



The Impact of Virtual Reality Tools on Purchasing Decisions and Return Rates in E-Commerce

Influence of virtual fitting rooms on return rates in the fashion industry

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Dissertation written under the supervision of Prof.
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Dissertation submitted in partial fulfilment of requirements for the MSc in
Management with a specialization in Strategic Marketing, at the
Universidade Católica Portuguesa, January 2025.

Title: The Impact of Virtual Reality Tools on Purchasing Decisions and Return Rates in E-Commerce. Influence of virtual fitting rooms on return rates in the fashion industry.

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Abstract

The dissertation examines online purchasing decisions via e-commerce within the fashion industry. Return rates of fashion products due to incorrect size and fit are impacting businesses. The use of new technologies such as virtual fitting rooms 3 VFR aiming to provide customers with more accurate size and fit information, is examined. Specifically, an experimental study was conducted to examine how technology acceptance impacts consumers' willingness to use virtual reality tools, including the perceived technology innovation behind using VFR.

Additionally, the study examined the impact of using size and fit tools (standard vs. VFR) on perceived fit information quality. The moderated-moderating role of perceived technology innovation and perceived fit information quality on the relationship between size and fit tools (standard vs. VFR) and return reasons (product damage, order of multiple sizes in the same style) was also conducted. Results show that VFR significantly enhance perceived fit information quality compared to standard size and fit tools. Additionally, when perceived fit information quality and perceived technological innovation are high, a decrease in return attitudes related to product damage is noted for consumers exposed to VFR. Conversely, those using standard fit and size charts demonstrate increased return attitudes regarding product damage. This research provides brands with insights on the potential to lower return rates by addressing sizing uncertainties, thus offering economic benefits for retailers and positively impacting environmental sustainability.

Keywords: E-Commerce, Returns, Virtual Fitting Room, Augmented Reality, Artificial Intelligence, 3D Modeling, Online Shopping, Technology.

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Resumo

A dissertação analisa decisões de compra online no comércio eletrónico de moda, destacando o impacto das devoluções causadas por tamanhos e ajustes incorretos. Estas devoluções afetam negativamente as empresas, enquanto mercadorias não vendidas frequentemente acabam no lixo, prejudicando a sustentabilidade ambiental.

A investigação explora o uso de novas tecnologias, como provedores virtuais (VFR), para fornecer informações mais precisas sobre tamanhos e ajustes. Um estudo experimental foi conduzido para examinar como a aceitação tecnológica influencia a disposição dos consumidores em usar VFR, bem como o impacto da perceção de inovação tecnológica e da qualidade da informação sobre o ajuste percebida na relação entre ferramentas de tamanho e ajuste (padrão vs. VFR) e motivos de devolução (danos no produto, encomenda de vários tamanhos do mesmo estilo).

Os resultados mostram que o VFR melhora significativamente a perceção da qualidade da informação sobre o ajuste em comparação com ferramentas padrão. Além disso, quando a qualidade da informação percebida e a inovação tecnológica percebida são elevadas, consumidores expostos ao VFR demonstram menores atitudes de devolução relacionadas a danos no produto. Por outro lado, os consumidores que utilizam ferramentas padrão demonstram um aumento das atitudes de devolução relacionadas com danos ao produto. Esta investigação destaca o potencial dos VFR para reduzir taxas de devolução ao abordar incertezas de dimensionamento, oferecendo benefícios económicos aos retalhistas e contribuindo positivamente para a sustentabilidade ambiental.

Palavras-chave: Comércio Eletrónico, Devoluções, Provedor Virtual, Realidade Aumentada, Inteligência Artificial, Modelação 3D, Compras Online, Tecnologia.

Acknowledgements

There are a lot of people I would like to thank for their support during my dissertation. First, I would like to thank my professor, Vera Herédia Colaço, who was always there to help me. I benefited from her extreme expertise repeatedly during the writing process. Thanks to her help, I was able to complete this thesis. I would also like to thank my fellow students Mafalda and Adriana, who also supported me.

The next thanks go to my family and especially my parents, who supported me especially during the dissertation, but also during my entire studies and were and still are always a big support.

I would also like to thank my friends, who have always supported me and given me new ideas for my dissertation.

Moreover, I would like to thank everyone who took part in the survey for the study, because without the responses, no analysis could have taken place. I would like to thank everyone who helped me with advice and support during this time.

Finally, I would like to thank my university Católica Lisbon School of Business & Economics and the country of Portugal for the unforgettable experience of studying in a foreign country. I will always carry this time in my heart.

Obrigado!

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List of Abbreviations

3D	3	Three-Dimensional
AI	3	Artificial Intelligence
ANOVA	3	Analysis of Variance
AR	3	Augmented Reality
CO ₂	3	Carbon dioxide
E-Commerce	3	Electronic Commerce
Versus	3	vs.

1 Introduction

1.1 Problem Definition and Relevance

Shopping conveniently and easily from home. This type of shopping is called electronic commerce (e-commerce) and is a practice that is not only becoming increasingly popular, but has been indispensable for years (Bhat et al., 2012). Nearly 21 percent of overall fashion retail sales worldwide, are e-commerce transactions (Statista, 2024). The coronavirus pandemic significantly impacted this trend because it was not possible to shop physically in stores (Wijendra & De Silva, 2021). In addition, the urge to wear the latest fashions and buy new clothes has been increasing for years. (Granskog et al., 2020).

Online shopping for new clothes is convenient, but it has several drawbacks. The fashion industry belongs to the most polluting sectors in the world. This is due to complex reasons related to the production, transportation, and mass production of clothes (Bailey et al., 2022). Regarding e-commerce, the main driver for the poor environmental impact is the increase in online shopping. And online shopping does not just mean the purchasing process, where the retailer aims to sell as many goods as possible. Rather, the returns process is also of particular importance. Today, clothes can be conveniently ordered online from anywhere in the world, but this can significantly impact the planet. If the items don't fit as expected, they can usually be returned easily and at no extra cost to the buyer (BoF Studio, 2024). These returns usually result in costs for the retailer and a negative environmental impact regarding sustainability.

The reasons for returns are diverse, but one common reason often considered during the ordering process is the fit of items. (Mzizi, 2024). The fit of clothing can vary between different manufacturers and even within the same brand, leading to a lack of consistent fit information. As a result, people often feel uncertain about whether a particular product will look as they expect it to on them. This uncertainty makes it difficult for consumers to know in advance whether a piece of clothing will fit them well. As a result, many people end up ordering the same item in multiple sizes, colors, and designs, with the expectation that they will likely return the items that don't fit as desired (Morris, 2023).

Returns have a negative environmental impact, as the associated increase in transportation volume increases carbon dioxide (CO₂) emissions, and the volume of transport on roads, ships, railways, and aircraft rises (Gund & Daniel, 2023).

This raises the question of what can be done during online purchasing to minimize the negative aspects of returns as a result of fitting issues, and consequently, its impact on the

environment. With the emergence of more digital and technological tools and associated opportunities, more companies are developing solution-oriented approaches aiming to tackle the returns9 problems. Therefore, this dissertation seeks to examine the role of digital and technological tools, namely sizing and fitting tools available within e-commerce sites, and their impact on returns. The objectives and research questions are presented next.

1.2 Objective and Research Questions

With the rise in online orders, e-commerce faces various environmental and logistical challenges. Retailers are working to boost online sales and make shopping more convenient and cost-effective for consumers. However, this convenience brings social and environmental issues like overconsumption and the impact of returns, transportation, and logistics.

Companies are investing in new technologies, such as virtual fitting rooms - VFR, to tackle these challenges. However, implementing new technologies like virtual reality tools introduces several issues related to consumers technology acceptance and willingness to use virtual reality tools. Understanding their success versus failure is crucial since fashion brands contend with excess waste due to product returns when sizes and fit do not match customers9 expectations, consequently leading to high costs.

Three research questions arise in this context, which are examined in more detail below.

RQ1: How do virtual fitting rooms influence the purchase process and return rates in e-commerce in the fashion industry?

Online orders differ from the ordering process in a store and offer enormous potential for an increased volume of returns because products cannot be tested in advance. This impacts both fashion brands9 profit margin and the environment. This work therefore examines whether and how new technologies can make a decisive difference in the right direction.

RQ2: How do consumers react to the use of new technologies in e-commerce?

The willingness to use virtual reality tools is crucial for successful implementation, which is why the study examines how customers react to the use of new technological possibilities.

Because new technologies are associated with costs and development effort for fashion brands, it should be clear whether these are beneficial for consumers.

RQ3: How can the implementation of technologies like virtual fitting rooms create strategic advantages for e-commerce retailers and drive broader adoption across the fashion industry?

To answer this question, the strategic advantages of using technologies such as virtual fitting rooms will be discussed. The aim is to examine whether and to what extent such technologies create competitive advantages and whether the use of virtual fitting rooms can be expected to reduce costs by reducing returns. The aim is to show whether it is useful and possible for retailers to implement these new technologies and whether they will be able to determine the market in the future.

1.3 Thesis Structure

The first chapter deals with the problem definition and the relevance of the work. Following the presentation of the research objective and the research questions, the second chapter provides a detailed analysis of the literature. The focus is on the purchase and return process in e-commerce, the dilemma between fashion and sustainability and the challenges that arise in online retail and especially in the fashion industry. Other key topics in the literature review include the importance of the return rate for fashion retailers and the use of new technologies like virtual reality tools in the fashion sector. A particular focus is placed on key factors for the implementation of these technologies, such as the technology acceptance, perceived technological innovation, and the perceived fit information quality. At the end of the second Chapter the reasons for returns are discussed. Building on this foundation, hypotheses are developed within a conceptual framework that focuses on technology acceptance, perceived innovation, and fit information quality. The methodology section describes the experimental design, sampling methods, and data collection process, followed by an analysis of the empirical findings, including hypothesis testing and moderating effects. After that, the conclusion is provided, and theoretical and practical implications are given. The thesis concludes by addressing the study's limitations and future research.

2 Literature Review

2.1 Purchase and return process in e-commerce

The purchase and returns process in e-commerce differs in many ways. When shopping offline in a store, customers have the advantage of going into a store and looking at and trying on items of clothing on-site. If, when shopping in a store, the customer finds that they don't like the product or that it doesn't fit as they had hoped after trying it on, they can avoid making a bad purchase. However, when the purchase is made and the consumer changes their mind, they can often return the clothes without any associated costs for him (BoF Studio, 2024).

In contrast, shopping in e-commerce offers the advantage that there is usually a greater choice, and consumers don't have to leave the house to buy their favorite clothes. Regarding e-commerce, there are some drawbacks to consider in the purchase and return process. One significant disadvantage is the inability to physically test products before buying. This is particularly important in the fashion industry, where sizes and fits can vary between different brands and within the same brand, such as in different collections. As a result, online purchases are often made without the certainty that the items will fit. This leads to a higher likelihood of returns. In addition, returning items purchased online usually require additional transportation, which can be costly and also hurt the environment.

2.2 The Dilemma of Fashion & Sustainability

Increasing returns in e-commerce also increase CO₂ emissions for transportation. The reason for this is clear: Products are not only delivered to the customer, which already generates CO₂ emissions. They must also be returned to the retailer, resulting in additional transportation routes. Moreover, there are general difficulties in the fashion industry, such as the fact that more and more fashion is being consumed and the number of online orders with the associated problems of CO₂ emissions is increasing, which is contrary to sustainability (Statista, 2024).

The fashion industry also has very fundamental problems with sustainability. According to the European Environment Agency, the textile industry is the fourth largest cause of environmental and climate damage, particularly through water pollution caused by textile dyeing (Tammen, 2024). Furthermore, up to 700,000 microplastic fibers are released into the groundwater per wash cycle when washing polyester clothing, which means half a million tons of microplastics in the oceans annually (Tammen, 2024). Such facts do not even consider

social problems, such as the social exploitation, that arise during the production of many garments (Thorisdottir & Johannsdottir, 2020). These challenges justify why the fashion industry will face an unprecedented increase in government regulation over the next few years. More specifically, over 35 sustainability laws are expected to be enacted by 2027 (Kent 2023).

In the present research, however, the focus is on the size and fit information provided during the online shopping process and, consequently, its impact on returns.

2.3 Challenges facing the fashion industry in online retail

At first glance, the fact that more and more fashion is being demanded speaks in favor of online retail. However, highly competitive pressure is making it increasingly difficult for retailers to differentiate themselves from the competition. Additionally, globalization has further intensified competition for retailers because large fashion brands operate worldwide and can often offer their products more cheaply and operate in higher quantities and better availability (Gonda et al., 2020). These competitions include, above all, the pressure to meet consumers' rapidly changing needs and fashion preferences to remain competitive (Gonda et al., 2020). And for consumers, the awareness of sustainability has increased among the broad mass, which forces retailers to act sustainably and market themselves authentically as such. A 2021 survey suggested that 71% of consumers prefer brands that combine their business success with a clear, ethical motivation, if the price and quality are of equal value (Zajac & Jordan-Kulczyk, 2021). Additionally, the increasing number of regulators mentioned above is a response to the numerous sustainability challenges in the fashion industry (Morris, 2024). Another challenge is efficient logistics in e-commerce, as it plays a key role in transporting goods as cost-effectively as possible, both during delivery to the customer and in the returns process (BoF Studio, 2024). According to a Shopify report, 20 percent of online items were returned in 2021 (BoF Studio, 2024). Therefore, retailers are strongly interested in minimizing returns to keep costs low. New technologies provide potential savings in this area to deliver better fit information quality, enabling consumers to make more informed decisions.

2.4 Status Quo of the Purchases and Returns in e-Commerce

2.4.1 Purchases

Today, 400% more clothes are used than 20 years ago which means that the number of purchases of clothing is also increasing (Zajac & Jordan-Kulczyk, 2021).

As aforementioned, sustainability plays an important role from the consumer's perspective. However, consumers are often guided by fast-moving fashion trends rather than sustainable products (Mandarić et al., 2021). Specifically, consumers' behavior shows to be many times irrational and far from their good sustainability intentions, resulting in the attitude-behavior gap (Niinimäki & Aalto University, 2010). And online shopping in particular uses practices that run counter to sustainability. An example of this is bracketing, where the traditional fitting room is replaced by ordering several sizes of the same item online and calculating that large quantities will be returned (Salerno-Garthwaite, 2022). According to a study by Statista in 2022, 31% of US consumers surveyed said that they had ordered multiple sizes of the same item when shopping online because they did not have sufficient information about the fit (Chevalier, 2024). In addition, 27% said that they have ordered items multiple times and then returned them because they were unable to try them on previously (Chevalier, 2024). The survey was based on the responses of 2,023 people from the USA aged 18 to 65 who had returned at least one item in the last six months (Chevalier, 2024).

2.4.2 Returns

If products must be returned, customers expect this to be as convenient as possible and that the retailer will cover the costs and brands that do not fulfill this expectation are even rejected (BoF Studio, 2024).

70 percent of returns were caused by poor fit and dissatisfaction with style (McKinsey & Company 2021). The figures come from a 2019 McKinsey survey on returns management with over 20 executives from 14 leading North American fashion retailers, as well as over 15 additional interviews with brands, retailers and returns technology providers in 2020 and 2021 (McKinsey & Company 2021). A decisive factor for the high number of returns is bracketing, which has increased significantly in recent years (Placek, 2024). According to the Statista study, which surveyed US participants aged 18 to 65 who had returned at least one item in the last six months, the proportion of people who bracketed was 40% in 2017. In 2022, this figure rose to 63% (Placek, 2024). This increase shows that the number of returns has risen significantly in recent years and is likely to continue to rise in the future. This also

corresponds to the growing volume of returned products that retailers are recording (McKinsey & Company, 2021).

The major retailers in the fashion industry are and have been prepared to handle the returns process as conveniently as possible for their customers and at the expense of the companies (BoF, 2024). Retailers often see a generous returns policy as an evil that must be accepted to avoid upsetting customers and keep making sales with them (McKinsey & Company 2021). In many cases, returns management is simply neglected and is rarely one of retailers' top five priorities (McKinsey & Company 2021). However, many fashion and e-commerce brands have started charging customers for the cost of returns. These include Zara and H&M, which have started charging for returns in markets such as the UK and the US (Morris, 2023). Amazon is beginning to make returns more challenging by encouraging customers to return items to a central physical location. Additionally, they have implemented a \$1 fee for certain customers who return Amazon packages to a UPS store if there is a nearby (Amazon-owned) Whole Foods grocery store (Morris, 2023).

In e-commerce, the many returns are not only a reason for the already excessive CO₂ emissions; returns also represent an enormous cost factor. Some of the reasons are related to logistics and shipping costs, processing costs and the loss of value that occurs if the clothes are worn more often and returned in poorer condition. (NRF & Appriss Retail, 2023).

Virtual reality tools to improve the fit information quality could therefore play a decisive role in reducing returns and optimizing the shopping experience (McKinsey & Company, 2021).

2.5 The use of technologies in the fashion area

Most e-commerce websites provide customers with a standard size and fit tools based on the average measurements of population groups to make it easier to select the right size (Medium, 2019). However, these tools may not accurately reflect the diversity of individual body shapes, which can result in a suboptimal fit for many customers. Nevertheless, standard size and fit tools are a widely used method of providing size and fit information.

However, several retailers are attempting to improve the presentation of size and fit information with the help of new technologies and often rely on the help of specialized companies. Sizebay, for example, a global leader in providing size recommendations, offers a solution where customers can enter personal data such as height, weight and age to receive customized recommendations (Sizebay, n.d.). Based on this information, Sizebay creates a virtual avatar that customers can edit more specifically to their individual body measurements

- and after checking or adjusting the suggested measurements, an individual suitable size is recommended (Sizebay, n.d.).

The next big leap of innovation in providing the right size and fit information according to industry observers, is the use of Augmented Reality (AR) (Fernandez, 2021). The literature comes up with many definitions of AR. This dissertation uses the definition by Mekni & Lemieux (2014), which describes AR as a system that combines real and virtual elements, is interactive in real time and aligns in a three-dimensional - 3D space.

Individual brands, such as L'Oréal, are developing concepts to create a broader market for AR-supported size and fit information (Mzizi, 2024). Gucci used Snapchat's AR-technology to showcase its sneaker collection, allowing users to virtually try them on and buy them directly in the app, reaching 18.9 million users (Mzizi, 2024).

The technology for improving size and fit information, which this dissertation focuses on, and in which AR plays an important role, is the virtual fitting room - VFR. VFR is a technology that enables virtual product trials by simulating products on a virtual model using consumers' body measurements (Blázquez, 2014). There are many different types of VFR available on the market, each offering unique solutions and using different technologies (Lee & Xu, 2020). Trials with VFR technology have been ongoing since at least 2019, but their importance is growing. Several fashion brands have tackled the topic, such as Louis Vuitton, Walmart, H&M, and Hugo Boss. (Russon, 2023).

This dissertation focuses on the VFR, which uses AR, Artificial Intelligence (AI), and 3D modeling to make it possible to try on clothes at home, which can be a decisive added value for the e-commerce sector. There is no universally accepted definition of AI (Russel & Norvig, 2016). In the case of VFR, AI is used to create a complete 3D model of the body of a person standing in front of the camera using algorithms and machine learning. It helps to analyze the body shape and create a realistic virtual image (Heekyeong & B, 2024). 3D modeling is the complete process of creating a virtual 3D model on the computer from collected data (Remondino & El-Hakim, 2006).

According to a McKinsey analysis, over the next three to five years, generative AI could conservatively add USD 150 billion and up to USD 275 billion to the operating profits of the apparel, fashion and luxury sector (Harreis et al., 2023). This includes VFR and styling recommendations (Harreis et al., 2023). Even big brands like Apple and Adobe have presented how their 3D technologies can be used in the fashion industry. This involves creating a 3D product of a product by taking around 70 pictures with a smartphone in a

special illuminated box, transferring them to a laptop and assembling them into a 3D image using software (Bain, 2024).

VFR are primarily intended to help reduce the number of returns. However, they also offer other benefits, such as a convenient way for customers to try on clothes, make purchasing decisions easier and strengthen customer relationships in the long term (Dietmar, 2021). Flint et al. (1997) say that technological and service-oriented innovations can significantly increase the benefits for customers in e-commerce. In addition, according to Tsai et al. (2010), the development of innovative services such as VFR has a positive effect on customer expectations and satisfaction. Nevertheless, the introduction of VFR requires significant financial investment, which is often prohibitively expensive for smaller retailers, and their success depends on many different factors (Snijder, 2024).

Technology Acceptance

The Technology Acceptance Model by Davis (1989) states that the technology acceptance depends on two main factors, namely perceived usefulness and perceived ease of use. Previous literature has also shown that perceived usefulness is more important for the intention to use than the attitude towards using new technologies (Masrom, 2007). Fedorko et al. (2018) also emphasized the importance of the quality of the technology provided and discussed that this influences the perceived use. Moreover, the aesthetics of a technology, the joy, and the possibility of involving users also increase user-friendliness, which all can increase the technology acceptance (Noordin et al., 2018; Venkatesh et al., 2012).

Perceived Technology Innovation

The work of Venkatesh et al. (2012) shows that the perceived technology innovation influences the technology acceptance, both the initial acceptance and the long-term use. Perceived technological innovation refers to how consumers view a new technology as novel, advanced or transformative compared to existing solutions (Kim & Garrison, 2009). The perception is subjective and therefore varies from user to user (Boisvert & Khan, 2022). According to Rogers' Diffusion of Innovation Theory (1995), there are 5 main characteristics that influence the perceived technology innovation.

Bozbay & Yasin (2008) define these using the model as follows:

Relative Advantage: The perceived benefit of the innovation compared to existing alternatives.

Compatibility: How well the innovation fits in with the user's existing values, experiences and needs.

Complexity: The simplicity or difficulty of using an innovation.

Trialability: The opportunity to try out the innovation before final acceptance.

Observability: The visibility of the benefits of the innovation for others.

The perceived technology innovation can also be influenced by effective communication, for example if the benefits of the technology are presented clearly and convincingly (Lowe & Alpert, 2015). It is therefore important for the retailer not to rely on the new technology being perceived automatically, but also to communicate the relevant benefits to the customer.

According to the study by Shams et al. (2015), the perceived technological innovation strengthens both the customer's intention to buy and their trust in the brand. E-commerce retailers can therefore derive additional benefits if the technologies they use are seen as innovative.

Perceived Fit Information Quality

According to Venkatesh et al. (2012), customers are initially particularly attracted by the novelty of a technology. Over time, however, it becomes increasingly important to focus on the actual purpose and benefits of the technology (Venkatesh et al., 2012). In the context of offering VFR, this means that the added value of VFR should stand out, namely the ability to obtain high-quality and precise size and fit information.

When considering the fit information quality, the perspective of use with standard size and fit tools is considered on the one hand. On the other hand, the perspective of use with VFR is considered. In the study by Kim & Damhorst (2013), the standard size and fit tools were examined, and it was discussed whether image enlargements and vides provide customers with sufficient fit information quality. The results showed that these tools could not eliminate the two biggest concerns of customers - the lack of opportunity to try on clothes and uncertainty about size and fit - and therefore did not provide sufficient fit information quality (Kim & Darmhhorst, 2013). This is evidence that standardized size and fitting information is not sufficient and that its use must be extended to innovative technologies, such as VFR.

The aim of VFR is, among others, an improved presentation of size and fit quality and hence the reduction of returns (Kennedy, 2022). Mason et al. (2008) also found that if customers can quickly and easily find the right size, they have a better shopping experience, which can also have a positive impact on the retailer.

However, initial experience with virtual fitting rooms shows that the fit information quality is not automatically guaranteed and, depending on how it is used, problems can also occur, such as poor 3D images, an impractical design or problems with the processing of body measurements (Randall, 2015). It is therefore important that virtual fitting rooms display the fit information very accurately, otherwise they will not fulfill their purpose (Snijder, 2024).

Return Reasons

As aforementioned, 70% of returns are due to poor fit and dissatisfaction with the style, which is also encouraged by the increase in bracketing (McKinsey & Company, 2021). Another reason frequently cited in the literature is product damage (Hulett, 2024). A study by Coresight Research on the frequency and impact of online returns in the US apparel sector shows that in 2022, 10% of returns were due to product damage (Zheng, 2023).

The figures on the reasons for returns show that a large proportion of returns could be avoided if the size and fit information could be presented better. Furthermore, it could also lead to less bracketing, which would also decrease returns.

3 Conceptual Framework and Hypotheses

In line of the academic literature and previous studies around the topic of e-commerce, returns and use of new technologies, a set of hypotheses is proposed, followed by a conceptual framework.

In recent years, fashion brands and retailers have been investing in various size and fit tools to help consumers make more informed decisions. However, consumers also differ in their willingness to use technology for online purchases. The successful adoption of VFR technologies relies not only on their availability but also on customers' willingness to engage with them (Noordin et al., 2018). As highlighted in the literature review, perceived usefulness and ease of use are critical factors influencing technology acceptance. In the context of VFR, customers must perceive the tool as making the fitting process easier and more efficient to be motivated to use it (Venkatesh & Davis, 2000).

It is therefore expected that a high level of technology acceptance will positively influence both the willingness to use virtual reality tools.

H1: Technology acceptance will positively impact the willingness to use virtual reality tools.

According to Godoe & Johansen (2012) and Parasuraman (2000), high perceived innovation increases technology acceptance. This dynamic suggests a possible moderating effect of perceived technological innovation on the link between technology acceptance and willingness to use VFR, which is investigated in the second set of hypotheses.

H2: There will be a moderating effect of perceived technology innovation between technology acceptance and the willingness to use virtual reality tools, so that:

H2a: The higher (vs. the lower) the perceived technology innovation, the higher (vs. the lower) technology acceptance impact on the willingness to use virtual reality tools.

In addition to the first two hypotheses, the role of size and fit tools (standard vs VFR) is examined on perceived fit information quality. As discussed in the literature review, VFR offer the opportunity to improve perceived fit information quality. Fashion brands have been investing in the latest technology innovations to aid consumers in selecting and visualizing their appearance with garments and accessories. The survey data from the Coresight analysis showed that 85% of apparel brands and retailers either already use virtual fitting tools or plan

to implement them (Zheng, 2023). This shows that brands and retailers have high expectations of VFR, which is why the impact of size and fit tools (standard vs. VFR) on perceived fit information quality in H3 is to be investigated.

H3: The use of size and fit tools (standard vs. VFR) has an impact on the perceived fit information quality.

Further, the fourth hypothesis examines the moderating role of perceived technological innovation on the relationship between the type of size and fit tools (standard vs. VFR) on the perceived fit quality information. In addition, it will be analyzed whether the use of VFR helps to reduce returns. Perceived technological innovation was chosen as a moderator because VFR is based on advanced technologies such as AI, AR and 3D modeling, and it is crucial that customers perceive them as innovative. As previously stated, perceived technological innovation has both short and long-term effects on technology acceptance (Venkatesh et al., 2012).

H4: Perceived technology innovation will moderate the relationship between size and fit tools (standard vs. VR) and return attitudes (product damage, order of multiple sizes in same style), so that:

H4a: Return attitudes (product damage, order of multiple sizes in same style) will be lower when participants are exposed to the VFR than standard size and fit tools.

In addition to the perceived technological innovation moderating role between the type of size and fit tools and return attitudes, it is useful to consider an additional factor that could further influence this interaction, namely the perceived fit information quality. As previous studies have shown, the perceived fit information quality plays a central role in shaping consumer trust and decision making (Kim & Lennon, 2013). Customers may develop trust in a brand and its technology when the technology is personalized, convenient and of high quality, which has a positive impact on the overall service experience (Ameen et al., 2021; Mason et al., 2008). However, this effect can vary depending on the extent to which the innovative technology is perceived as beneficial and effective. If a VFR is seen as highly innovative but does not provide high fit information quality, its effectiveness in reducing return behavior could decrease. On the other hand, if both perceived fit information quality and perceived

technological innovation are high, these factors may work synergistically to reduce common return problems such as product damage or size discrepancies.

The interaction between these elements suggests that the perceived fit information quality not only has a direct influence on consumer attitudes, but also moderates the impact of perceived technological innovation on return attitudes. Therefore, a further set of hypotheses was established for the study:

H5: The moderating impact of perceived technology innovation on the relationship between size and fit tools (standard vs. VFR) and return attitudes (product damage, order of multiple sizes in same style) will be moderated by perceived fit information quality so that:

H5a: The return attitudes will be lower (vs. higher) when the perceived technology innovation and perceived fit information quality are high (vs. low) for consumers exposed VFR than standard size and fit tools.

Based on these hypotheses, two conceptual models are presented. The first conceptual framework intends to analyze how technology acceptance impacts consumers' willingness to use virtual reality tools. After testing the initial hypotheses and outlining the premises of the current research, the study will investigate the impact of using size and fit tools (standard vs. VFR) on perceived fit information quality. Additionally, it examines the moderated-moderating role of perceived technology innovation and perceived fit information quality on the relationship between size and fit tools (standard vs. VFR) and return attitudes (product damage, order of multiple sizes in same style), presented in the second framework below.

Figure 1: Conceptual Framework H1, H2

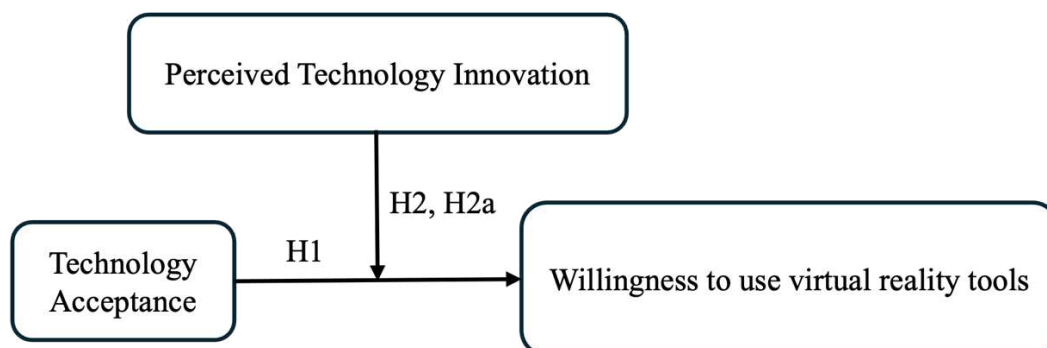
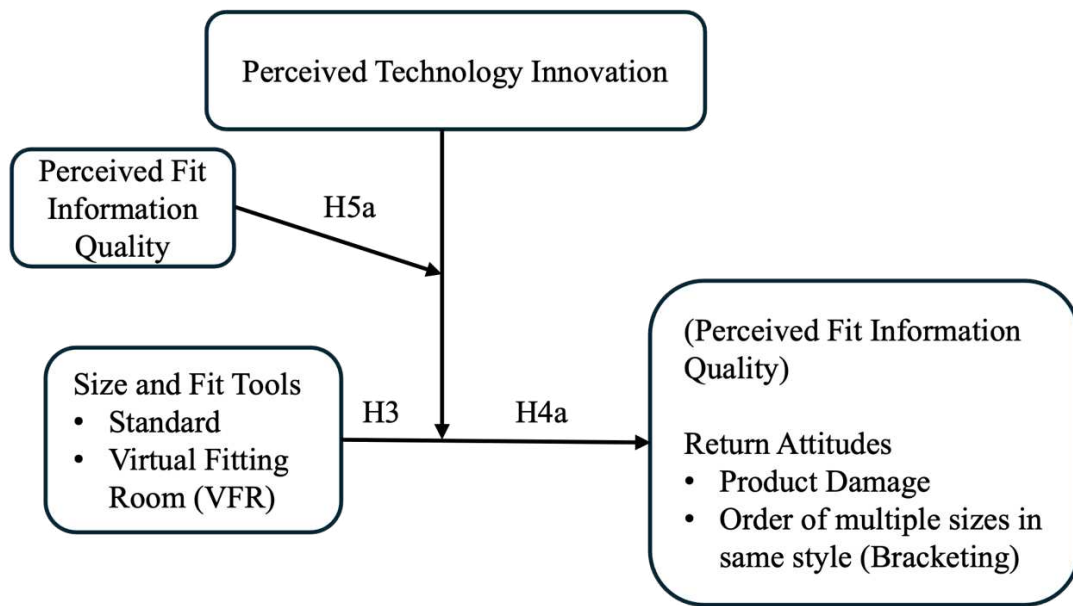


Figure 2: Conceptual Framework H3, H4, H5



4 Methodology and Data Collection

4.1 Research Method

An experimental study was conducted using the Qualtrics survey software. The surveys were shared online with the help of a link. In addition to providing the links, Qualtrics also supports the process by enabling reliable data collection, high precision, and user-friendly operation (Barnhoorn et al., 2015). The advantages of online surveys are the low cost and the ability to conduct them in a short time, conveniently and at the participant's convenience, wherever they are (Nayak & Narayan, 2019). Because the survey was conducted via Qualtrics, it was possible to evaluate the answers given with the help of SPSS. SPSS is a data analysis software that students and scientists often use because it makes complex analyses more accessible to non-professionals (Arkkelin, 2014).

4.2 Sampling

The random sampling method was used for this study. This means that the participants were not selected at random from the entire population but were selected because they were available to the author (Dorneyei, 2007). This has a positive effect on the already limited time available for the work. Because the study is intended to cover a wide range of potential online shoppers, as many different people with different demographic and geographical characteristics as possible were surveyed.

Thus, the survey was mainly distributed via WhatsApp, Instagram, LinkedIn and further contacts of the author. Experience has shown that participants are more likely to be attracted if they are addressed directly by message.

4.3 Research Instruments

Two studies were conducted. Firstly, a pilot study was carried out in advance to test the quality and effectiveness of the main study (In, 2017). Secondly, the main study is an essential part of the dissertation. Special care was taken to ensure that the survey was anonymous so that participants felt safe and were more likely to give honest answers and not feel under pressure because they might be judged by others (Whelan, 2008).

4.3.1 Pilot Study

The pilot survey was conducted before the main survey in the period from 13.11.2024 to 19.11.2024 and received 41 responses. After removing incomplete responses, a total of 34 responses were analyzed. Nineteen participants answered the survey and were shown a

scenario involving a traditional shopping experience which showed standard size and fit tools. The other 15 participants were shown the scenario in which VFR were used. An image was chosen that showed that the person had uploaded a photo of themselves and tried on the garment virtually. In addition, a text was added below the image to describe the process once again and explain how the virtual fitting works. The manipulation check questions assessed two key aspects: the clarity of the information provided about the fit of the pants and how it influenced the decision-making process in purchasing the pair of pants.

A univariate analysis of variance (ANOVA) was used to evaluate the results of the manipulation check questions in the pilot study. When both manipulation checks were analyzed, only one was statistically significant (Table 1).

Contrary to expectations, participants exposed to the stimulus without the VFR classified the fit information as more adequate than those exposed to VFR ($M_{\text{Standard}} = 5.16$, $SD_{\text{Standard}} = 1.80$ vs. $M_{\text{VFR}} = 4.67$, $SD_{\text{VFR}} = 1.67$, $F(1,34) = .661$, $p < .05$).

Concerning the decision support, non-significant differences were observed between participants exposed to the standard size and fit tools vs VFR ($M_{\text{Standard}} = 4.58$, $SD_{\text{Standard}} = 1.86$ vs. $M_{\text{VFR}} = 4.60$, $SD_{\text{VFR}} = 1.84$, $F(1,34) = .001$, $p < .05$). Based on the findings, changes were made to the manipulations so that a clearer visual representation was created, and participants could identify the main differences between the two scenarios. The aim of this is to ensure that differences in the answers to the various scenarios become apparent in the main study, allowing the hypotheses to be confirmed or refuted beyond doubt.

Table 1: Manipulation Check - Pilot Study

	<u>Standard Size and Fit Tool</u>		<u>Virtual Fitting Room (VFR)</u>		<i>F</i>
	Mean	SD	Mean	SD	
<u>Fit Information</u>	5.16	1.80	4.67	1.67	.661*
<u>Decision support</u>	4.58	1.86	4.60	1.84	.001

*Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .1$*

4.3.2 Main Study

The main study was distributed from 23.11.2024 - 03.12.2024 and received a total of 243 responses during this period, of which 149 responses were complete. However, the number of complete participants is high enough for at least 70 responses to be collected per scenario. In contrast to the Pilot Study, it was decided that the main study would be available in English and German.

4.4 Design & Procedure

In the study, participants were asked to provide information about their behavior during the online purchasing process. The focus was on the area in which customers generate the size and fit information for the desired item while shopping for trousers. The survey was divided into several blocks. The first part of the main survey consisted of introducing the participants to the survey topic and pointing out the importance of answering the survey for the study. In addition, explicit reference was made to the anonymity of the answers to dispel concerns about data protection and increase the likelihood of receiving honest answers. The second block of the study is the one in which the <Randomizer= in Qualtrics was used to randomly show the participants either the block in which a standard size and fit tool was used or the block in which the VFR was presented.

In the third block, all participants were asked the same questions to assess the perceived technology innovation of VFR. The fourth block included general questions about the participants' online shopping process to understand how they engage with online shopping. The next section dealt with returns. The question was asked how often items purchased online are returned and what the reasons for this are. Participants were also asked to evaluate whether they think that these returns can be decreased with the help of VFR. The final block of the survey was dedicated to collecting demographic data from the participants to understand who they are and whether they have any common representative characteristics.

4.5 Stimuli Development

Two stimuli were developed to illustrate different approaches to size selection in the purchasing process. In particular, the step in which customers decide on a suitable size was emphasized. Pants were chosen as an example product. In both scenarios, a purchase process for women's pants and a purchase process for men's pants were presented.

In the first scenario, size selection was illustrated using standard size and fit tools based on Zalando. Zalando was chosen because, as an internationally successful retailer operating

throughout Europe, it provides a representative basis. The table showed the size information that is common on many online platforms.

The second scenario simulated the use of VFR. Here, images were used that showed how selfies were uploaded to be able to determine the fit more individually. In addition, clearly visible references to the used technology such as AR, AI and 3D modeling were included. This display illustrated how such innovative tools can help to personalize the buying process and minimize potential uncertainty when choosing a size.

4.6 Variables Descriptions

4.6.1 Manipulation Checks

In the manipulation checks, respondents were asked how much they agreed with the following statements: <The picture I just saw gives me information about the fitting of the pants= and <The illustration gave me an impression and helped me to decide whether to buy the pants.= Both questions were measured using a 7- point Likert scale from 1- Completely disagree to 7- Completely agree adapted from Likert (1932) (Appendix 1).

In the main study, adjustments were made to the questions, although the answer options remained the same (Appendix 2): <The image above offers insights on sizing and fit, demonstrating how the product would look on me using advanced technologies such as AI, AR, and 3D modeling= and <The picture shows a suggested size for me.=

4.6.2 Independent Variable

Technology Acceptance: The participants were asked to evaluate their level of agreement with the statement <The use of new technologies such as AI AR and 3D body modeling could help to reduce the number of returns due to size and fit uncertainties= on a 7-point scale (1- Completely disagree to 7- Completely agree), adapted from Davis (1989).

Size and Fit Tools (standard vs. VFR): Manipulated; one scenario showed a standard size and fit tool. The other scenario presented the use of VFR by showing images illustrating the uploading of selfies, as well as references to technologies such as AR, AI and 3D modeling used for individual sizing.

4.6.3 Dependent Variables

Willingness to use virtual reality tools: The participants were asked to evaluate their level of agreement with the statement "If I were to buy clothes online and had the opportunity to use new technologies such as virtual reality tools along with information about my personal body measurements to understand better how the clothes would fit, I would take advantage of this" on a 7-point scale (1- Completely disagree to 7 3 Completely agree), adapted from Davis (1989).

Return Attitudes: Participants were asked to rate their level of agreement with the following two reasons, on a 7-point Likert scale (1- Completely disagree to 7- Completely agree).

Product damage: <The reasons that lead me to return fashion articles are related to product damage.=

Order of multiple sizes in same style: <The reasons that lead me to return fashion articles are related to ordering the same article in different size / fit.=

4.6.4 Moderators

Perceived Technology Innovation: Participants were asked to indicate their level of agreement with the following statements, on a 7-point Likert scale (1- Completely disagree to 7- Completely agree), adapted from Lowe & Alpert (2015) using 4 items:

<VFR are innovative=; <VFR offer unique advantages=; <VFR solve problems I had with competing technologies=; <VFR are new to me.=

Perceived Fit Information Quality: Participants were asked to select: <The quality of the fit information provided is comparable to that of similar online providers...= on a 7-point scale (1- Worse to 7- Better; 1- Confusing to 7- Clear; and from 1- Abstract to 7- Realistic).

5 Analysis and Results

5.1 Sample Characterization

The last block of the survey dealt with demographic data (see Appendix 3). Demographic questions are particularly important for researchers to determine whether as many different groups as possible were represented in the survey and whether the results can be transferred to the population (Hughes et. al, 2016).

The final sample, which has already been adjusted for incomplete responses, has 149 participants. 51.7% of them were men, 47.7% women. The remaining percentage was non-binary / third gender. In terms of the different age structures, most participants (49%) were aged between 25 and 34. This is followed by the age groups 18-24 years with 18.1%, 55-64 years with 13.4%, 45-54 years with 7.4% and over 65 years with 6.7%. The smallest group was the 35-44 age group with 5.4%. The third demographic question asked about current employment. The largest group here was full-time workers at 56.4%. The second most frequently selected employment relationship by a clear margin was that of full-time students (18.1%). The remaining percentages were accounted for by part-time employed (8.7%), retired (6%), apprenticeship (4.7%), self-employed (3.4%) and unemployed and other with 1.3% each.

The answers to the question about the highest level of completed education are very balanced. The bachelor's degree was mentioned most frequently with 29.5% of votes. This was closely followed by the professional degree with 24.2%. High school (22.1%) and master's degree (20.1%) were also close behind. 4% chose the answer <other=.

91.9% and thus most respondents currently live in Germany. 5.4% stated that they live in Germany. France, Luxembourg, the Netherlands and the United States each accounted for less than 1%. The final question of the demographic block, and therefore also the final question of the entire survey, dealt with the income of the participants. This was also divided into different levels. At 25.5%, the most frequently stated annual income was between –40,000 and –59,999. This was immediately followed by less than –20,000 (24.8%). A large proportion (16.1%) did not answer this question. 15.4% stated that they earn between –60 and –79,999. 10.1% stated that they earned between –20,000 and –39,999. Both –80,000-99,999 and –100,000-150,00 accounted for 3.4% of the votes. 1.3% stated that they earned over –150,000.

5.2 Scales Reliability and Factor Analysis

Scales from scientific literature were used for most of the study. However, to ensure a high statistical accuracy of the results, it is necessary to analyze the items used.

A differentiation is first made between scales with two items and scales with three or more items. For scales with three or more items, it must first be checked whether the variable is measured appropriately and whether there is a strong relationship between the different items.

A factor analysis was used to determine the Cronbach's alpha (Table 2).

Table 2: Cronbach's Alpha of the Variables

	Initial Number of Items	Cronbach's Alpha	Cronbach's Alpha if item deleted	Items deleted	Final number of items
Perceived Fit Information Quality	3	.81	.75	-	3
Size & Fit Information	3	.79	.93	1	2
Perceived Technology Innovation	4	.69	.61	-	4

There is no standardized value in the literature as to when the Cronbach's alpha must be at least to be meaningful. However, it is common for values between 0.6 and 0.9 to be considered acceptable for research purposes, while alpha values that are too high (above 0.9) are considered to indicate redundancy between the items (Streiner, 2003).

Exactly one item in the Size & Fit Information variable was deleted to significantly increase the Cronbach's alpha. In general, all alpha values are between 0.6 and 0.9, which makes them meaningful for the study.

In the next step, a bivariate correlation analysis was carried out for the scales with two items to measure the correlation between the two items (Table 3). In the study, this only concerns the Size & Fit Information, which was updated from three items to two items in the previous step. The following applies: If the correlation value is 0, there is no relationship between the two items, while a value of 1 describes a perfect positive correlation and a value of -1 describes a perfect negative correlation (Ahlgren et al., 2003).

Table 3: Pearson Correlation Fit and Size Information Quality

Variable	Pearson Correlation (r)	Sig (2-tailed)
Size & Fit Information	.87	<.001

Because the correlation with $p < .001$ and $r > 0.5$ is significant and shows a strong relationship, it can be assumed that high reliability levels are present (Cohen, 1988).

5.3 Manipulation Check Results

The manipulation check questions were analyzed to assess the successful interpretation of the stimulus. Participants who received the stimulus with the VFR clearly classified the fit information as more adequate than those exposed to the standard size and fit tool chart ($M_{VFR} = 5.46$, $SD_{VFR} = 1.52$ vs. $M_{Standard} = 3.78$, $SD_{Standard} = 1.86$, $F(1,148) = 35.59$, $p < .001$).

Similar results were shown for the second question. Participants who received the stimulus with the VFR clearly classified the decision support as more adequate than those exposed with standard size and fit information ($M_{VFR} = 5.37$, $SD_{VFR} = 1.73$ vs. $M_{Standard} = 3.76$, $SD_{Standard} = 2$, $F(1,148) = 27.33$, $p < .001$).

Table 4: Manipulation Check Results - Main Study

	Standard Size and Fit Tool		Virtual Fitting Room (VFR)		<i>F</i>
	Mean	SD	Mean	SD	
Fit Information	3.78	1.86	5.46	1.52	35.59***
Decision support	3.76	2	5.37	1.73	27.33***

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

This provides a successful manipulation check for the main study, allowing to proceed with the main analyses with confidence.

5.4 Main Results

5.4.1 Technology Acceptance

H1: Technology acceptance will positively impact the willingness to use virtual reality tools.

A linear regression analyses was used for the first tests to measure the first hypothesis. It was measured whether and how the willingness to use virtual reality tools is impacted by technology acceptance (Table 5).

Table 5: Linear Regression - Technology Acceptance

Technology Acceptance	Coefficient	SE	Correlation	R2
Willingness to use virtual reality tools	.52***	.09	.41	16.7%

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

Results show that the technology acceptance has a significant and positive influence on willingness to use virtual reality tools with a correlation of .41 ($p < .001$). If a consumer's technology acceptance increases by one unit, their willingness to use virtual reality tools increases by .41 units if everything else remains constant. In addition, 16.7% of the variability of willingness to use virtual reality tools is explained by technology acceptance.

In summary, the technology acceptance significantly influences the willingness to use virtual reality tools, validating H1.

5.4.2 Moderating effect of perceived technology innovation

H2: There will be a moderating effect of perceived technology innovation between technology acceptance and the willingness to use virtual reality tools, so that:

H2a: The higher (vs. the lower) the perceived technology innovation, the higher (vs. the lower) technology acceptance impact on the willingness to use virtual reality tools.

The second set of hypotheses investigates whether a higher perceived technology innovation positively moderates the role of technology acceptance and the willingness to use virtual reality tools for online clothing shopping. Hayes' linear regression model 1 (Hayes, 2012, 2018) was used to conduct the moderation analysis. The moderating effect is confirmed if the confidence interval does not reach Zero. This means that the upper limit cannot be positive and the lower limit negative if the moderation is to be confirmed.

Table 6: Hayes' linear regression model 1 on Perceived Technology Innovation & Technology Acceptance

	Condition Effects	SE	Lower CI	Upper CI
Perceived Technology Innovation	-.16	.07	-.29	-.03

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

Results show a non-significant main effect on technology acceptance ($B = .06$ SE = .11, $t(145) = 42.69$, $p > .05$, 95% CI = [5.06, 5.55]), but a main effect of perceived technology innovation ($B = .79$ SE = .13, $t(145) = 6.05$, $p < .05$, 95% CI = [.53, 1.05]), on willingness to use virtual reality tools.

Results show that the interaction term was statistically significant ($B = -.16$ SE = .07, $t(145) = -2.38$, $p < .05$, 95% CI = [-.29, -.03]) in the conducted model, indicating that perceived technology innovation moderated the relationship between technology acceptance and consumers' willingness to use virtual reality tools.

Slope analysis (Aiken & West, 1991; Fitzsimons, 2008) was then conducted with the aim of investigating differences between the conditional effects at one standard deviation below (-1SD) and above the mean (+1SD).

Table 7: Conditions of Perceived Technology Innovation and Technology Acceptance

	Condition Effects	SE	Lower CI	Upper CI
Low Perceived Technology Innovation	.22*	.11	.01	.43
Medium Perceived Technology Innovation	.06	.11	-.16	.27
High Perceived Technology Innovation	-.11	.14	-.4	.18

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

-1SD: On the centered perceived technology innovation (representing low perceived technology innovation), the relationship between technology acceptance and the willingness to use virtual reality tools for online clothing shopping is positive and significant ($B = .22$, SE = .11, $t(145) = 2.09$, $p < .05$, 95% CI = [.01, .43]). At the mean on the centered moderator variable (representing medium perceived technology innovation), the relationship was positive but non-significant ($B = .06$, SE = .11, $t(145) = 0.54$, $p > .05$, 95% CI = [-.16, .27]). Finally, at +1SD on the centered perceived technology innovation (representing high perceived technology innovation), the relationship was negative but non-significant ($B = -.11$, SE = .14, $t(145) = -.74$, $p > .05$, 95% CI = [-.4, .18]).

Findings show that perceived technology innovation significantly influences individuals' technology acceptance on the willingness to use virtual reality tools for online shopping when they have lower perceived technology innovation (-1SD) (see Table 7), validating H2.

5.4.3 The use of size and fit tools and the impact on the perceived fit information quality

H3: The use of size and fit tools (standard vs. VFR) has an impact on the perceived fit information quality.

To test hypothesis 3, an analysis of variance (ANOVA) was used to test the differences between the means. Results show a marginally significant difference between participants' responses exposed to size and fit tools (standard vs. VFR) on the perceived fit information quality ($M_{\text{Standard}} = 4.54$, $SD_{\text{Standard}} = 1.30$ vs. $M_{\text{MVFR}} = 4.94$, $SD_{\text{VFR}} = 1.21$, $F(1, 148) = 3.61$, $p = .1$, partially validating H3 (see Table 8).

Table 8: Univariate Anova 3 Perceived Fit Information Quality

	Perceived Fit Information Quality		
	Mean	SD	N
Standard Size and Fit Tools	4.54	1.30	79
Virtual Fitting Room (VFR)	4.94	1.21	70
<i>F</i> -Test	3.61+		

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p = .1$

5.4.4 Moderation of perceived technology innovation between size & fit tools and perceived fit information quality

H4: Perceived technology innovation will moderate the relationship between size and fit tools (standard vs. VR) and return attitudes (product damage, order of multiple sizes in same style), so that:

H4a: Return attitudes (product damage, order of multiple sizes in same style) will be lower when participants are exposed to VFR than standard size and fit tools.

To test hypothesis 4, Hayes' regression model 1 (Hayes, 2012, 2018) was also used to conduct the moderation analysis. The moderating effect is confirmed if the confidence interval does not reach zero. This means that the upper limit cannot be positive, and the lower limit cannot be negative if the moderation is to be confirmed.

Results show a non-significant main effect of size and fit tools (standard vs. VFR) ($B = .33$ SE = .19, $t(145) = 1.72$, $p > .05$, 95% CI = [-.05, .69]), but a significant main effect of perceived technology innovation ($B = .27$ SE = .11, $t(145) = 2.44$, $p < .05$, 95% CI = [.05, .49]) on perceived fit information quality.

Most importantly, results show a statistically significant size and fit tools (standard vs VFR) x perceived technology innovation interaction effect ($B = .49$ SE = .19, $t(145) = 2.65$, $p < .01$, 95% CI = [.13, .86]) on perceived fit information quality.

Slope analysis (Aiken & West, 1991; Fitzsimons, 2008) was again conducted with the aim of investigating differences between the conditional effects at one standard deviation below and above the mean ($\pm 1SD$).

Table 9: Hayes' linear regression model 1 on Perceived Technology Innovation & Size & Fit Tools (standard vs. VFR)

	Condition Effects	SE	Lower CI	Upper CI
Perceived Technology Innovation	.49	.19	.13	.86

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

Table 10: Conditions of Size & Fit Tools and Perceived Technology Innovation

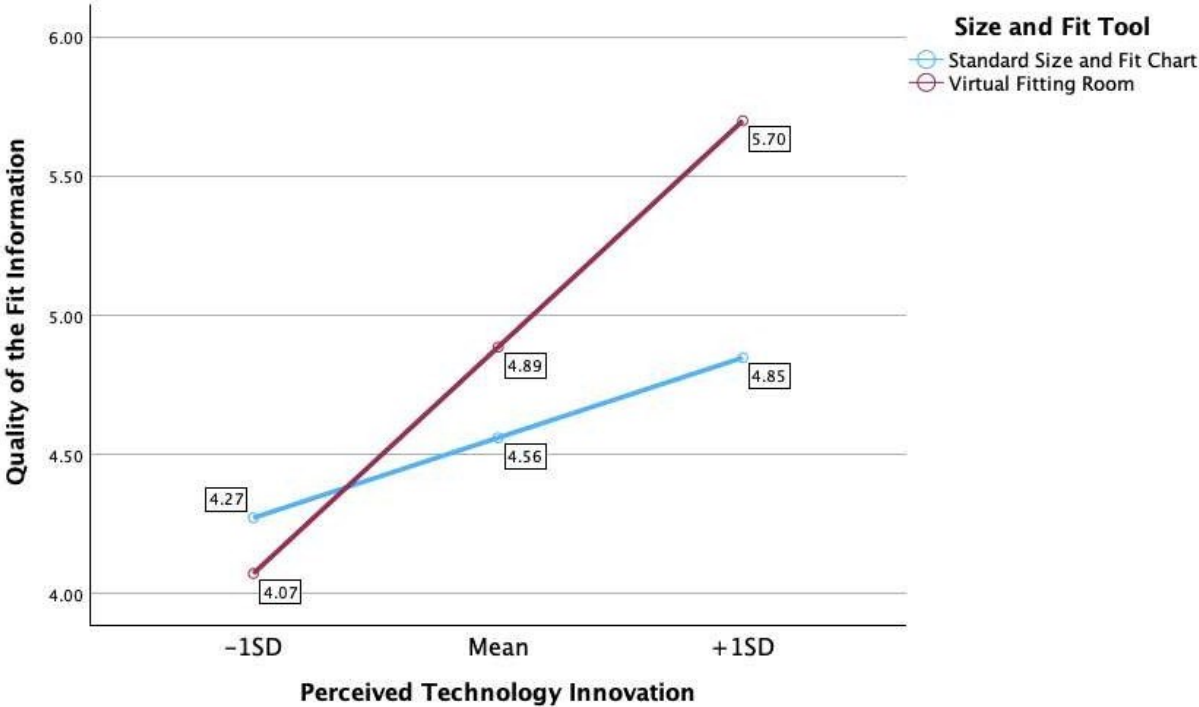
	Condition Effects	SE	Lower CI	Upper CI
Low Perceived Technology Innovation	-.2	.28	-.75	.35
Medium Perceived Technology Innovation	.33	.19	-.05	.7
High Perceived Technology Innovation	.85**	.27	.32	1.39

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

The results show statistically significant effect at +1SD, that is on high perceived technology innovation; the relationship was positive and significant ($B = .85$, SE = .27, $t(145) = 3.14$, $p < .01$, 95% CI = [.32, 1.39]). However, at (-1SD) low ($B = -.2$, SE = .28, $t(145) = -.72$, $p > .05$, 95% CI = [-.75, .35]) and medium levels ($B = .33$, SE = .19, $t(145) = 1.72$, $p > .05$, 95% CI = [-.05, .7]), non-significant differences were observed (see Table 10).

Findings reveal that differences arise between participants exposed to standard size and fit tools and VFR when perceived technology innovation increases. This effect is particularly significant for those utilizing VFR, where the quality of perceived fit information is also enhanced, validating H4a (Figure 3).

Figure 3: Moderation of Perceived Technology Innovation & Quality of Fit Information



5.4.5 Moderated-moderation of perceived technology innovation

H5: The moderating impact of perceived technology innovation on the relationship between size and fit tools (standard vs. VFR) and return attitudes (product damage, order of multiple items in same size) will be moderated by perceived fit information quality so that:

H5a: The return attitudes will be lower (vs. higher) when the perceived technology innovation and perceived fit information quality are high (vs. low) for consumers exposed VFR than standard size and fit tools.

To test hypothesis 5, Hayes Process Macro Software for SPSS, was again used for moderated-moderation analysis (Model 3).

Product damage: Results show non-significant main effects of size and fit tools (standard vs. VFR) ($B = .44$ SE = .29, $t(145) = 1.48$, $p > .05$, 95% CI = [-.15, 1.03]), perceived technology innovation ($B = .14$ SE = .17, $t(145) = .79$, $p > .05$, 95% CI = [-.20, .48]), and perceived fit information quality ($B = .10$ SE = .15, $t(145) = .67$, $p > .05$, 95% CI = [-.19, .39]), on the return attitude related to product damage.

Results also show a non-significant two-way size and fit tools (standard vs. VFR) x perceived technology innovation interaction effect ($B = -.10$, SE = .32, $t(149) = -.32$, $p > .05$, 95% CI = [-.73, .53]) on product damage, despite a significant and positive two-way size and fit tools (standard vs. VFR) x perceived fit information quality interaction effect ($B = -.69$, SE = .26, $t(149) = -2.69$, $p < .01$, 95% CI = [-1.20, -.18]) and positive two-way perceived fit information quality x perceived technology innovation ($B = .33$, SE = .12, $t(149) = 2.70$, $p < .01$, 95% CI = [.09, .57]). Most importantly, results reveal a statistically significant and positive three-way size and fit tools (standard vs. VFR) x perceived technology innovation x perceived fit information quality interaction effect on product damage ($B = -.44$, SE = .21, $t(149) = -2.07$, $p < .05$, 95% CI = [-.86, -.02]).

Slope analysis was again used to measure the three-way interaction effect at low, medium and high perceived fit information quality (Aiken and West, 1991; Fitzsimons, 2008).

Findings show that differences between standard size and fit tools versus VFR exist at high perceived fit information quality ($B = -1.14$, SE = .50, $t(149) = -2.27$, $p < .05$, 95% CI = [-2.13, -.15]). When the perceived fit information quality and perceived technological innovation are high, participants exposed to the VFR scenario exhibit a decrease in return attitudes related to product damage. Yet, participants using standard fit and size charts show increased return attitudes related to product damage.

Order of multiple sizes in same style: Results show a significant main effect of perceived technology innovation ($B = 1.46$ SE = .62, $t(145) = 2.34$, $p < .05$, 95% CI = [.23, 2.68]), despite the non-significant main effects of size and fit tools (standard vs. VFR) ($B = -8.07$ SE = 5.66, $t(145) = 1.43$, $p > .05$, 95% CI = [-19.27, 3.11]), and perceived fit information quality ($B = .81$ SE = .68, $t(145) = 1.18$, $p > .05$, 95% CI = [-.55, 2.16]), on order of multiple sizes in same style.

Results also show non-significant two-way interaction effects for size and fit tools (standard vs. VFR) x perceived technology innovation ($B = 1.28$, $SE = 1.23$, $t(149) = 1.04$, $p > .05$, 95% CI = [-1.15, 3.72]), size and fit tools (standard vs. VFR) x perceived fit information quality ($B = 2.06$, $SE = 1.18$, $t(149) = 1.75$, $p > .05$, 95% CI = [-.27, 4.39]), and perceived technology innovation x perceived fit information quality ($B = -.23$, $SE = .14$, $t(149) = -1.65$, $p > .05$, 95% CI = [-.51, .46]). The three-way size and fit tools (standard vs. VFR) x perceived technology innovation x perceived fit information quality interaction effect on product damage ($B = -.33$, $SE = .24$, $t(149) = -1.36$, $p < .05$, 95% CI = [-.81, .15]) on order of multiple sizes in same style, was also not significant, thus, partially validating hypothesis 5a.

Table 11: Hayes Process Model 3 - Product Damage

Return attitude related to product damage	B	SE	t	p	LLCI	ULCI
Size and Fit Tools (standard vs. VFR)	.44	.29	1.48	.14	-.15	1.03
Perceived Technology Innovation	.14	.17	.80	.43	-.20	.48
Size and Fit Tools (standard vs. VFR) x Perceived Technology Innovation	-.10	.32	-.32	.75	-.73	.53
Perceived Fit Information Quality	.10	.15	.67	.51	-.19	.40
Size and Fit Tools (standard vs. VFR) x Perceived Fit Information Quality	-.69	.26	-2.69	.00**	-1.20	-.18
Perceived Technology Innovation x Perceived Fit Information Quality	.33	.12	.69	.00**	.08	.57
Size and Fit Tools (standard vs. VFR) x Perceived Technology Innovation x Perceived Fit Information Quality	-.44	.21	-2.07	.04*	-.86	-.02
Return attitude related to product damage	B	SE	t	p	LLCI	ULCI
Size and Fit Tools (standard vs. VFR)	-8.07	5.66	-1.43	.15	-19.27	3.12
Perceived Technology Innovation	1.46	.62	2.34	.02*	.23	2.68
Size and Fit Tools (standard vs. VFR) x Perceived Technology Innovation	1.28	1.23	1.04	.29	-1.15	3.72
Perceived Fit Information Quality	.81	.68	1.18	.24	-.55	2.16
Size and Fit Tools (standard vs. VFR) x Perceived Fit Information Quality	2.06	1.18	1.75	.08	-.27	4.39
Perceived Technology Innovation x Perceived Fit Information Quality	-.23	.14	-1.65	.10	-.51	.05
Size and Fit Tools (standard vs. VFR) x Perceived Technology Innovation x Perceived Fit Information Quality	-.33	.24	-1.36	.17	-.81	.15

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, + $p f .1$

6 Discussion

The results provide insights into the use of virtual fitting rooms and how it can help reduce returns in e-commerce. The results of H1 confirmed that technology acceptance significantly influences willingness to use virtual reality tools. In the second set of hypotheses, it was found that perceived technology innovation significantly influences individuals' technology acceptance and willingness to use virtual reality tools for online clothing shopping when they have lower perceived technology innovation.

Although marginally significant, H3 results show that virtual fitting rooms are more positively rated than standard size and fit tools on perceived fit information quality. This suggests that although virtual fitting rooms offer added value, the benefits and use are still not widespread. H4a confirmed that perceived technology innovation in interaction with the use of VFR significantly increases perceived fit information quality. This shows that combining innovative technology and improved fit information is particularly effective for consumers who already perceive the technology as advanced. The moderated-moderation effect of perceived technology innovation and perceived fit information quality has shown that the success of virtual fitting rooms in reducing returns due to product damage relies on a high perceived fit information quality and perceived technology innovation. This finding confirms that virtual fitting rooms can contribute to reducing returns if the fit information quality is better than the standard tools and technological innovation is recognized by the users.

7 Conclusion and Implications

The dissertation has highlighted the potential of virtual fitting rooms for the described challenges in fashion e-commerce. It has been shown that VFRs can significantly improve perceived fit information quality and contribute to part of the solution to the problem of size and fit in online shopping. Consequently, they could reduce the number of returns and offer retailers economic benefits through lower costs for returns, as well as environmental goals through the reduction of CO2 emissions.

RQ1: How do virtual fitting rooms influence the purchase process and return rates in e-commerce in the fashion industry?

The study shows that VFRs improve the purchasing process because they minimize uncertainties regarding size and fit. As a result, customers feel more confident when buying and bracketing can be reduced, which ultimately means that fewer products need to be returned.

RQ2: How do consumers react to the use of new technologies in e-commerce?

The results show that the acceptance of VFR is significantly influenced by the perceived ease of use and technological innovation. Customers are more willing to use VFR if these tools are intuitive to use and offer clear added value, in particular improved fit accuracy.

RQ3: How can the implementation of technologies like virtual fitting rooms create strategic advantages for e-commerce retailers and drive broader adoption across the fashion industry?

It has been shown that not only the main benefit, the reduction of returns, is made possible with the use of VFR, but that the use of virtual reality tools can also lead to customer retention. In addition, adoption across the fashion industry can also be increased if the sustainability aspect is considered. Retailers will be forced to improve their sustainability in the future and VFR can be one of many factors to improve sustainability in the dirty fashion industry.

7.1 Theoretical Implications

The study contributes significant findings for theoretical implications. On the one hand, it confirms existing findings on technology acceptance and what influence this has on the willingness to use virtual reality tools. With a particular focus on virtual fitting rooms, it was possible to gain insights that were not comprehensively examined in previous studies. The results show that the acceptance of technologies, as described in the Technology Acceptance Model by Davis (1989), is decisive for the willingness to use innovative tools such as VFR. The study confirms findings that perceived usefulness and ease of use are significant influencing factors for technology acceptance (Venkatesh & Davis, 2000; Masrom, 2007).

On the other hand, the study extends the literature by shedding light on the moderating role of perceived technological innovation, which has only been examined to a limited extent in the literature by Godoe & Johansen (2012) and Parasuraman (2000). It is shown that high perceived technology innovation can influence the effect of technology acceptance on willingness to use virtual reality tool and thus provides new impetus for research on the diffusion of innovations (Rogers, 1995).

The literature has also discussed the relevance of fit information quality (Kim & Damhorst, 2013; Mason et al., 2008). However, due to their reference, which dates back several years, they did not consider the technologies that are available today. The study carried out can therefore also offer added value here with the insight that VFR is seen as a suitable tool for presenting size and fit information better than standard size and fit tools. It is important to note that the perceived technology innovation and the accuracy of the presentation must be given.

While Bozbay & Yasin (2008) and Tsai et al. (2010) emphasize the importance of perceived technological innovation for customer satisfaction, the present study goes further and provides empirical evidence that high quality fit information can increase the effectiveness of VFR in terms of returns. Boisvert & Khan (2022) found that a higher perceived level of innovation leads to a stronger purchase intention. The findings of the present study further deepened the findings and found for e-commerce that a higher perceived innovation increases the willingness to use virtual reality tools.

In addition, existing studies show that it is still necessary to test how consumers respond to VFR (Noording et al., 2018). With the findings of the study conducted, it is shown that many participants are willing to use VFR and therefore are open minded to use these technologies.

7.2 Practical Implications

The results of the study provide important insights for e-commerce retailers. They show that VFR can improve the perceived fit information quality compared to standard size and fit tools. This could lead to a reduction in returns, resulting in significant economic benefits for retailers, for example in the form of lower transportation and storage costs and a reduction in CO2 emissions, which in turn makes a positive contribution to sustainability (McKinsey & Company, 2021; Tsai et al., 2010). E-commerce retailers should therefore focus on VFR using technologies such as AI, AR and 3D modelling to provide customers with an easy way to make purchasing decisions and minimize uncertainties regarding fit. This can help reduce the rate of returns (Kim & Damhorst, 2013; McKinsey & Company, 2021).

As the technology acceptance depends mainly on perceived usefulness and ease of use (Davis, 1989; Venkatesh & Davis, 2000), retailers should ensure that VFR are intuitive to use. In addition, clear communication of the benefits of this technology to customers is crucial to ensure that they use the tools offered (Lowe & Alpert, 2015).

Most e-commerce retailers are already using VFR or are at least on it to implement it (Zheng, 2023). Managers should therefore make sure to actively drive the implementation forward in order to be overtaken by the competition. VFR should not only be seen as a tool to improve fit information quality, but as a strategic tool to improve the customer relationship (Mason et al., 2008; Flint et al., 1997). For smaller retailers that may not have sufficient financial and technical resources, partnerships with specialized providers such as Sizebay could be a way to integrate virtual reality tools without having to make large investments (Blázquez, 2014; Snijder, 2024).

8 Limitations and Future Research

One of the limitations of the work is that the manipulation checks did not work out in the pilot study. However, the main study could still be conducted. It was important to note the modification of the study and to check whether the modification led to the recognizable differences in the responses (Thabane et. al, 2010).

Even if the anonymity of the data was pointed out at the beginning of the study, it is possible that participants did not answer honestly, e.g. if they did not trust that the survey was truly anonymous (Roberts & Allen, 2015). This would lead to a distortion of the statements.

Furthermore, due to the scope of the work, only the VFR was used to increase the fit information quality. In practice, however, there are several tools that can be used to better represent the fitting information, such as AI avatars or photogrammetry (Durgade et. al., 2024).

Another limitation is that there are differences in the sample size across the different scenarios: both in the pilot and the main study. It can also be said that the survey is based on a small sample. With over 90% of participants from Germany, the significance of the survey relates to the German market.

It is important for future research to conduct further studies on the topic of virtual fitting rooms and their influence on e-commerce. The focus should be on testing the premises of the present research across larger samples and with participants from different countries to get more diverse data.

In addition, not only the possibility of using virtual fitting rooms should be considered, but also which alternatives are available in this area and for which areas which alternative is best suited. It is essential to be constantly updated with the latest technology. With the rapid growth in technical progress, solutions are being developed all the time that must be taken into consideration.

Studies can also change over time. It therefore makes sense to conduct the study again in a modified form in one- or two-years9 time to find out what the opinion will be if the technologies presented are even more widespread and more frequently used.

Another possibility for future research is to subdivide the fashion e-commerce sector to recognize whether there are differences in the various areas of online shopping. For example, it could be investigated whether there are differences in the successful implementation of new technologies in clothing accessories.

Finally, future research could also focus on comparing regions and countries to better account for different perceptions of sustainability. The demand for virtual dressing rooms and similar technologies could depend strongly on local attitudes and priorities regarding environmental awareness and sustainability. In countries where sustainability is highly valued, such tools could be more demanded than in other regions. A detailed examination of these regional differences could help to offer customized solutions that meet the specific requirements and expectations of the respective markets.

Appendices

Appendix 1: Pilot Study

Introduction Block

Dear participants,

Welcome and thank you for taking the time to complete this survey.

The survey is part of a master thesis in its final stage. The aim is to find out whether innovative technologies can be used to improve fitting information in the online purchasing process and therefore reduce the return rate. Your participation is very important and contributes to its completion. This survey takes approximately 4 minutes to complete.

All data obtained will be used anonymous and confidential. Therefore, I ask you to answer honestly and spontaneously. There are no right or wrong answers.

If you have questions or feedback regarding the survey, please contact: s-ljuckemoller@ucp.pt

Thank you in advance 3 Leon

In the next step, one important step of the online purchasing process for pants is visualized. Please take a moment to have a careful look. You may even scroll up and down to better review it.

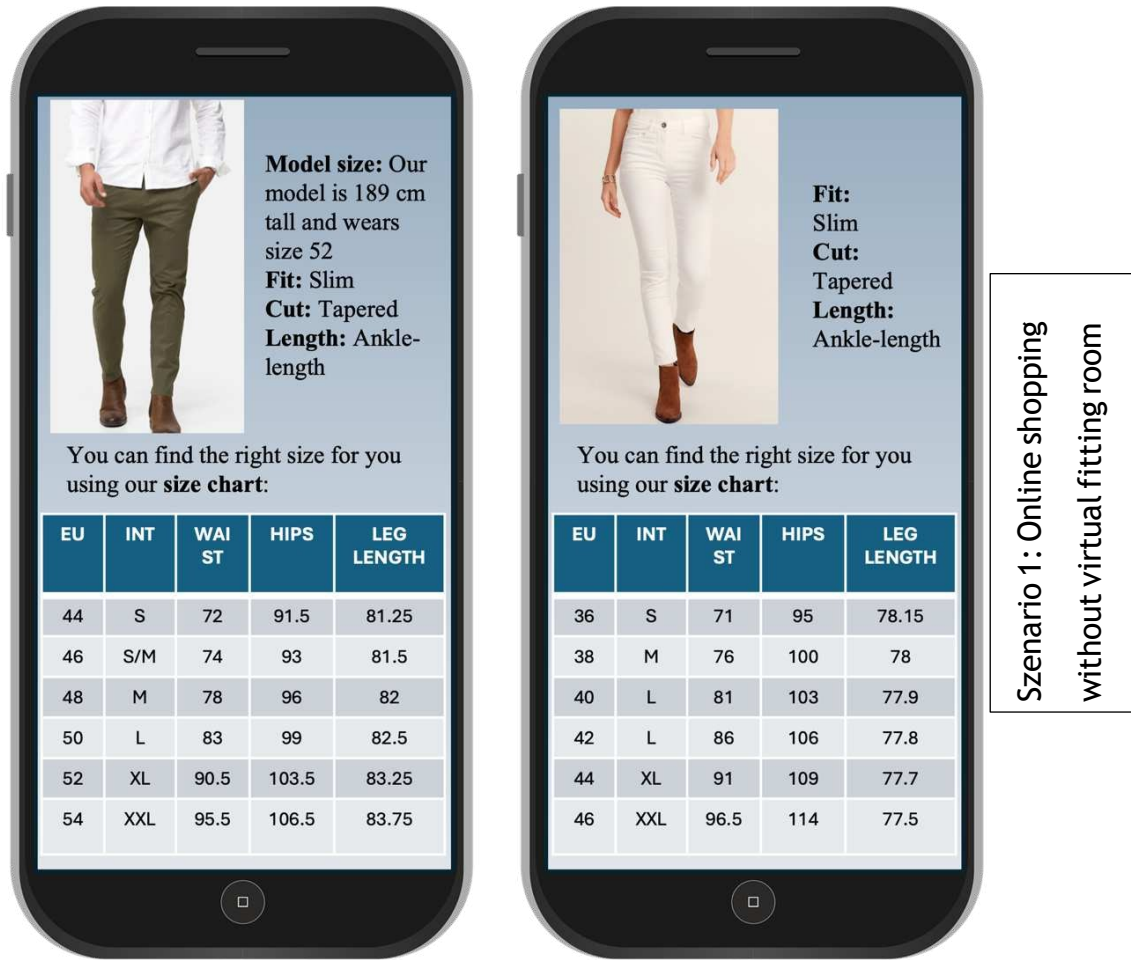
Randomization Block:

Either first or second scenario is displayed:

First scenario: Imagine you would like to order a pair of trousers from one of your favorite online stores. You have now clicked on the desired trousers and receive the information on the fit of the trousers as visualized in the picture:

(On the left is an example of the purchase of men's trousers,
on the right is an example of the purchase of women's trousers)

Figure 4: Example illustrations of fitting information



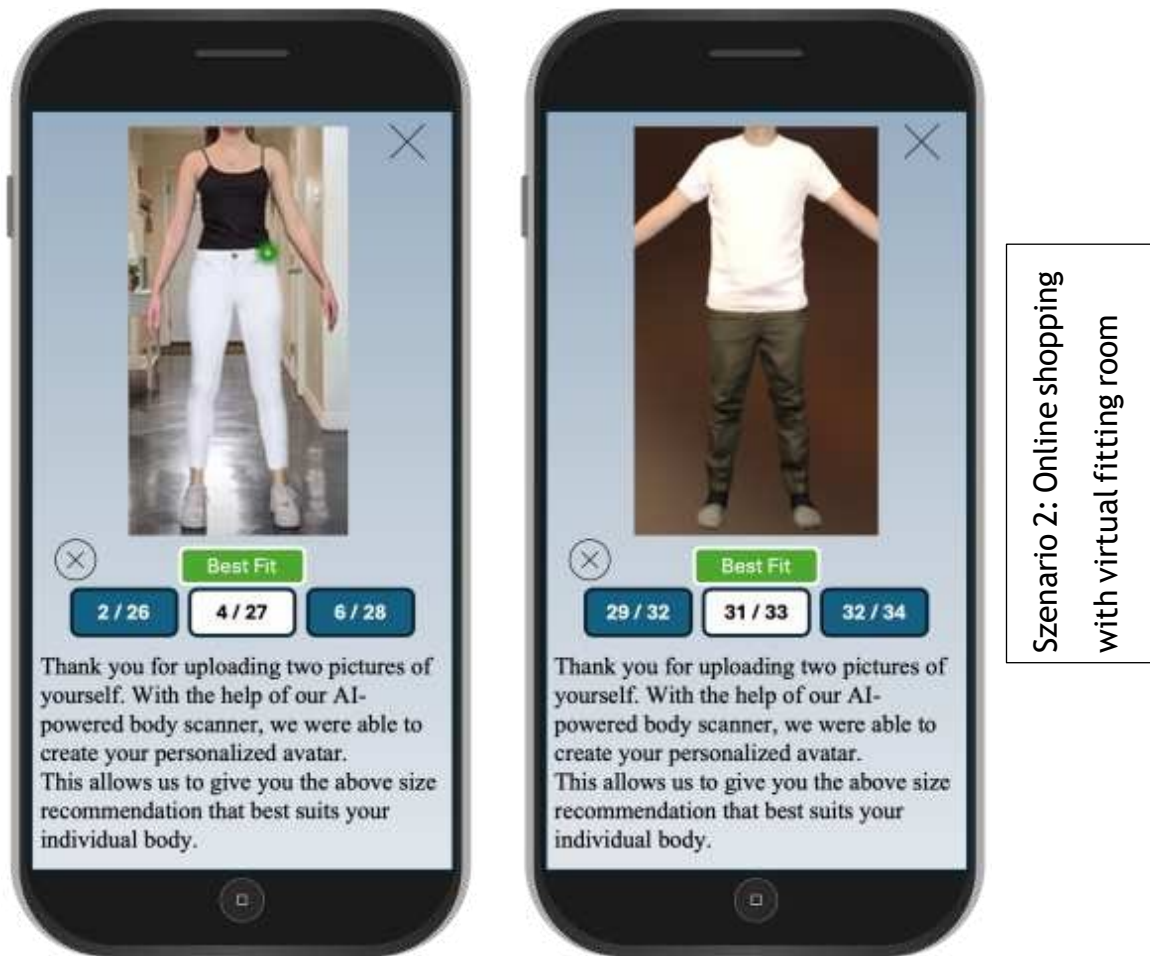
(Based on Zalando, n.d.)

Second scenario: Imagine you would like to order a pair of trousers from one of your favorite online stores. You have now clicked on the desired trousers and receive the information on the fit of the trousers as visualized in the picture:

(On the left is an example of the purchase of women's trousers

On the right is an example of the purchase of men's trousers)

Figure 5: Example illustration of fitting information



(Based on Business of Fashion, 2022; Herrmann, 2019)

Manip. Check 1:

How much do you agree with the following statement?

The picture I just saw gives me information about the fit of the pants.

- | | | | | | | |
|------------|------------|--------------|-----------|--------------|------------|------------|
| 1 - | | 4 - Neither | | 7 - | | |
| Completely | 2 - Mostly | 3 - Slightly | agree nor | 5 - Slightly | 6 - Mostly | Completely |
| disagree | disagree | disagree | disagree | agree | agree | agree |

Manip. Check 2:

How much do you agree with the following statement?

The illustration gave me an impression and helped me to decide whether to buy the pants.

1 - Completely disagree 2 - Mostly disagree 3 - Slightly disagree 4 - Neither agree nor disagree 5 - Slightly agree 6 - Mostly agree 7 - Completely agree

Q3:

After looking at the picture above, how accurately do you rate the dimensions of the shown item of clothing?

1 - Extremely inaccurate 2 - Very inaccurate 3 - Slightly inaccurate 4 - Neutral 5 - Slightly accurate 6 - Very accurate 7 - Extremely accurate

Q4:

How much do you agree with the following statement?

If I were to buy clothes online and there was the possibility of using new technologies in conjunction with information about my personal body measurements to get a better feel for the fitting of the clothes, I would take advantage of this.

1 - Completely disagree 2 - Mostly disagree 3 - Slightly disagree 4 - Neither agree nor disagree 5 - Slightly agree 6 - Mostly agree 7 - Completely agree

Q5:

Please use the following scale to select the extent to which the statement applies to you in relation to the following keywords.

The size information when I order online is...

	1 - Completely disagree	2	3 - Neither agree nor disagree	4	5 - Completely agree
Suitable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6:

Please rate your level of agreement with this statement:

The quality of the fit information provided compares favorably with similar online providers:

Worse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Better
Confusing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Clear
Abstract	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Realistic

Demographics Block

Finally, I would like you to answer a few demographic questions about yourself.

Q7:

What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

Q8:

How old are you?

- Under 18 years
- 18 - 24 years
- 25 - 34 years
- 35 - 44 years
- 45 - 54 years
- 55 - 64 years
- 65 years and over

Q9:

Which of the following employment statuses best describes your current situation?

- Full-time employed
- Part-time employed
- Self-employed
- Student
- Apprenticeship
- Unemployed
- Retired
- Other

Q10:

What is the highest level of education you have completed?

- Bachelor Degree

- Master Degree
- Doctoral Degree
- Professional Degree
- Other

Q11:

Where do you live?

[Click here to edit choices](#)

Q12:

What is your current annual income in Euros?

- Under 20,000
- 20,000 - 39,999
- 40,000 - 59,999
- 60,000 - 79,999
- 80,000 - 99,999
- 100,000 - 150,000
- Over 150,000
- Prefer not to say

THANK YOU!

By answering the survey, you have made an important contribution to my master's thesis!

Please do not discuss the nature of the study with any other participants, as it may bias future results.

Please click on the button below to end the study.

Appendix 2: Main Study

Introduction Block

Dear participants,

Welcome and thank you for taking the time to complete this survey.

The survey is part of a master thesis in its final stage. The aim is to find out whether innovative technologies can be used to improve fitting information in the online purchasing process and therefore reduce the return rate. Your participation is very important and contributes to its completion. This survey takes approximately 8 minutes to complete.

All data obtained will be used anonymous and confidential. Therefore, I ask you to answer honestly and spontaneously. There are no right or wrong answers.

If you have questions or feedback regarding the survey, please contact: s-ljuckemoller@ucp.pt

Thank you in advance 3 Leon

In the next step, one important step of the online purchasing process for pants is visualized. Please take a moment to have a careful look. You may even scroll up and down to better review it.

Randomization Block:

Either first or second scenario is displayed:

First scenario: Imagine you want to order a pair of trousers from one of your favorite online stores. As usual, you select the desired item, and while scrolling down the screen, you find information about the available sizes and fit options for the product (please see example below).

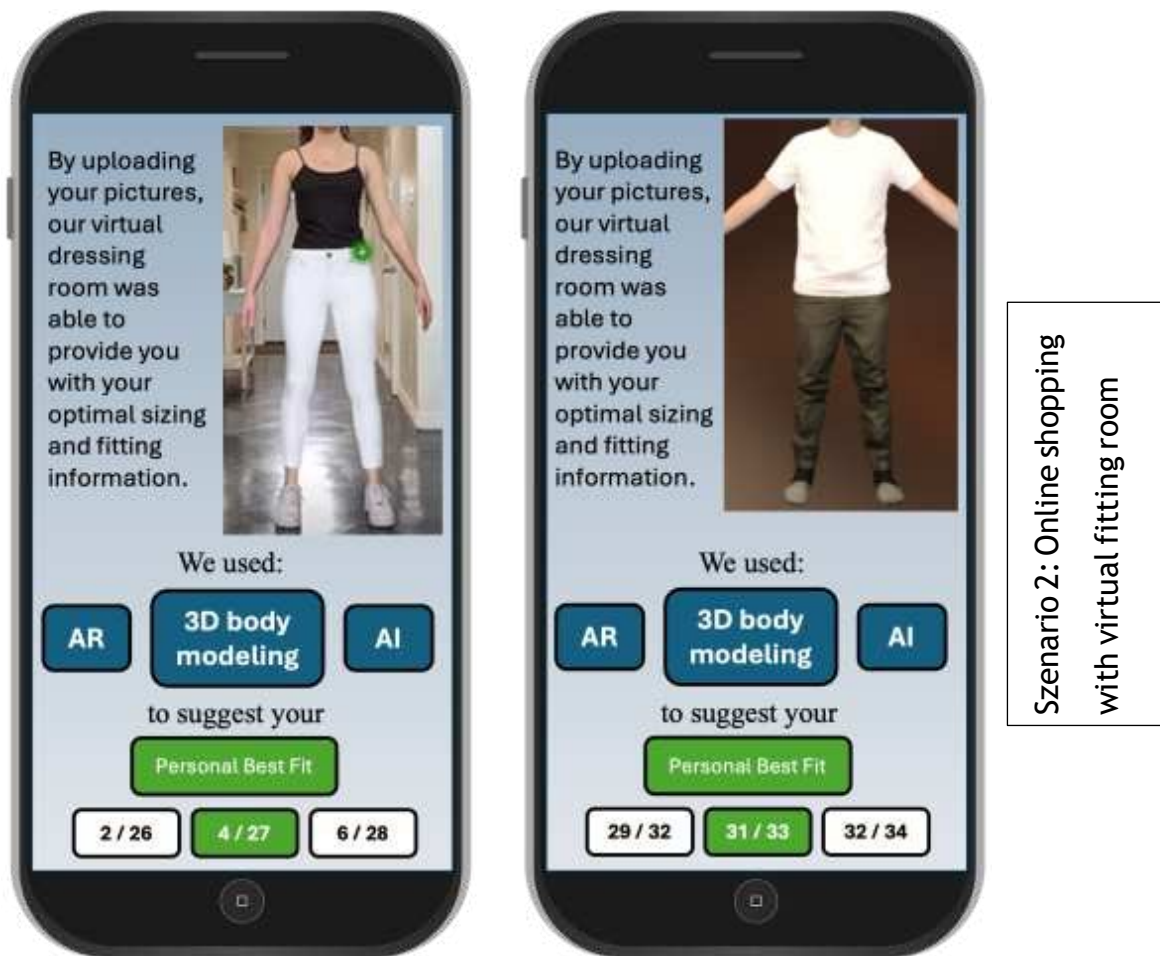
Figure 6: Example illustrations of fitting information



(Based on Zalando, n.d.)

Second scenario: Imagine you would like to order a pair of trousers from one of your favorite online stores. As usual, you select the desired item, and while scrolling down the screen, you find information about the suggested size and fit, including a simulation showing how the trousers will look on you (please see example below).

Figure 7: Example illustrations of fitting information



(Based on Herrmann, 2019 & Business of Fashion, 2022)

Augmented Reality (AR): Integrates digital elements into the real world, typically through smartphones or AR glasses, to create interactive experiences.

3D body modeling: Digital 3D body models from scans provide accurate size recommendations and enable virtual fittings.

Artificial Intelligence (AI): Imitates human learning and decision-making in order to solve problems or automate processes, e.g. personalization and image processing.

Manip. Check 1:

How much do you agree with the following statement on a scale from 1 (completely disagree) to 7 (completely agree)?

The image above offers insights on sizing and fit, demonstrating how the product would look on you using advanced technologies such as AI, AR, and 3D modeling.

1 - Completely disagree 2 - Mostly disagree 3 - Slightly disagree 4 - Neither agree nor disagree 5 - Slightly agree 6 - Mostly agree 7 - Completely agree

Manip. Check 2:

How much do you agree with the following statement?

The picture shows a suggested size for me.

1 - Completely disagree 2 - Mostly disagree 3 - Slightly disagree 4 - Neither agree nor disagree 5 - Slightly agree 6 - Mostly agree 7 - Completely agree

Q3:

Based on the picture just shown, how accurately do you rate the dimensions of the clothing item shown?

1 - Extremely inaccurate 2 - Very inaccurate 3 - Slightly inaccurate 4 - Neutral 5 - Slightly accurate 6 - Very accurate 7 - Extremely accurate

Q4:

Please select:

The quality of the fit information provided is comparable to that of similar online providers...

Worse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Better
Confusing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Clear
Abstract	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Realistic

Q5:

Now, please evaluate your level of agreement with the following statement:

"If I were to buy clothes online and had the opportunity to use new technologies such as virtual reality (VR) along with information about my personal body measurements to understand better how the clothes would fit, I would take advantage of this."

1 - Completely disagree 2 - Mostly disagree 3 - Slightly disagree 4 - Neither agree nor disagree 5 - Slightly agree 6 - Mostly agree 7 - Completely agree

Q6:

Please indicate how well the following statement applies to you regarding size information when ordering online, based on the following dimensions:

The size and fitting information is...

	1 - Completely disagree	2 - Mostly disagree	3 - Slightly disagree	4 - Neither agree nor disagree	5 - Slightly agree	6 - Mostly agree	7 - Completely agree
Suitable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Perceived Innovativeness Block:

Q7:

Please indicate your level of agreement with the following statements, on a scale from 1 (completely disagree) to 7 (completely agree):

	1 - Completely disagree	2 - Mostly disagree	3 - Slightly disagree	4 - Neither agree nor disagree	5 - Slightly agree	6 - Mostly agree	7 - Completely agree
Virtual dressing rooms are innovative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virtual dressing rooms offer unique advantages.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virtual dressing rooms solve problems I had with competing technologies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virtual dressing rooms are new to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8:

Please select:

The technology behind virtual fitting rooms is...

Predictable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Innovative
Ordinary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Unique
Old-fashioned	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Trendy

General Online Shopping Block:

Q9:

Please indicate your level of agreement with the following statements.

	1 - Completely disagree	2 - Mostly disagree	3 - Slightly disagree	4 - Neither agree nor disagree	5 - Slightly agree	6 - Mostly agree	7 - Completely agree
Learning to operate online shopping systems is easy for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned about my personal information being misused during online shopping.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a high level of uncertainty in the quality of products purchased online.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Loyalty Block:

Q10:

Please indicate your level of agreement with the following statements.

	1 - Completely disagree	2 - Mostly disagree	3 - Slightly disagree	4 - Neither agree nor disagree	5 - Slightly agree	6 - Mostly agree	7 - Completely agree
I find the experience of a virtual dressing room superior to other online shopping methods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a virtual dressing room motivates me to continue shopping with this brand, even if other providers have similar features.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Because I am more involved in determining the right size, my loyalty to the retailer is strengthened.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The combination of virtual fittings and other online shopping functions strengthens my trust in the brand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Return Block

Q11:

Please rate your level of frequency that you return fashion articles.

1 - Not at all frequent	2	3	4 - Occasionally frequent	5	6	7 - Very much frequent
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Q12:

Please rate your level of agreement with the following statement:

The reasons that lead me to return fashion articles are related to:

	1 - Completely disagree	2 - Mostly disagree	3 - Slightly disagree	4 - Neither agree nor disagree	5 - Slightly agree	6 - Mostly agree	7 - Completely agree
Size and fit issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Due to ordering the same article in different size / fit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Product damage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unmet expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13:

Please evaluate your level of agreement with the following statement:

The use of new technologies such as AI AR and 3D body modeling could help to reduce the number of returns due to size and fit uncertainties.

1 -			4 - Neither			7 -
Completely	2 - Mostly	3 - Slightly	agree nor	5 - Slightly	6 - Mostly	Completely
disagree	disagree	disagree	disagree	agree	agree	agree

Demographics Block

Finally, I would like you to answer a few demographic questions about yourself.

Q14:

What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

Q15:

How old are you?

- Under 18 years
- 18 - 24 years
- 25 - 34 years
- 35 - 44 years
- 45 - 54 years
- 55 - 64 years
- 65 years and over

Q16:

Which of the following employment statuses best describes your current situation?

- Full-time employed
- Part-time employed
- Self-employed
- Student
- Apprenticeship
- Unemployed
- Retired
- Other

Q17:

What is the highest level of education you have completed?

- Bachelor Degree
- Master Degree
- Doctoral Degree
- Professional Degree
- Other

Q18:

Where do you live?

[Click here to edit choices](#)

Q19:

What is your current annual income in Euros?

- Under 20,000[€]
- 20,000[€] - 39,999[€]
- 40,000[€] - 59,999[€]
- 60,000[€] - 79,999[€]
- 80,000[€] -99,999[€]
- 100,000[€] - 150,000[€]
- Over 150,000[€]
- Prefer not to say

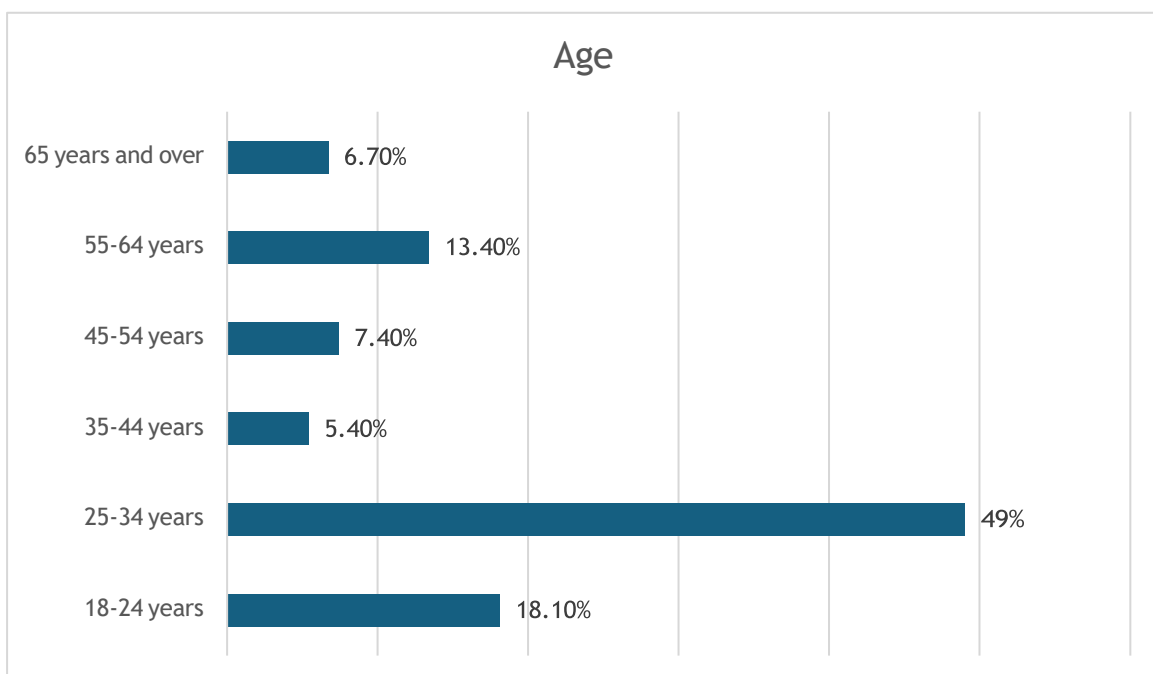
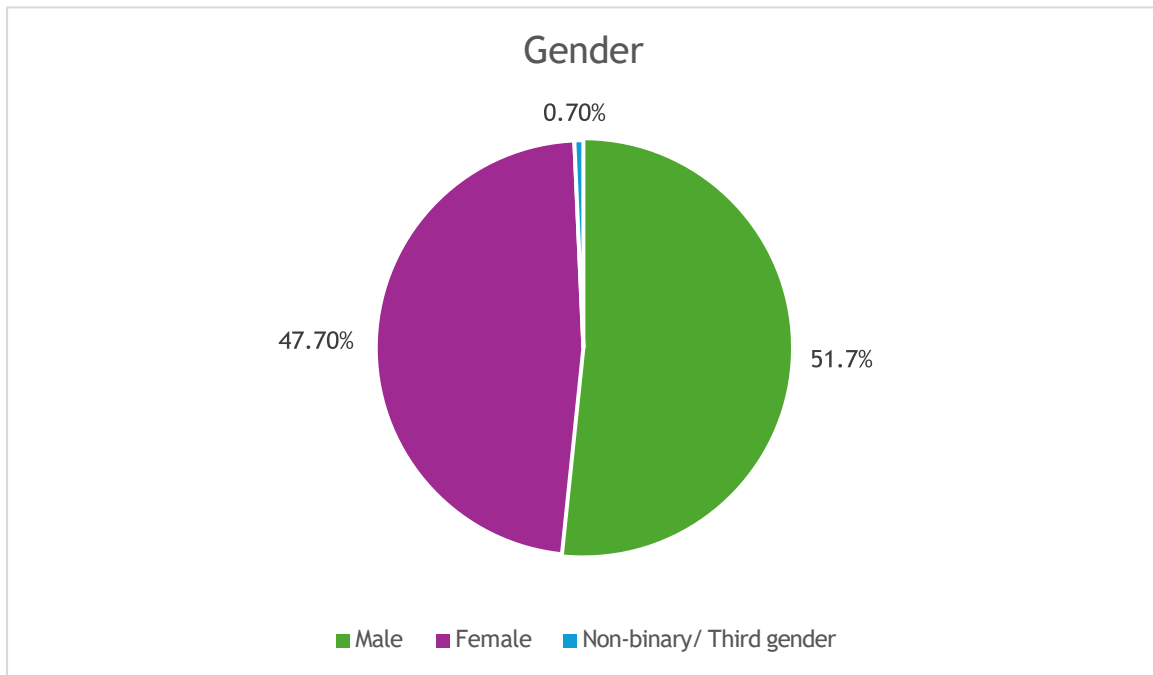
THANK YOU!

By answering the survey, you have made an important contribution to my master's thesis!

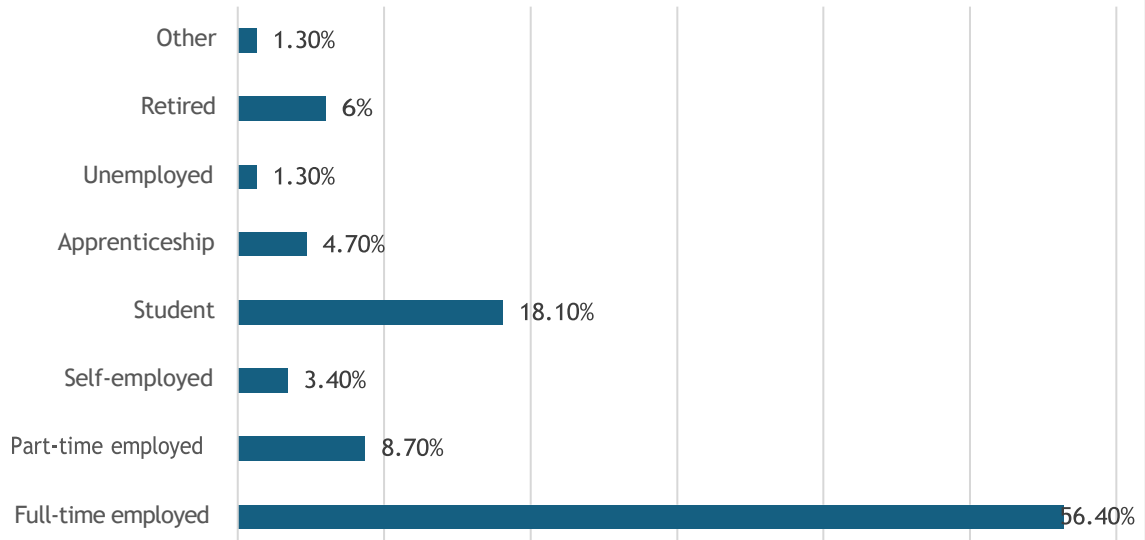
Please do not discuss the nature of the study with any other participants, as it may bias future results.

Please click on the button below to end the study.

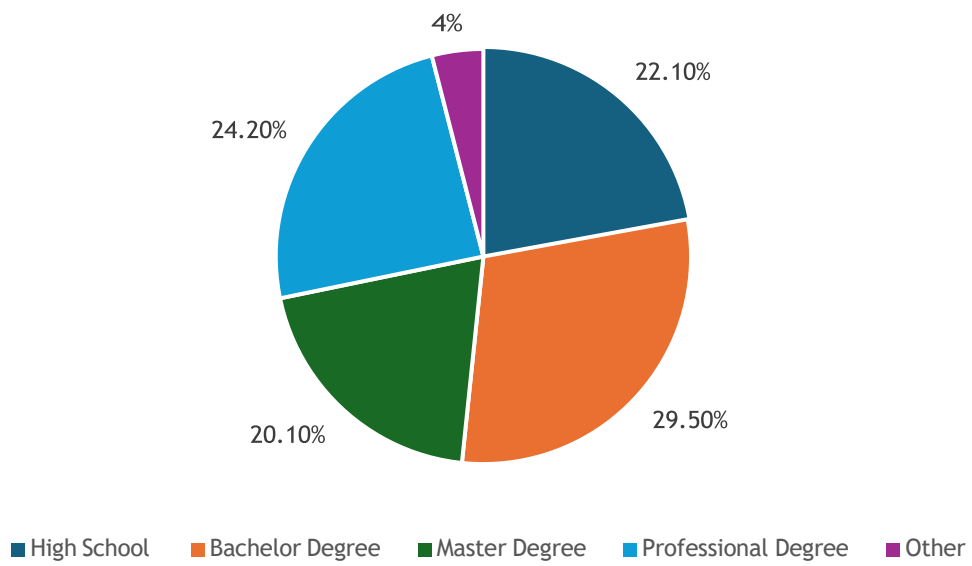
Appendix 3 Survey Demographics:



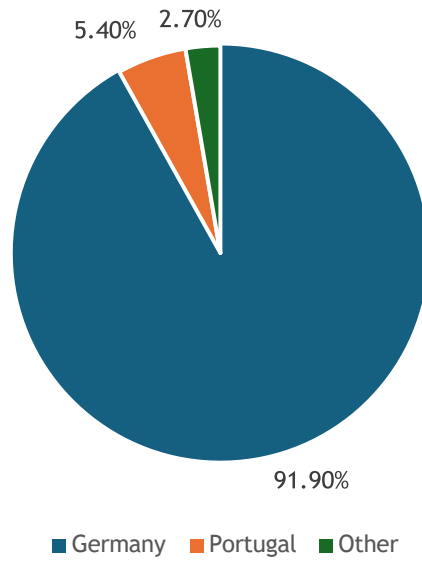
Current Occupation



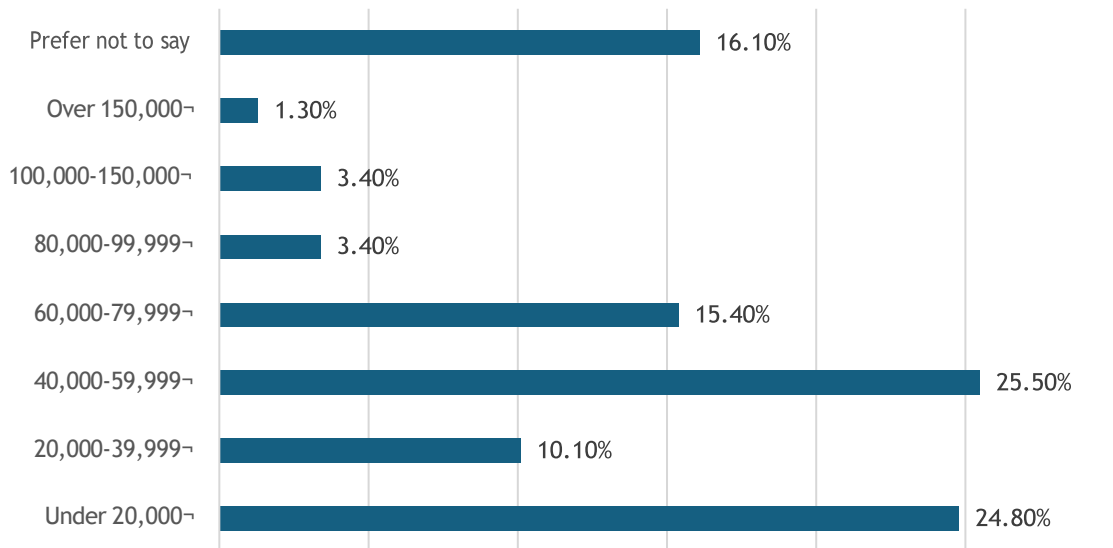
Highest Level of Education



Located



Annual Income



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