Hilken et al. 2017 Baek, Yoo, and Yoon 2018 Poushneh 2018 Cowan, Javornik, and Jiang 2021 Eisert, Fechteler, and Rurainsky 2008 Jimeno-Morenilla, Sánchez-Romero, and Salas-Pérez 2013 Hirst and Omar 2007 Merle, Senecal, and St-Onge 2012 Baytar, Chung, and Shin 2020 Ivanov, Mou, and Tawira 2022 Heller et al. 2019 Scholz and Duffy 2018
2) Online Shopping Experience	• Regular online shopping • Personalised online shopping based on shared measurements • Personalised online shopping with an avatar • Personalised Online Shopping with Virtual Try-On	Kim and Forsythe 2009 Lee, Fiore and Kim 2006 Kim and Forsythe 2009 Merle, Senecal, and St-Onge 2012 Ivanov, Mou, and Tawira 2022 Baytar, Chung, and Shin 2020
3) Data Privacy	• Accept mandatory cookies • Accept mandatory cookies, share personal measurements • Accept mandatory cookies, share personal	Stradivarius 2022 Zara 2022 Farftech 2022 Quay Australia 2022

	measurements, upload a picture Accept mandatory cookies, terms & conditions of VTO, give access to camera	
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Table 11: Applicability of levels according to Data Privacy

Applicability of levels according to Data Privacy				
Levels	Accept mandatory cookies	Accept mandatory cookies, share personal measurements	Accept mandatory cookies, share personal measurements, upload a picture	Accept mandatory cookies, terms & conditions of VTO, give access to camera
Product Type				
Upper garments	✓	✓	✓	✓
Footwear	✓	✓	✓	✓
Eyewear	✓	✓	✓	✓
Online Shopping Experience				
Regular online shopping	✓			
Personalised online shopping based on shared measurements		✓		
Personalised online shopping with an avatar			✓	
Personalised online shopping with Virtual Try-On				✓

Figure 62: Conjoint Analysis Survey Design Overview

Welcome to this study that allows you to treat yourself with a little retail therapy!

Throughout the survey you will be presented with different cases of online shopping experiences related to different products. You will have to pick the one that suits you the most, based on your needs and preferences.

The 4 different online shopping experiences are: **(1) Regular online shopping**, **(2) Personalised online shopping based on measurements**, where you have to share your body measurements to receive fitting and sizing recommendations, **(3) Personalised online shopping based on avatar**, where you have to take a picture of yourself in order to activate your avatar, and **(4) Personalised online shopping with Virtual Try-On (VTO), where you have to record yourself while you are virtually trying on products**. A Virtual try-on (VTO) refers to trying on digitally created garments or accessories in a virtual environment.

It will require less than 10 minutes of your time. The answers are anonymous and there is no right or wrong answer. We appreciate your participation. Keep calm and shop on!

SECTION 1 – CHOICE OF ONLINE SHOPPING EXPERIENCE	Product Type • Upper garments • Footwear • Eyewear	SECTION 2 – ADDITIONAL QUESTIONS	Segment Distributors • Gender • Age
	Data Privacy • Accept mandatory cookies • Accept mandatory cookies, share personal measurements • Accept mandatory cookies, share personal measurements, upload a picture • Accept mandatory cookies, terms & conditions of VTO, give access to camera		Consumer's Perspective • Would you like to share any other thoughts about this service?
	Online Shopping Experience • Regular online shopping • Personalized online shopping based on shared measurements • Personalized online shopping with an avatar • Personalized Online Shopping with Virtual Try-On		

12.4.2. Results

Figure 63: Respondents Gender Distribution

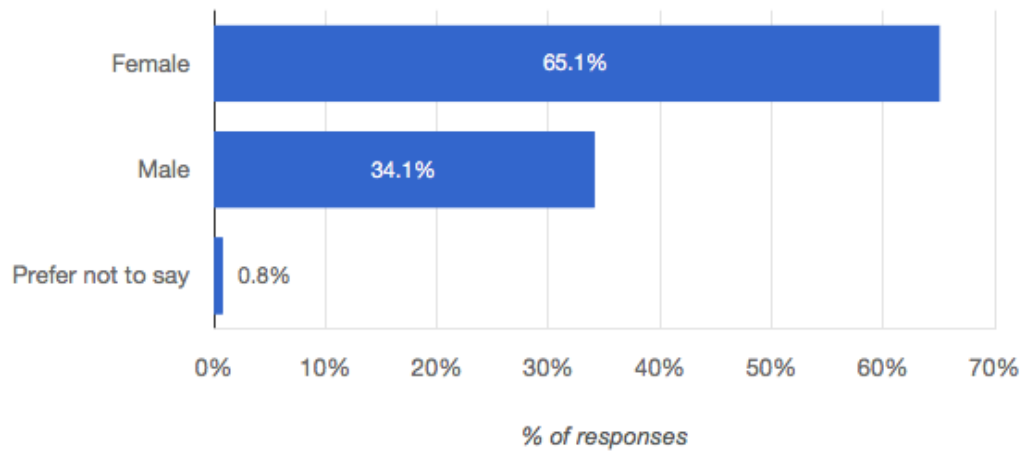


Figure 64: Respondents Age Distribution

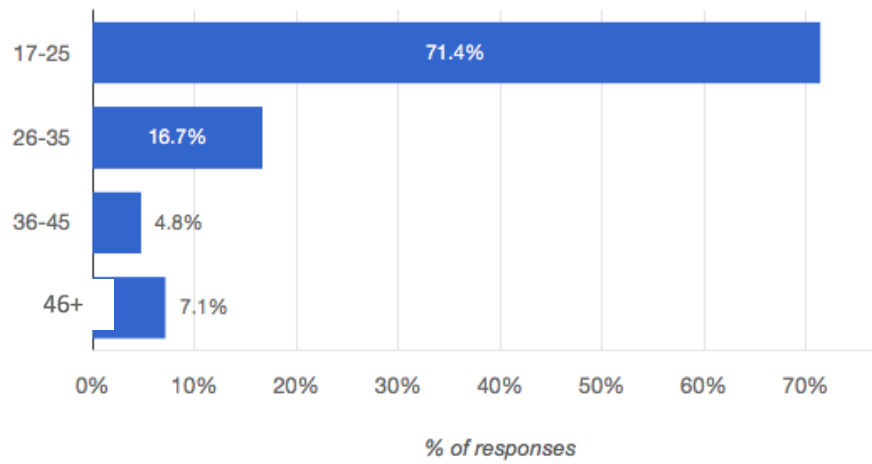


Table 12: Ranked List of Concepts

Rank	Product	Data Sharing	Online shopping experience	Minimum	Median	Maximum
1	Upper garments	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	8,6	10,9	13
2	Footwear	Accept mandatory cookies	Regular	7,8	10,3	13
3	Upper garments	Accept mandatory cookies	Regular	5,1	7,5	10
4	Footwear	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	4,6	6,9	9,4
5	Eyewear	Accept mandatory cookies	Regular	0,12	3,7	7,7
6	Upper garments	Accept mandatory cookies, terms & conditions VTO, give access to camera	Personalised with VTO	(1,6)	0,9	3,4
7	Footwear	Accept mandatory cookies, terms & conditions VTO, give access to camera	Personalised with VTO	(5,6)	(3,0)	(0,46)
8	Upper garments	Accept mandatory cookies, share personal measurements, upload a picture	Personalised with avatar	(4,8)	(3,3)	(1,8)
9	Eyewear	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	(6,3)	(3,9)	(1,4)
10	Eyewear	Accept mandatory cookies, terms & conditions VTO, give access to camera	Personalised with VTO	(7,2)	(4,3)	(1,4)
11	Eyewear	Accept mandatory cookies, share personal measurements, upload a picture	Personalised with avatar	(8,9)	(6,5)	(4,1)
12	Footwear	Accept mandatory cookies, share personal measurements, upload a picture	Personalised with avatar	(23)	(19,2)	(16)

Table 13: Data Privacy/Online Shopping Experience Preference Descriptive Statistics per segment

Experience	Segment	Minimum	Median	Maximum
1	17-25	4,6	8,1	11
	26-35	(2,0)	3,7	4,5
	36-45	14,6	15,2	19
	46+	(1,6)	4,6	9,6
	Whole sample	3,7	7,5	10,3
2	17-25	(4,0)	6,9	11,6
	26-35	(4,2)	6,9	8,5
	36-45	(6,2)	1,8	5,8
	46+	(1,6)	9,8	14,1
	Whole sample	(3,9)	6,9	10,9
3	17-25	(19,3)	(6,8)	(3,3)
	26-35	(15,0)	(3,0)	(1,8)
	36-45	(23,7)	(12,3)	(5,8)
	46+	(23,8)	(5,4)	(4,0)
	Whole sample	(19,2)	(6,5)	(3,3)
4	17-25	(5,3)	(3,8)	0,5
	26-35	(0,2)	(0,2)	3
	36-45	(4,1)	(3,5)	(0,7)
	46+	(4,1)	(1,2)	3,7
	Whole sample	(4,3)	(3,0)	0,9

Table 14: Ranked list of concepts per segment

Segment	Rank	Product	Data Sharing	Online shopping experience	Minimum	Mean	Maximum
17-25	1	Upper garments	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	8,8	11,56	14,4
	2	Footwear	Accept mandatory cookies	Regular	7,6	11,00	14,4
	3	Upper garments	Accept mandatory cookies	Regular	4,8	8,08	11,3
26-35	1	Upper garments	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	4,7	8,49	12,2
	2	Footwear	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	2,5	6,85	10,9
	3	Footwear	Accept mandatory cookies	Regular	(0,5)	4,45	9,6
36-45	1	Footwear	Accept mandatory cookies	Regular	-	19,01	-
	2	Eyewear	Accept mandatory cookies	Regular	-	15,22	-
	3	Upper garments	Accept mandatory cookies	Regular	-	14,55	-
>45	1	Upper garments	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	-	14,09	-
	2	Footwear	Accept mandatory cookies, share personal measurements	Personalised with shared measurements	-	9,76	-
	3	Footwear	Accept mandatory cookies	Regular	-	9,55	-

Table 15: Partworth utilities of all the experiences per segment – Product Type

Experience	Segment	Upper garments	Footwear	Eyewear
1	17-25	3,1%	48,5%	(51,6%)
	26-35	25,40%	37,3%	(62,7%)
	36-45	(38,30%)	61,7%	(23,4%)
	46+	3,8%	48,1%	(51,9%)
	Whole sample	5,6%	47,2%	(52,8%)
2	17-25	43,3%	13,5%	(56,8%)
	26-35	37,6%	24,7%	(62,3%)
	36-45	44,3%	11,4%	(55,7%)
	46+	42,5%	14,9%	(57,4%)
	Whole sample	42,3%	15,4%	(57,7%)
3	17-25	40,6%	(59,5%)	18,9%
	26-35	36,5%	(63,4%)	26,9%
	36-45	45,6%	(54,5%)	8,9%
	46+	35,7%	(64,3%)	28,6%
	Whole sample	40,0%	(60,0%)	20,0%
4	17-25	57,9%	(15,8%)	(42,1%)
	26-35	66,1%	(32,2%)	(33,9%)
	36-45	61,5%	(22,9%)	(38,6%)
	46+	54,4%	(8,7%)	(45,7%)
	Whole sample	58,5%	(17,1%)	(41,4%)

12.6 Conjoint Analysis: Recommendations for VTO for Eyewear

12.6.1 Survey Setup

Table 16: Overview of Attributes and Levels

Attribute	Levels	Source
1) Type of VTO	- Personalised avatar based on measurements and picture - VTO recording of yourself	Lee, Fiore, and Kim 2006 Kim and Forsythe 2009 Merle, Senecal, and St-Onge 2012 Ivanov, Mou, and Tawira 2022 Baytar, Chung, and Shin 2020
2) Where to use VTO	- Mobile application - Brand's website - Social Media Filters (Snapchat/Instagram)	Feng and Xie 2018 Harborth and Pape 2021 Cowan, Javornik, and Jiang 2021
3) Purpose of experience	- Fun and interactivity - Picking the right product (size/fit)	Watson, Alexander and Salavati 2018 Hwangbo et al. 2020 De Canio, Fuentes-Blasco, and Martinelli 2021 Yim, Chu, and Sauer 2017 Yang and Wu 2009 Lee, Xu and Porterfield 2022 Baytar, Chung, and Shin 2020 Rese et al. 2017

Figure 76: Conjoint Analysis Survey Design Overview

CONJOINT.LY INTRODUCTION			
Hello, help us finish our Master's Thesis by filling out this survey :) It will take 3 to 5 minutes, and your help is very much appreciated. The survey is anonymous, and there are no right or wrong answers. Before you start, a Virtual Try-On (VTO) refers to how a customer can “try on” a product through mobile or other devices. There are 2 types of VTOs: 1) <u>VTO recording of yourself</u>, for which you need to accept mandatory cookies, terms & conditions of the VTO, and give access to the camera. 2) <u>Personalized avatar based on measurements and picture</u>, for which you need to share body measurements and upload a photo of your face.			
SECTION 1 – CONFIRMATION OF DATA AWARENESS	Please confirm you are aware you need to accept mandatory cookies, terms & conditions of VTO, and give access to camera when VTO recording yourself		SECTION 3 – ADDITIONAL QUESTIONS
	Please confirm you are aware you need to accept mandatory cookies, share personal measurements, and upload a picture of your face in order to engage with a personalized avatar		
SECTION 2 – CHOICE OF ONLINE SHOPPING EXPERIENCE	Type of VTO • VTO recording of yourself • Personalized avatar based on measurements and pictures		For which experience do you believe that the benefits of a personalized shopping experience outweigh the costs of data disclosure? (both; personalized avatar based on measurements and pictures; VTO recording of yourself; none)
	Where to use VTO • Mobile application • Brand's website • Social Media Filters		
	Online Shopping Experience • Picking the right product (size/fit) • Fun and interactivity		
		Segment Distributors • Gender • Age • Self-esteem • Frequency of online shopping	

Figure 77: Layout of the choice sets within Conjoint.ly

Which of the following VTO experience would you choose for Eyewear?

	VTO A	VTO B	VTO C	
Type of VTO	VTO recording of yourself 	Personalized avatar based on measurements and picture 	Personalized avatar based on measurements and picture 	
Where to use VTO	Mobile app 	Brand's website 	Social Media (Snapchat/Instagram) 	None of the above
Purpose of experience	Picking the right product (size/fit)	Picking the right product (size/fit)	Fun and interactivity	

12.6.2 Results

Figure 78: Respondents Gender Distribution

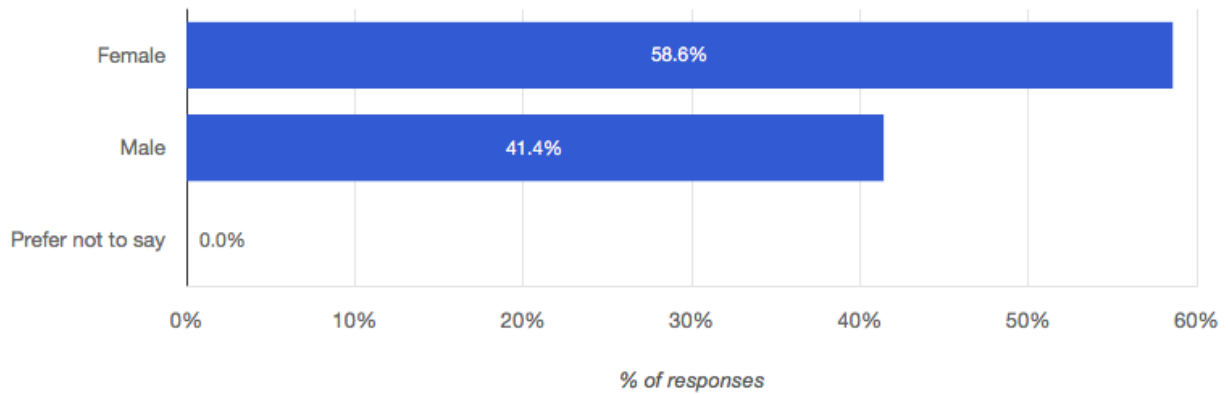


Figure 79: Respondents Age Distribution

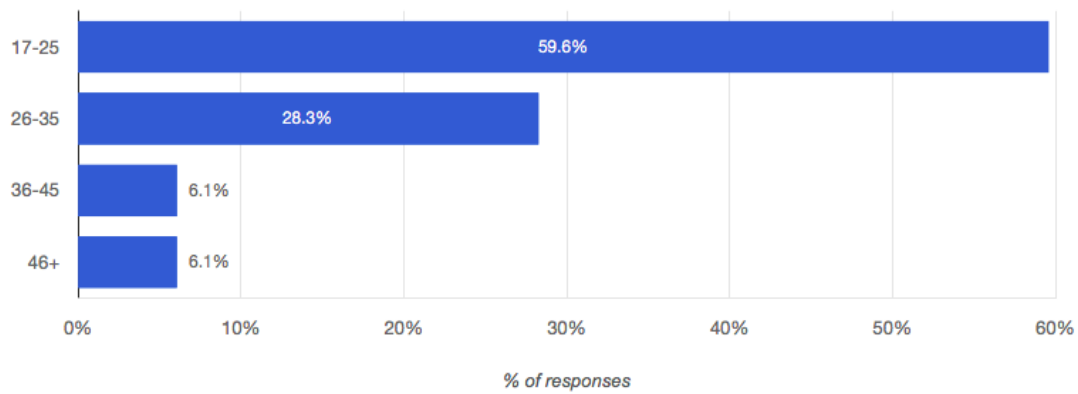


Figure 80: Which personalised experience assures a positive trade-off between data sharing and added value to the online shopping experience

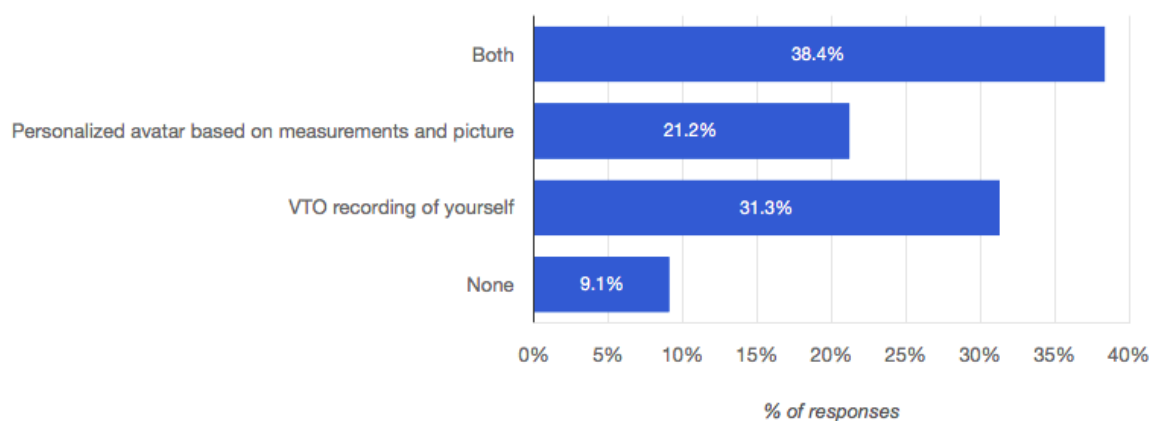


Figure 81: Respondents Distribution of self-esteem ratings

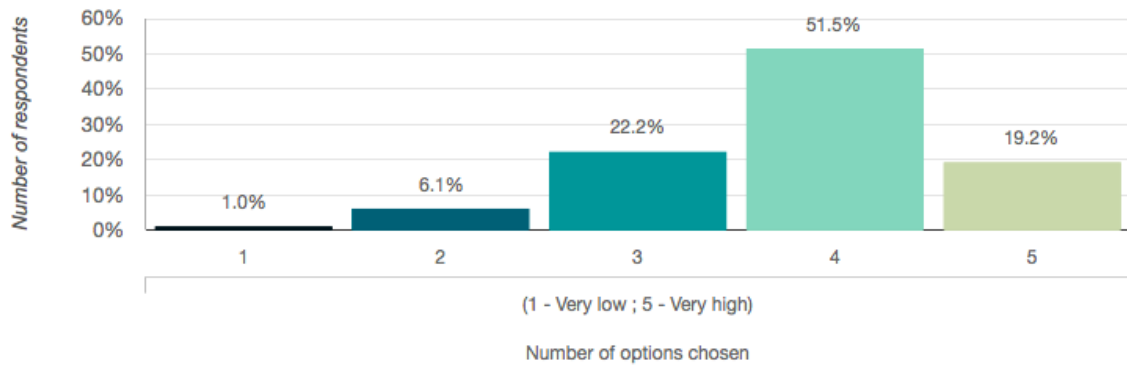


Figure 82: Respondents Distribution of online shopping frequency

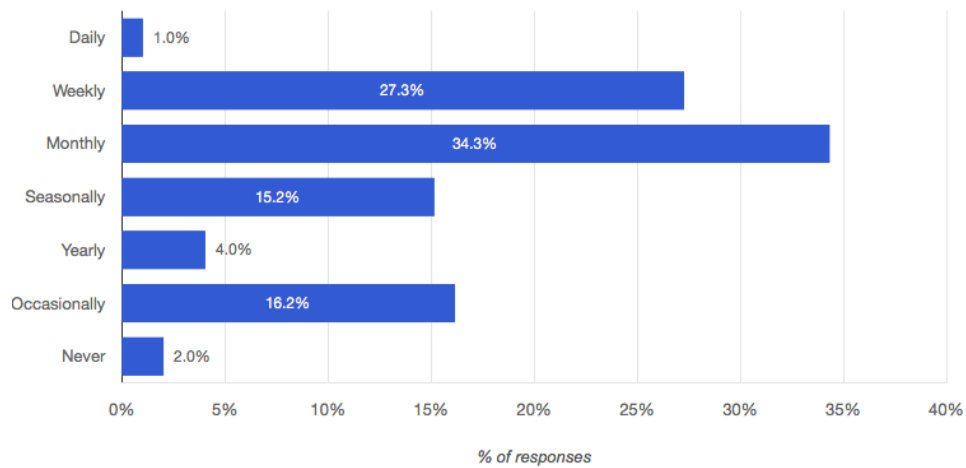


Figure 83: Relative Importance by Attribute

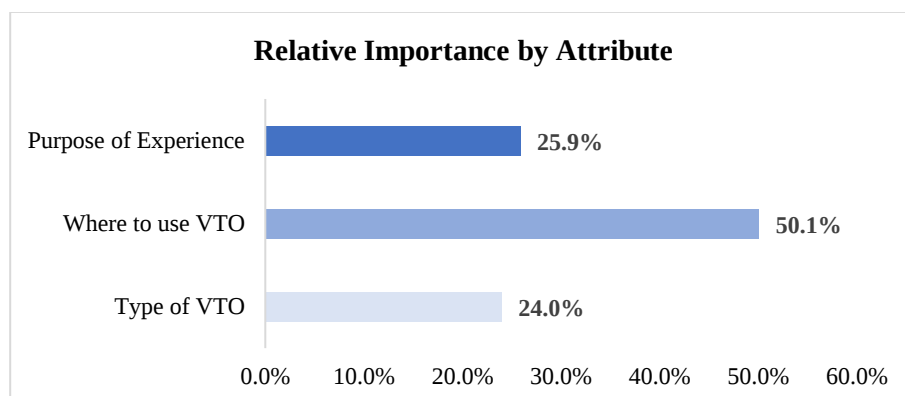


Figure 84: Distribution of preferences for levels by Attribute

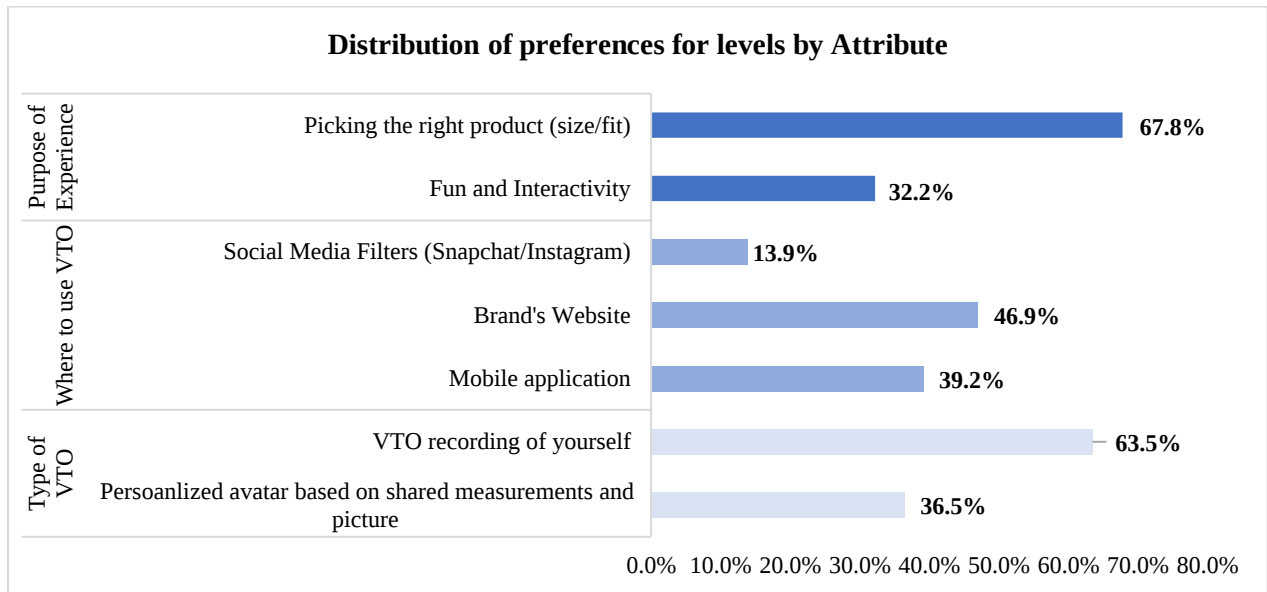


Table 17: Ranked List of Concepts

Rank	Type of VTO	Where to use VTO	Purpose of experience	Minimum	Mean	Maximum
1	VTO recording of yourself	Brand's website	Picking the right product (size/fit)	15,9	20,12	24,3
2	VTO recording of yourself	Mobile application	Picking the right product (size/fit)	15,6	18,50	21,7
3	Personalised avatar based on measurements and picture	Brand's website	Picking the right product (size/fit)	6,6	11,52	16,6
4	Personalised avatar based on measurements and picture	Mobile application	Picking the right product (size/fit)	5,5	9,89	14,6
5	VTO recording of yourself	Brand's website	Fun and interactivity	3,5	6,91	10
6	VTO recording of yourself	Mobile application	Fun and interactivity	2,6	5,29	8
7	Personalised avatar based on measurements and picture	Brand's website	Fun and interactivity	(4,4)	(1,69)	1
8	Personalised avatar based on measurements and picture	Mobile application	Fun and interactivity	(6,1)	(3,32)	(0,2)

9	VTO recording of yourself	Social Media Filters (Snapchat/Instagram)	Picking the right product (size/fit)	(9,3)	(5,90)	(2,4)
10	Personalised avatar based on measurements and picture	Social Media Filters (Snapchat/Instagram)	Picking the right product (size/fit)	(17,3)	(14,51)	(11,5)
11	VTO recording of yourself	Social Media Filters (Snapchat/Instagram)	Fun and interactivity	(25,3)	(19,11)	(13,2)
12	Personalised avatar based on measurements and picture	Social Media Filters (Snapchat/Instagram)	Fun and interactivity	(32,6)	(27,72)	(23,1)