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MSc
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AUGMENTED REALITY IN ONLINE RETAIL: GENERATIONAL DIFFERENCES BETWEEN MILLENNIALS AND GENERATION Z USING VIRTUAL TRY-ON'S

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ABSTRACT

The aim of this thesis is to examine the differences across two generational cohorts, millennials, and Generation Z, in terms of their augmented reality (AR) experience using virtual try-on's (VTO) in online retail. Based on a quantitative study involving an online survey and experiment carried out among 198 participants, the results revealed significant differences in post-usage variables. Millennials experienced higher hedonic value and need for touch while Gen Z experienced higher utilitarian value, ease of use, attitude towards using and purchase intention. There were no statistical differences in spatial presence, psychological ownership, and awareness of privacy practices. However, the study clearly shows differences among the generations and thus contributes to the research on augmented reality and generational marketing. Considering cohort-specific differences will enable practitioners to cluster demographic groups, thus creating specific buyer personas to target more efficiently for optimised marketing strategies, and, as a bonus, to increase the environmental sustainability of online retail.

Keywords: Augmented reality (AR); virtual try-on (VTO); generational marketing; millennials; generation Z

Paper type: Research paper

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AR	Augmented reality
ARM	Augmented reality marketing
Gen Z	Generation Z
MNC	Multinational company
Sig.	Significance level
TAM	Technology acceptance model
UN	United Nations
UGC	User-generated content
VR	Virtual reality
VTO	Virtual try-on
XR	x Reality (see Chapter 2.1.2)

1. INTRODUCTION

Augmented reality (AR) is on the rise. The AR market is growing exponentially, with an annual growth rate of 48.6% (Fortune Business Insights, 2022; The Insight Partners, 2022), as AR technology has been broadly adopted across a range of industries – among which is that of online retail. In this commercial sector, rapidly progressing digitalisation and radically changed post-pandemic consumer behaviour (Aksoy & Ergen, 2020) have contributed greatly to its steady growth (ecommerceDB, 2021). And it is in this context of online retail that AR has the potential to enhance the online shopping experience in a host of different ways (Song et al., 2019). Unsurprisingly, it is the younger generations – that is, millennials and generation Z (Gen Z) – who have become the main target groups for AR, thanks, on the one hand, to their increasing purchasing power as they age and enter the job market (Pollard, 2021), and, on the other, to their interest in new technologies and demand for innovations (Klarna, 2022). While millennials have grown up in parallel with the digital transition, experiencing first-hand the development of technologies and the introduction of the internet, Gen Z was born into our fast-evolving, digital world. However, while both cohorts can be considered the most tech-savvy, there are differences in their buying behaviours and shopping experiences that cannot be overlooked (Agrawal, 2022). Indeed, a consideration of these cohort-specific differences enables practitioners to cluster demographic groups, create specific buyer personas and, thus, optimise their marketing strategies and measures as they seek to target the respective generations more efficiently.

1.1. Presentation of the Topic

The awareness of and interest in AR is high not only among users and companies (Statista, 2022b) but also among researchers. Within the field of AR research, scholars have mainly focused on the general acceptance and perception of these emerging technologies (Kumar, 2021), though some studies have focused on more specific aspects, including the need for touch (Gatter et al., 2022) and cognitive innovativeness (Huang & Liao, 2014). The few studies conducted to date that distinguish between segments do so based on attitudes towards AR (Romano et al., 2022); however, to the best of the author's knowledge no attempts have been made to address differences in this regard between generations. In the context of generational marketing, studies seek to examine the differences between cohorts (Agrawal, 2022); nevertheless, scholars have yet to examine generational differences in relation to emerging technologies such as AR.

The importance of understanding these generational differences takes on additional weight here as it should contribute to the sustainability of online retail (Saggau & Connell, 2021). One of the major challenges faced by the sector is that customers cannot touch or try on products prior to purchasing, resulting in product return rates of up to 33% (Statista, 2022c). It is here that AR provides a solution: Enabling customers to try on a product virtually, which in turn should reduce product returns and related shipping and transportation costs incurred in returning the product (Baytar et al., 2020; Yim et al., 2017). It can also reduce, in part, customer trips to physical stores given the greater convenience of online retail. In short, implementing AR features, such as virtual try-ons (VTOs), can make online retail more sustainable by decreasing product returns and carbon footprints, and thereby contribute to the

United Nation's (UN) Sustainable Development Goals (see Chapter 2.2.3). In this regard, Alvarez & Marsal (2021) reports that product return rates among Gen Z are the highest in Europe, which suggests that given they are one of the primary target groups of AR, VTOs should go some way to reducing their return rates. Likewise, future developments such as the emergence of metaverse – a network of 3D virtual worlds (Sparkes, 2021) – mean that technologies like AR will acquire even greater importance. Based on AR and virtual reality (VR) technologies, an immersive digital environment is being created (Rauschnabel et al., 2022; Wang & Zhang, 2018).

Thus, the obvious potential of AR as an emerging technology coincides with the increasing purchasing power of two demographic cohorts – the millennials and Gen Z – both showing considerable high tech-affinity and willingness to use these technologies. To exploit this combination, it is critical to understand the differences in the AR experiences of these two generations as they relate to online retail. Acknowledging these differences is crucial to developing efficient marketing strategies targeting the respective generation. Thus, this study addresses a research gap and contributes to both fields of interest – AR and generational marketing – in what constitutes a novel analysis. Moreover, due to the practical approach taken in designing the current research, its findings should prove valuable to both scholars and practitioners.

1.2. Research Objective

This thesis aims to examine the differences across two generational cohorts, millennials, and Gen Z, in terms of their AR experience. It analyses differences in variables influencing their acceptance and perception of AR, including hedonic and utilitarian benefits, ease of use, attitude towards using and purchasing intention. It also addresses further influential AR-specific variables, including spatial presence, psychological ownership, need for touch and awareness of privacy practices. The hypotheses are developed in Chapter 2.4.

1.3. Applied Methodology

The research is based on a quantitative study carried out with 198 participants between the ages of 13 and 41. The data were collected by online survey, and it included an online experiment. For this, a standardised questionnaire was created. It was developed using previously approved constructs and items from existing studies to ensure validity. The online experiment encouraged the participants to try out a web-based virtual try-on (VTO) feature of an established online retailer. The experiment was included to increase the accuracy of the results, as previous studies found that participants' perceptions after the actual use of AR may differ from their previous assessment (Gatter et al., 2022). In addition, the experiment enables the collection of data prior to and after the usage of AR.

The data were analysed using SPSS. In the first stage, the sample characteristics were described. Furthermore, Cronbach's alpha was calculated to assess the internal consistency of the constructs**.** In the second stage, descriptive statistics were applied to compare the means of the variables. Firstly, pre-, and post-usage values were compared to assess whether AR affects the users and secondly, AR-specific variables were compared to identify the differences between millennials and Gen Z. Depending on if homogeneity of variances was assumed, independent

t-tests and Mann-Whitney U tests were conducted to assess whether the differences were statistically significant. The magnitude of the differences was determined by calculating the effect size via Cohen's d.

1.4. Structure

The purpose of this study is to examine the differences across two generational cohorts, millennials and Gen Z, in terms of their AR experience in online retail, focusing on the specific example of VTOs. To do so, the thesis is organized into six chapters. The first chapter introduces the thesis by presenting the topic and aim of the research and by describing the applied methodology and structure of the thesis. The second chapter gives an overview of the theoretical background and related frameworks on AR. Since AR is related to and often confused with VR, it introduces the XR framework to distinguish both concepts clearly (Rauschnabel et al., 2022b). Further, it discusses AR in the context of online retailing, the different implementations and applications, benefits, and challenges. Lastly, it addresses generational marketing by defining millennials and Gen Z, pointing out the main differences between the cohorts, and then illustrates the development of the hypotheses.

The main body of the thesis comprises the methodology section, followed by data analysis and research findings. The third chapter explains the applied methodology and outlines the research design of the experiment and online survey. Next, it describes the data collection before explaining the data analysis methods and introducing the methodological limitations. The data analysis is elaborated in the fourth chapter, starting with a description of the sample characteristics, followed by descriptive statistics. The derived research findings are discussed in Chapter 5, addressing the main findings, practical implications, limitations, and implications for future research. The final chapter summarises the findings and draws conclusions.

2. LITERATURE REVIEW

This chapter is based on an extensive literature review to set the theoretical background for the thesis. The first part of the chapter introduces AR by distinguishing it from VR and introducing the XR framework. The second part addresses AR in online retail, its implementation and different applications and then outlines benefits and challenges of AR. Finally, the third part describes millennials and Gen Z, pointing out differences and commonalities among the two generations and the importance of considering the differences between those two generations.

2.1. Augmented Reality

With maturing technologies, new opportunities arise. In both the professional and academic context, the focus has been placed, above all, on AR and VR. Their growing importance is evident by the fact that the number of users and market size are growing annually (Statista, 2022; Statista, 2021). While AR is usually thought of in terms of entertainment and technology, it is nowadays being used in a wide range of industries for different purposes including education, military, medical, retail and marketing (Kumar, 2021). Multinational companies (MNC) that use AR are BMW, Sephora, IKEA, Zara (McLean & Wilson, 2019), Amazon, Asos, Nike (McLean & Wilson, 2019), Mini and eBay (Yim et al., 2017). This diverse list gives an indication of the wide range of possible applications of AR. Also, researchers have examined

various use cases, of which Caboni and Hagberg (2019) provide a list of brands and investigated use cases.

2.1.1. Definition and Classification

AR is a technology that allows to *augment* and therefore enhance the reality by combining real environments with virtual elements. The user can still see the real surroundings in which digital elements are integrated in the form of texts, images, or videos. Hereby, the virtual overlayer enhances the physical environment (Azuma, 1997). To be able to apply the technology, in most cases, the use of AR requires a device with a screen and camera or wearables such as Microsoft's HoloLens glasses (Microsoft, 2022). Even though the literature is fragmented in terms of classification of the category mixed or extended realities and thus, AR, scholars agree on the following three main characteristics of AR: (1) combination of real and virtual worlds, (2) real-time interactivity and (3) computer-generated (Azuma, 1997; Huang & Liao, 2014; Kumar, 2021; Yim & Park, 2019). Depending on the use case, when moving the camera, the virtual elements move or can be moved in real time. As such, the computer-generated content interacts with physical surroundings.

In an augmented environment, the physical environment persists, being enhanced by virtual elements. In contrast to this, in a VR experience, the existing surroundings play a minor role as a completely virtual environment is created in which the user is fully immersed. Thus, in comparison, AR can be positioned between reality and VR (see Figure 1) as it merges physical environments and virtual elements (Flavian et al., 2019; Mishra et al., 2021; Yim & Park, 2019). Further, VR creates a virtual immersion in which the content is fully computer-generated while AR combines computer- and camera-generated content and is therefore experienced as *"more realistic"* (Caboni & Hagberg, 2019, p. 1130).

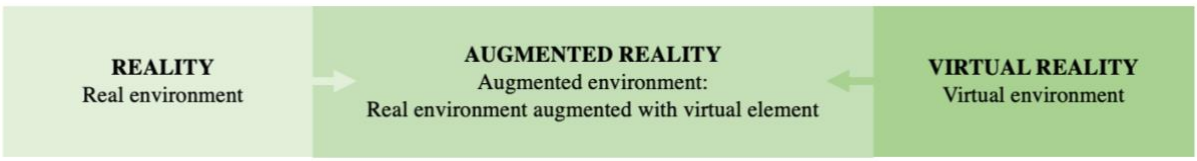


Figure 1 Comparison of reality, augmented reality, and virtual reality
Source: Adapted from Azuma (1997)

2.1.2. XR Framework

For a better understanding, it crucial accurately to distinguish between AR and VR. Both belong to the category of *mixed reality*, also called *extended reality* (Flavian et al., 2019). Hence, they are often associated and sometimes confused with each other in social settings. Even though both technologies are somewhat similar, there are substantial differences in user experience (Mishra et al., 2021; Yim & Park, 2019).

An extensive literature review shows that existing definitions and concepts of AR, VR, and mixed reality are often contradictory or omit aspects of one or the other. This impression is confirmed by the recent research of Rauschnabel et al. (2022), whose novel framework distances itself from previous concepts of extended reality or mixed reality and rather refers to *X Reality* (XR), where X acts as a placeholder for any new sort of reality. In contrast to existing concepts, it is comprehensive and contemporary, as it incorporates a wide range of

aspects and current technical possibilities of different technologies including AR and VR. Furthermore, it is more applicable to current uses and more consistent with current literature. As such, it is adopted here as a guiding framework to discuss the concept of AR, being *"conceptualized as an established umbrella term for a variety of digital reality formats"* (Rauschnabel et al., 2022, p. 11).

2.1.3. Distinction between Augmented Reality and Virtual Reality

The XR framework clearly distinguishes between AR and VR as two separate concepts and experiences with fundamental differences (see Figure 2). In determining whether an experience can be classified as one of virtual or augmented reality, it is necessary to consider how the physical environment is integrated (Rauschnabel et al., 2022).

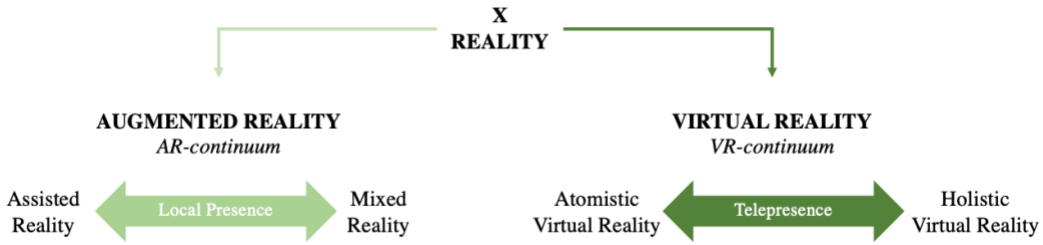


Figure 2 X reality framework distinguishing between augmented and virtual reality
Source: Rauschnabel et al. (2022)

If the environment is visually integrated as a part of the experience and digital elements are integrated in the existing environment, it can be described as augmented reality, that is, the *"augmentation of the real world"* (Rauschnabel et al., 2022, p. 11). If the physical surroundings are excluded from the experience and have no further meaning, a virtual artificial environment is created that replaces existing surroundings, that is, virtual reality (Rauschnabel et al., 2022). Until now, the XR framework is not only the most recent but also the most accurate framework clearly pointing out the different experiences and further defining the AR and VR continuums.

Furthermore, it should be stressed that the distinction is not based on the specific choice of device. The same device – for example, HoloLense glasses – can be used for VR and AR depending on the specific characteristics that define the experience. Colloquially, they are often misleadingly referred to as VR glasses, although these can also be used as AR glasses.

2.1.4. Distinction between Assisted and Mixed Reality

Within the AR continuum, the framework distinguishes between *assisted reality* and *mixed reality*. Similar distinctions are made by other authors in recent studies (Dwivedi et al., 2021). It basically differs between two main kinds of AR. As the name already indicates, assisted reality aims to *assist* users by providing useful information into their environment, for instance information about surroundings. The user can clearly separate the virtual content from reality. In contrast to this, mixed reality *combines* the physical environment and virtual contents to a degree that the user cannot distinguish what is real and what is virtual. The AR continuum thus has two main types of AR implementations. Even though one of them is less immersive, neither is better or worse, both are to be considered equally valuable. (Rauschnabel et al., 2022)

2.2. Augmented Reality in Online Retail

AR is an interdisciplinary phenomenon as the technology can be applied in various industries and cases. It is not limited to a specific use or product but can rather be applied in various ways to achieve diverse objectives. At this point, it is already being used in a variety of industries, including online retail. The following chapter addresses with AR in online retail. It introduces the different implementations and applications before pointing out benefits and potential challenges.

2.2.1. Augmented Reality Implementations

AR Marketing (ARM) describes the implementation of AR in the field of marketing (Chylinski M et al., 2020). In this context, Caboni and Hagberg (2019) differ between three types of AR implementation: (1) in-store, (2) mobile and (3) online web-based application. While mobile applications and online web-based applications are similar in terms of type and usage requirements, in-store applications are different due to their stationary nature.

In-store applications refer to displays or devices that are pre-installed at the physical store of a retailer. The user can employ the AR feature on site. The AR feature combines online shopping and the offline experience at the physical store and thus, aims to enhance the omnichannel shopping experience (Hilken et al., 2018). However, as such, it is stationary, thus fixed to the location and cannot be accessed elsewhere or outside of opening hours. Examples for in-store applications are installed displays or mirrors where the customer can try on the offered products, customize, or order products. (Rauschnabel, 2018) Nike and Adidas are two companies that take advantage of in-store AR devices (Yim et al., 2017).

Web-based and mobile applications are not location bound and can be accessed anywhere and at any time through a device with an internet connection and camera (Caboni & Hagberg, 2019). Online web-based AR features are implemented in webpages, e.g., online shops of retailers. Companies like Fielmann and MisterSpex are using this type of implementation. As such, the feature can be accessed and activated through the browser and does not require further installations, unlike mobile applications where the AR feature is implemented in the application of a retailer. To access the feature, users are first required to download the application. Sephora and Nike are two examples using AR in their applications. (Scholz & Duffy, 2018)

The different implementation exemplify how AR plays a major role in the sense of omni-channel marketing, driving digitalisation and merging offline und online retail business (Hilken et al., 2018). The choice of the type of implementation does not directly affect the functionality of the feature, but it is rather a matter of how the feature can be accessed. However, it should be considered that the installation of an application in order to use an AR feature may be an additional barrier for some customers.

2.2.2. Augmented Reality Applications

Different types of products have different requirements in terms of the AR feature, and thus, there are different AR applications. In online retail, three types of AR applications are being implemented: (1) VTOs, (2) virtual try-out's and (3) interactive products. Figure 3 gives an

overview of the types, for which product categories the AR Applications are used for and their development maturity.

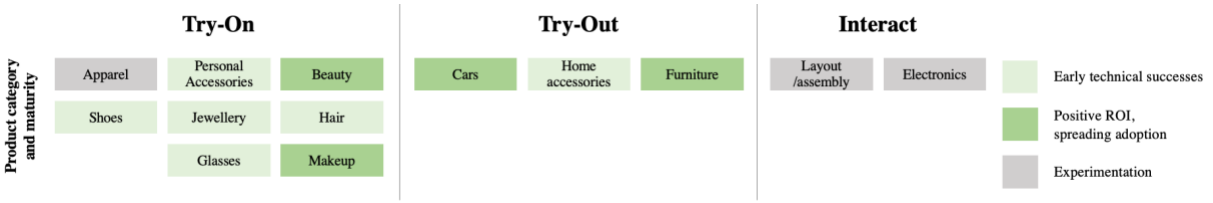


Figure 3 AR use cases and maturity by product type
Source: Cook et al. (2020)

VTOs are one example of the implementation of AR in online retail. As the name implies, VTOs are features that allow users to *virtually try on* products. Activating the camera, the screen acts as a virtual mirror in which the users can see themselves (Caboni & Hagberg, 2019). Using AR, the product, e.g., a pair of glasses or jewellery, is virtually placed on the user's face or wrist. This way, customers can see the fit on their own body (Yim & Park, 2019). Deloitte (Cook et al., 2020) gives interesting insights on the different product categories and their development maturity (see Figure 3). Besides glasses and jewellery, VTOs are broadly being used for shoes, personal accessories, and hair with early technical successes while apparel is still considered to be in the experimentation phase. Especially makeup and beauty are successfully adopted generating positive ROI. Virtual try-outs are different in the sense that the product is not being tried on but as the name indicated being *virtually tried out*. Using AR, the product, e.g., a couch or table, can be virtually placed into the user's environment, e.g., the physical room. As such, it helps the customers to see how the furniture piece will fit and look like in their apartment. It can also be used to configure the interior and exterior of new cars. In the case of virtual try-outs cars and furniture generate positive ROI. The third type are interactive products referring to products that the user specifically interacts with, e.g., electronics or assembly. This use case type is at early maturity and therefore still being explored. (Cook et al., 2020)

As such, those types tend to belong to the nature of mixed reality. The more advanced the technology used and the sharper the image, the more realistic it looks to the user. The features can be implemented in online shops as web-based or mobile features (Pantano et al., 2017). In most cases, the feature can be accessed via a button on the product page in the online shop or the application.

2.2.3. Benefits of Augmented Reality

The use of AR in online retail may enhance the shopping experience in different ways (Kumar, 2021). The literature and previous studies reveal a large variety of different advantages. For a better understanding and a clearer overview, the following chapter structures the advantages into advantages for customers and retailers, similar to Caboni & Hagberg (2019). In addition, with a focus on sustainability, this is complemented by environmental benefits.

Benefits for the Customer

There are various diverse benefits for customers. Broadly, the benefits can be structured into two dimensions: hedonic and utilitarian. Hedonic value is perceived subjectively and emotionally, referring to pleasure and enjoyment. In the case of AR, hedonic benefits include

the customers' interaction, experience, engagement, entertainment, and creativity. Utilitarian value is rational, thus perceived more objectively. Hereby, the focus is on the function and informativeness and thus, the usefulness of AR. (Childers et al., 2001)

The interactivity of AR not only represents one of the key characteristics but also a key benefit driving its hedonic value (Dacko, 2017; Jessen et al., 2020; McLean & Wilson, 2019; Yim et al., 2017; Yim & Park, 2019). It gives the user the possibility playfully to try out different products. Thus, the interactive nature increases the creative customer engagement (Jessen et al., 2020; Nikhashemi et al., 2021) and creates enjoyment and inspiration (Hinsch et al., 2020; Rauschnabel et al., 2019). As such, it may engage the user to check products, shapes, or colours which she/he normally would not be trying out in the physical shop. As such, AR satisfies the increasing demand for personalization (Romano et al., 2020) by creating an experience where customers become *"co-designer[s]"* (Caboni & Hagberg, 2019, p. 1133) and create or personalize products by themselves in real-time. Furthermore, the use of a novel technology creates excitement and increases the hedonic value (Berman & Pollack, 2021).

Next to the playful and interactive components, the use of AR creates utilitarian value by increasing the perceived informativeness. The visual experience is not just entertaining, but also gives users the opportunity to get to know more about the product by trying it on and examining it on themselves. (Childers et al., 2001) As such, AR enriches the product information compared to ordinary product pages and images. With the visual information applied to the appearance, users can get an impression of the personal fit of the product (Caboni & Hagberg, 2019). This way, products that do not fit or do not appeal to the users can be rejected during the consideration phase. It does not only increase the online shopping convenience but also facilitates the decision-making process (Cuomo et al., 2020). This creates both monetary and time savings. Furthermore, research by Romano (2020) showed that AR increases the product consideration scope of users, trying on new products that they might not have considered expanding their consideration scope, decreasing choice overload and increase choice confidence. Furthermore, seeing the personal fit can create a sense of physical control or ownership of the product, which in turn can increase the customers' purchase willingness.

Summarizing, AR does fulfil all three dimensions of hedonic values including exploration, self-expression, and entertainment and all dimensions of utilitarian values including shopping convenience, improved product information quality, and monetary savings (Chandon et al., 1999). It creates an interactive and authentic experience (Hilken et al., 2017) whereby the customer gets more information in a playful way. The enhanced product information increases the confidence and reassurance towards the fit of the product (Pantano et al., 2017) while decreasing efforts (Romano et al., 2020) and perceived risks (Bonnin, 2020; Yim & Park, 2019). Combining hedonic and utilitarian benefits, AR can improve customers' online shopping experience (Caboni & Hagberg, 2019; Javornik, 2016; Poushneh, 2018)**,** increase customers' satisfaction (Heller et al., 2019) and thus, affect purchase intentions (Mishra et al., 2021; Smink et al., 2019).

Benefits for Retailers

In addition to the aforementioned benefits that enhance the customers' shopping experience and the potential to increase the purchase intentions, there are further economic and strategic

benefits applying to retailers. Offering the try-on of virtual products and potentially the customisation, it enables retailers to easily increase their online product assortment without extra expenses, supply, or storage necessities. Without first having to purchase or stock every product, it allows retailers to offer all product and product types. (Berman & Pollack, 2021) Further, the "personalised pre-purchase evaluation" (Dacko, 2017) that VTOs allow can reduce workload and costs related to product returns. Hence, economically, AR can contribute to decreases expenses in terms of supply, storage, production and returns.

With the implementation of an interactive VTO retailers responds customers' increasing demand for personalization and a user-focused approach. Furthermore, by using the VTOs retailers can generate data on the interests and needs of customers. As such, it gives retailers valuable insights and the possibility to better adapt to customers' needs and demands. (Caboni & Hagberg, 2019; Flavian et al., 2019)

Contribution to Sustainability

Lastly, AR contributes to sustainability of online retail and therefore to the UN Sustainability Development Goals (United Nations, 2022). Firstly, it may contribute to the reduction of product returns (Statista, 2022c) as using VTOs customer can get more information on the product, visualize it and evaluate the personal fit. If the product does not fit or appeal virtually, it does not need to be ordered, sent, and returned, saving unnecessary shipments, transports, and related emissions. Secondly, it is not necessary for the retailers to preserve all products in their physical store saving further transportation costs. Depending on the case, a production on demand may save production and product disposal costs. Lastly, thanks to the VTO, the customer does not have to travel to the physical store to try on a product. To conclude, VTO may reduce product returns but also transportation and travel costs and emissions. In terms of UN Sustainability Development Goals, it helps to progress multiple goals including fostering innovation (goal 9), advance responsible consumption and production (goal 12), and driving climate action (goal 13). As such, AR has a large potential to contribute to making online retail more sustainable.

2.2.4. Challenges of Augmented Reality

However, there are also some challenges that AR is facing. Before buying a product, customers want to evaluate the product. They want to see it, touch it. AR can help customer to visualise the product in an interactive way and thus, increase the quality of product information in online shopping. However, it is solely a visualisation, hence there is customers' need to touch, which cannot be satisfied by AR and thus, represent a burden (Gatter et al., 2022; Pandey et al., 2017).

Furthermore, the implementation of such features requires the implementation of advanced technology. If the technology is not sufficient, the quality of the feature suffers. At worst, this can lead to the user having a negative experience and projecting this onto the products, the shop or the online retailer by means of spillover effects[1] (Gatter et al., 2022).

[1] Spillover effects describe the phenomena when the perceptions related to one event are transferred, therefore *spilled over* to another one, even though there is no objective relation (Hilken et al., 2017).

Romano et al. mention another important component: the "amplification of cognitive dissonance" (Romano et al., 2020). This is the case whenever a customer virtually tried on the product and virtually liked it. The VTO increases the customers' reassurance and purchase confidence. If the product physically does not fit, it may increase the customer's cognitive dissonance (Romano et al., 2020). This negative experience may cause the customer to lose trust in VTO features or even the online shop.

The use of such features requires camera access which leads to another challenge: data concerns (Hilken et al., 2017). Allowing camera access, customers share personal information. The data has to be protected upfront to not cause irritation on the part of the user (Hilken et al., 2017; Rauschnabel, 2018; Smink et al., 2019).

Lastly, the development and implementation of such features may be expensive. For this, products need to be scanned in 3D and then implemented into the system, which is to be integrated into each product page. There are professional companies specialised in such software solutions. Depending on the products and assortment, AR may be more or less costly. (Berman & Pollack, 2021)

Concluding, AR offers multiple benefits. If AR is well implemented and integrated, it can be a powerful marketing tool (Gatter et al., 2022; Rauschnabel et al., 2022) outweighing the disadvantages. Yim et al. (2017) describe it as more persuasive than traditional tools, thus it has the potential to outperform those (Gatter et al., 2022; Jessen et al., 2020). Cuomo et al. (2020) go a step further and describe AR not as a tool but rather as a *"project for value co-creation"* (Cuomo et al., 2020, p. 441).

2.3. Generational Marketing

The use of emerging technologies becomes particular important when targeting younger generations, including millennials and Gen Z (Yim & Park, 2019). In the context of new technologies, a customer segmentation according to the demographic variable age is appropriate and contemporary as younger generations are getting more and more familiar with technologies and its daily use by growing up with those. Hence, interactive marketing, customer engagement and involvement become increasingly important. A customer segmentation according to generations may have limitations, thus cultural, educational, social aspects should not be ignored. Still, generations are good indicators to develop marketing strategies when it comes to the involvement of technologies.

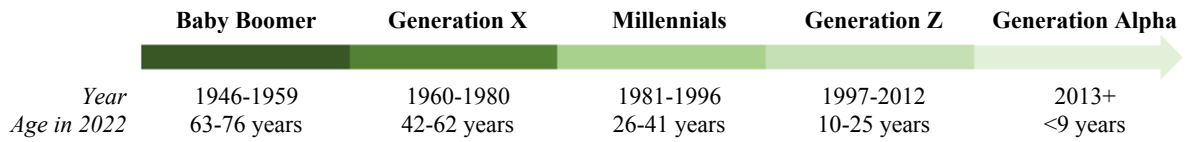


Figure 4 Overview of generations
Source: Adapted from Latkovikj & Borota Popovska (2020)

For a better understanding Figure 4 shows an overview of generations. Dating back to 1946, it starts with baby boomers and Generation X, then millennials and Gen Z and finally the newest generation, Generation Alpha (Latkovikj & Borota Popovska, 2020). Generations are defined

through an age range. However, the ranges are not officially established and may vary throughout the literature. For instance, some scholars define 1995 (Posnick-Goodwin, 2010), others the 2000s as the starting point for Gen Z (Chaney et al., 2017). This study defines millennials as people born between 1981 and 1996, being between 26 and 41 years old in 2022 and Gen Z as people born between 1997 and 2012, being between 10 and 25 years old in 2022 (Brosdahl & Carpenter, 2011). As such, both generations cover periods of 15 years each.

At this moment, millennials and Gen Z are considered *the youth* (Latkovikj & Borota Popovska, 2020), and there are communalities. Both are considered the most tech-averse generations with a high openness towards technologies. However, they grew up in different situations, being exposed to different circumstances, making them demand unique customer experiences and personalisation. Also, the increasing speed of digitalisation highly contributes to the differences. The study of Merriman (2015) has identified the main characteristics of millennials and Gen Z, which in turn substantially affect their attitude and behaviours (see Table 1).

Table 1 Key characteristics of millennials and Gen Z

Millennials	Gen Z
First digital natives	Newest born-digital natives
Self-centred	Self-aware
Entitled	Persistent
Idealistic	Realistic
Creative	Innovative
Dependent	Self-reliant

Source: Adapted from Merriman (2015)

2.3.1. Millennials

Millennials, also called Generation Y, were born in times of economic stability and growth (Merriman, 2015). They have experienced the digital transition and with it the beginning of digitalisation and the introduction of the internet and have grown up with it (Leung, 2013). So, they are the last generation to know both scenarios before and after digitalisation. Prensky (2001) accurately describes them as *"first digital native[s]"* (Prensky, 2001, cited in Agrawal, 2022). Having experienced the beginning of digitalisation, they have learned how to use technology as the technologies evolved.

2.3.2. Generation Z

Gen Z is the generation after the millennials. They were raised in times of the great recession, economic instability, global warming and increasing environmental issues. Those circumstances highly affect the generation, resulting in a more realistic, persistent and self-reliant attitude. Unlike the self-centric and idealistic millennials, Gen Z is self-aware with a high interest in the environment around them and sustainability (Merriman, 2015; Saggau & Connell, 2021).

Gen Z is also the first generation being born into the digital world and considered a mobile first generation (Merriman, 2015). Gen Z is even more tech-averse and defined as *"newest born-digital native[s]"* (Prensky, 2001, cited in Agrawal, 2022). Chaney et al. (2017) accurately describe Gen Z as *"socially conscious, tech-savy, particularly innovative and permanently looking for change"* (Chaney et al., 2017) and also *"most educated, mobile, and connected*

consumers to date" (Chaney et al., 2017). In social networks like Snapchat an TikTok, Gen Z makes the majority of users (Dixon, 2022; Statista, 2022b). They have strong desire for personalisation and content creation and thus, drive user-generated content (UGC) (Yim & Park, 2019).

Being between ten and 25 years old in 2022, they are beginning a phase where more and more of them are completing their education and entering the workforce (Merriman, 2015). Despite their young age, they already influence their parents' purchasing decisions and behaviour (Saggau & Connell, 2021). Their purchasing power will increase within the next years, so that, together with the millennials, they will make up the largest share of purchasing power (Latkovikj & Borota Popovska, 2020; Saggau & Connell, 2021).

2.3.3. Millennials and Generation Z in the Light of Online Retail

Both cohorts are highly tech averse. They are very open towards technologies, using them daily and demanding new innovations. In online retail, they have a proactive shopping behaviour with a strong focus on user experience (Yim & Park, 2019). Completely arrived in the digital world, they highly contribute to the rise of online retail (Agrawal, 2022). In this context, they demand innovations. Studies reveal that there is high interest in AR among millennials and Gen Z (Klarna, 2022). Hence, it is not surprising that they have become the main target group of AR (Yim & Park, 2019).

2.4. Development of Hypotheses

Even though millennials and Gen Z have commonalities, there are several differences. In the field of marketing, it is essential to identify those differences and adapt marketing strategies accordingly to be able to specifically target the respective generation and increase effectiveness of marketing actions (Agrawal, 2022). The increasing purchasing power combined with the growing AR potential and market (Fortune Business Insights, 2022), shows the importance for this research on the differences between millennials and Gen Z in terms of AR in online retail. The following hypotheses were developed to address different variables that influence the AR experience in online retail.

Research on AR in online retail is often based on or related to different theoretical concepts (Kumar, 2021). The most commonly used concept is the technology acceptance model (TAM) of Davis (1989) (McLean & Wilson, 2019; Plotkina & Saurel, 2019; Qin et al., 2021; Rauschnabel, 2018; Rese et al., 2017). The model predicts the acceptance and perception, thus the use of new technologies. The TAM encompasses multiple variables presented in Figure 5.

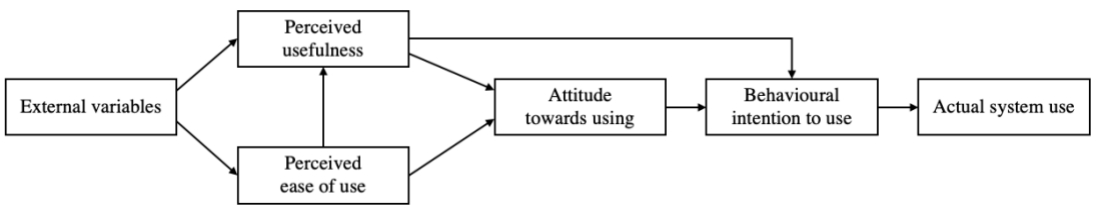


Figure 5 Technology acceptance model
Source: Davis (1989)

According to the TAM, perceived usefulness, thus the utilitarian benefits and perceived ease of use directly influence the attituded towards using a technology and through this the behavioural intention. Furthermore, there is a direct relationship from perceived usefulness towards purchase intention. (Huang & Liao, 2014) The TAM can be extended external variables affecting the ease of use and perceived usefulness. Furthermore, perceived enjoyment, thus, hedonic benefits, can be further added, influencing the perceived ease of use (Hilken et al., 2017). Since in the past the model was able to reliably analyse the use and effect of AR (McLean & Wilson, 2019; Plotkina & Saurel, 2019; Qin et al., 2021; Rauschnabel, 2018; Rese et al., 2017), it is adapted in this research as a basic framework for analysing variables related to the perception and acceptation of AR and thus the development of following hypotheses.

In addition, further studies have shown that there are additional variables that can influence the AR experience. Hence, those AR-specific variables supplement the variables of the TAM. The following overview in Table 2 illustrates the different variables that are examined throughout study.

Table 2 Overview of variables

Pre-usage	Post-usage	AR-specific
Pre hedonic value	Hedonic value	Spatial presence
Pre utilitarian value	Utilitarian value	Psychological ownership
Pre purchase intention	Perceived ease of use	Awareness of privacy practices
	Attitude towards using	Need for touch
	Purchase intension	

Source: Own elaboration

Before comparing how the generations differ from each other, it is essential to assess whether the AR-usage affects the users compared to a usual product page. Hence the first hypotheses assumes that the usage of a VTO feature in online retail has an impact on the hedonic motivation, the utilitarian motivation, and the purchase intention. The ease of use and attitude towards using were not integrated into the pre-usage stage. In the pre-usage stage, the evaluation is based on the representation through a conventional product page. Measuring the ease of use and attitude towards a product page may confuse users, so that the results of the evaluation of the product page and the AR-experience are not comparable. To avoid potential biases, both variables were excluded from the pre-usage stage.

H1: The usage of a VTO feature in online retail has an impact on (1) the hedonic motivation, (2) the utilitarian motivation, and (3) the purchase intention.

A majority of Gen Z frequently uses social networks, playfully using AR by applying filters to their stories and creating UGC (Merriman, 2015). It is a generation that likes to try out new things. Hence, the hypothesis assumes higher hedonic benefits of Gen Z compared to millennials how experience higher utilitarian benefits. Also, previous studies on online shopping behaviour show that while millennials are more purpose driven experience utilitarian benefits, Gen Z focuses on the enjoyment, therefore hedonic values (Agrawal, 2022). The study should show if those findings can be transferred to an AR experience as well.

H2: Using an VTO Gen Z experience higher hedonic benefits than millennials.
H3: Using an VTO millennials experience higher utilitarian benefits than Gen Z.

In the TAM the perceived ease of use describes how effortless the user perceived the usage of the technology, in this case AR. The attitude towards generally describes how the user perceives the technology and how likely they are to consider using it. (Davis, 1989) While millennials experienced the digital transition, Gen Z is the first generation to grow up with nowadays technologies (Latkovikj & Borota Popovska, 2020). Therefore, Gen Z is already more frequently using AR by for instance using filters on social networks like Snapchat where Gen Z represent the majority of users (Dixon, 2022). Hence, the hypothesis assumes Gen Z to have a higher perceived ease of use and attitude towards using. As a result of this, it further assumes higher purchase intentions of Gen Z.

H4: Using an VTO feature Gen Z perceive (1) a higher ease of use and (2) attitude towards using, resulting in (3) higher purchase intention compared to millennials.

In order to obtain information on several dimensions and more comprehensive results, the variables of the model are supplemented with additional variables that play a crucial role for the use of AR: spatial presence, psychological ownership, functionality, need for touch and awareness of privacy practices.

Spatial presence describes to what extent the customer perceives the virtual elements as real and therefore, as how authentic the experience is perceived. Wang & Zhang (2018) describe it as feeling of *"being there"* (Wang & Zhang, 2018, p.1383) creating spatial presence. This subjective perception can generate highly persuasive effectiveness. The spatial presence can further be related to the psychological ownership created by AR. It is defined to what extent the customer perceives the virtual product as their own through the personal try on and therefore feels a psychological ownership of the product. A study by Hilken et al. (2017) showed that the spatial presence and psychological ownership created by AR have positive influences on the decision comfort of the customer and thus increase the online shopping experience. The positive effect of spatial presence is further confirmed by Smink et al. (2020). Both variables are included to be able to analyse the difference in the drivers of the AR experience for millennials and Gen Z. (Hilken et al., 2017)

AR enables customers virtually to try on products and helps to visualise the personal it. This way it helps to overcome some of the disadvantages of online shopping. However, what remains is the need for touch of the customer and the missing haptic sense which usually represent a burden in online retail (Pandey et al., 2017; Rathee & Rajain, 2019). Gatter et al. (2022) investigated if AR can satisfy the need for touch in some way or whether it remains a disadvantage. The studies have shown that customers with higher need for touch experienced higher hedonic values through AR. Therefore, it makes sense to compare the need for touch of both generations.

H5: Millennials and Gen Z experience different (1) spatial presence, (2) psychological ownership and (3) need for touch when using VTOs.

With the ongoing digital transition, the awareness for data security and privacy practices significantly increases (Johnson, 2022). It is highly relevant in the context of AR as the use of AR requires camera access and thus, uses personal visual information. In that sense, concerns do have a negative effect on AR effectiveness (Hilken et al., 2017). Hence, the variable is included to be able to analyse potential differences and be able to estimate potential consequences. There is a tendency that the awareness increases with age; thus, the hypothesis assumes it to be larger for millennials compared to Gen Z (Cohen, 2020).

H6: Using AR millennials have a higher awareness towards privacy practices than Gen Z.

3. METHODOLOGY

This chapter explains the applied methodology for the developed research objective. After a brief description of the conducted procedure for the literature review, it introduces the general research approach and the research design of both the experiment and online survey including the questionnaire design. The chapter continues describing the data collection before explaining the methodology of the data analysis including the preparation of the data. Lastly, methodological limitations are introduced, and a concluding overview is given.

3.1. Research Objective

The research aims to examine the differences across two generational cohorts, millennials and Gen Z, in terms of their AR experience. For this, it analyses variables related to the perception and acceptance of AR including the hedonic and utilitarian benefits, ease of use, attitude towards using AR and the purchase intention. It further examines AR-specific variables, including spatial presence, possibly created psychological ownership of the product and awareness of privacy practices.

3.2. Literature Review

To set a theoretical framework, an extensive literature review was conducted based on data bases of the library of the University of Barcelona (UB). Primarily used databases were Scopus, Web of Science, SpringerLink and Emerald. Advanced search was applied and included the keywords ‘augmented reality’, ‘augmented reality marketing’ and ‘online retail’. The primary focus was placed on scientific articles and journals of academic and professional experts in the field of AR. An overview of renowned researchers in the field of AR was taken from the most recent systematic literature review by Kumar (2021). Since the thesis concerns a novel and rapidly emerging digital subject, further digital sources supplement the information. In terms of research design, to increase measurement accuracy and achieve valid results, the constructs and operationalisation of items was developed based on previous studies.

3.3. Research Approach

The research follows a positivistic research philosophy which is commonly for quantitative research in the field of marketing. Following positivism, there is one single and independent reality, which is observed objectively. It was important to distinguish the philosophy as it will affect the research approach. (Saunders, 2012)

A quantitative research approach was chosen collecting primary data. The study follows an ethnographic research strategy, which observes the experience of participants in their natural and thus, uncontrolled environment as it is most natural for online shopping (Vine et al., 2018).

3.4. Research Design

The research design is structured in two main components: a survey and an experiment. The survey is completed once before (pre-usage) and once after (post-usage) the experiment. Due to the nature of online retail allowing location independent use, the experiment was also integrated in the online survey. The usage of the web-based feature merely requires a mobile device with camera and an internet connection which in turn were necessary for participation in the online survey anyways.

3.4.1. Questionnaire Design

A standardised questionnaire was designed to collect primary data. To ensure validity the constructs and corresponding items were developed based on existing studies. Within the framework of the literature review, different studies were analysed, from which the constructs and items were eventually derived. Most of the constructs including the utilitarian value and perceived ease of use, were adapted from the adopted framework of the TAM from Davis (1989). The attitude towards using was derived from Chen et al. (2002). The items of hedonic value are supplementing the TAM and were adapted from Childers et al. (2001) and purchase intention from Zeithaml et al. (1996). Similar constructs are also used in other studies (e.g., Childers et al., 2001; Hausman & Siekpe, 2009; Hilken et al., 2017).

In terms of AR-specific constructs, the items were retrieved from studies that are specifically addressing the respective variables including studies on perceived psychological ownership (Pierce et al., 2001), spatial presence (Hartmann et al., 2016) and need for touch (Nuszbaum et al. 2010) and awareness of privacy practices (Malhotra et al., 2004). Annex 2 presents a table listing the constructs, corresponding measurement items, and references.

For each construct, up to three measurement items were adapted. The number of items was reduced to up to three items per construct to be able to analyse a larger number of variables without exceeding the length of the questionnaire and thus, preventing respondent fatigue of participants. The items were measured on a seven-point Likert scale ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (7) (Saunders, 2012). For two questions concerning the online shopping frequency and previous AR experience possible answers were provided.

3.4.2. Online Survey

The experiment was integrated into the online survey (see **Annex *1***) which was structured in four phases (see Figure 5): (1) demographics, online shopping experience and prior AR experience, (2) pre-usage questions, (3) online experiment and (4) post-usage questions. The pre-usage stage assessed the evaluation of hedonic value, utilitarian value and purchase intention based on the product representation of the product page (see image in **Annex *1***). Before the experiment, participants were given precise instructions. They were provided a link to the category page and asked to select glasses of their own choice to try out the VTO feature.

Participants were purposely asked to choose a product. On the one hand, to simulate a real online shopping scenario. On the other hand, to avoid any potential effects and biases caused by a preselected product. After selecting a product, participants were asked to try the out the VTO feature for at least one minute before coming back to the post-usage questionnaire. A timeframe of one minute was chosen so that participants had sufficient time to try out the feature without extending the duration of the questionnaire to ensure that participants return to the post-usage questionnaire. After conducting the experiment, the post-usage stage assessed the evaluation based on the experience with the VTO feature.

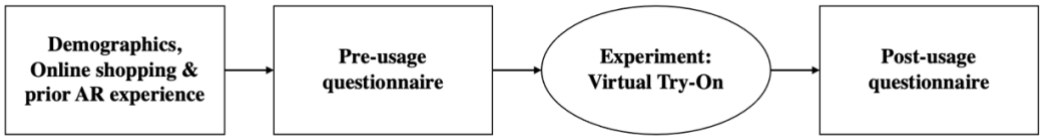


Figure 6 Structure of online survey
Source: Own elaboration

3.4.3. Online Experiment

As part of the online survey, participants were given instructions to conduct an experiment (see Figure 7). The experiment was designed to be short and involved the experimental usage of a web-based VTO. It is implemented for several reasons. For once, it should help to mimic a real online shopping experience. Secondly, previous studies that have proven that the solely description of an AR feature may mislead the results (Gatter et al., 2022). Lastly, a preliminary survey showed that a large proportion of the participants did not have prior AR experience; therefore, the actual use of a feature was considered essential to obtain accurate results.

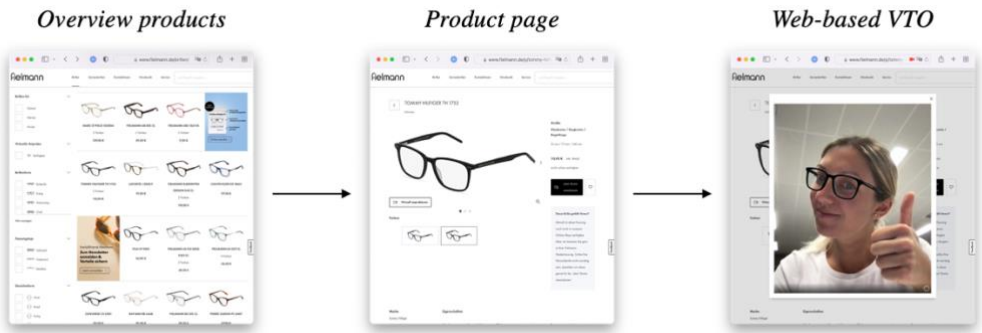


Figure 7 Screenshots of the virtual try-on feature of Fielmann
Source: Own elaboration of www.fielmann.de

For the VTO glasses were selected as appropriate product for several reasons. Firstly, glasses are not limited to a specific target or age. It is also not designed specifically for one gender, like makeup and Loreal's VTO (L'Oréal Paris, 2022). Secondly, the glasses are placed virtually on one's face and thus, creates a higher personal attachment to the product. Also, as such, the try-on of glasses does not require other premises, unlike a furniture app like the one of IKEA which requires a specific space to use their application (IKEA, 2022).

For the experiment, the online shop of Fielmann, a leading German optical retailer, was selected. As it is an establish commercial online shop, it increases the external validity. Their VTO feature is web-based, therefore easily accessible as it does not require the installation of

an app. It is available for all their products and works technically flawlessly. In order to implement the feature into their online shop in 2019, Fielmann invested into Fittingbox, a leading software company for try-on features in eyewear industry, making their VTO advanced compared to other companies (Europa Press, 2018) and suitable for this study.

3.5. Data Collection

The data were collected through an online survey. The data was collected cross-sectional at one point in time (Saunders, 2012), more concretely in May 2022 as it aims to compare two groups to identify differences. Due to access constraints, a non-probability sampling method was chosen. Based on the ease of access the data was collected from a convenience sample. The author mobilized her personal network through social networks. Furthermore, appropriate contacts were asked to share the survey, which corresponds to a snowball sampling method. (Saunders, 2012)

The questionnaire was implemented into Google Forms, one form in English and another translated version in German. A pre-test was conducted with five participants to finalize the questionnaire and avoid any miswording or misunderstanding. To avoid biased answers, those participants did not participate in the actual survey (Malhotra, 2012). After the pre-test, the survey was distributed via the network of the author. The distribution was carried out via online channels as it corresponds the nature of AR and online retail. Finally, the survey was answered by 209 participants.

3.6. Descriptive Statistics

After the data preparation in Excel, descriptive statistics were applied using SPSS. To prepare the data set for the analysis, the data set was cleaned by removing incomplete responses. As all items were measured on a 7-point Likert scales, therefore there was no need to standardise values. However, some items were reserve-coded (see Annex 2), thus negatively worded to avoid biases by unidirectional statements and thus ensure consistent answers (Saunders, 2012). Within the data preparation, those results were reversed. As the research aims to analyse differences between millennials and Gen Z, the observations were divided into two groups according to age. All observations not matching the criteria of neither the age of Gen Z nor millennials were removed, resulting in a total sample size of 198 observations.

In the next step the characteristics of both data sets were described. For this, the mean as a measures of central tendency, and measures of variability, including range and standard deviation were calculated. The data were then organized in frequency distribution tables and displayed in appropriate bar or pie charts to increase the understanding.

Before analysing the different variables, a reliability test was conducted calculating Cronbach's alpha to assess the acceptance and validity of each construct (Saunders, 2012). As the constructs and items were adapted from previous research, Cronbach's alpha of all constructs was above 0,7 and therefore acceptable (Tavakol & Dennick, 2011).

The means and standard deviation of each item and construct were calculated, presented in a table, and compared. After the comparison in absolute numerical terms and calculating the

differences between means further tests were applied to test whether the differences were statistically significant. For this, the independent *t*-test and Mann-Whitney U test were chosen as appropriate statical tool to compare the means of the two cohorts.

For the independent *t*-test, four assumptions must be met: (1) random sampling, (2) independent observations, (3) normal distribution of data or a sufficient sample size (n >= 30) and (4) equal variances/ homogeneity of variance. The research design and data fulfill the first three requirements. To assess the homogeneity variances, Levene's test for equality of variances was conducted. Its null hypothesis indicates equality of variances (Sig. > 0,05), in turn the alternative hypothesis indicates that the variances are not equal across groups (Sig. < 0,05). (Pandis, 2015)

If the null hypotheses and equality of variances are assumed, the independent *t*-test can be proceeded. If the alternative hypothesis applies and the variances are not equal a non-parametric test is appropriate, in this case the Mann-Whitney U test. The following assumptions must be met: (1) ordinal or continuous dependent variable, (2) independent variable with two categories, (3) independent observations and (4) not normal distributed data. The 7-point Likert scale is to be considered ordinal, the two generations represent the two categorical outcomes of the independent variables, and the observations are independent. According to Mann-Whitney, a p-value below 0,05 indicates a statistically significant difference. (Kasuya, 2001)

After assessing whether the differences are significant, it is essential to determine the size of the effects, thus the size of the difference between the two means by calculating Cohen's d. It is a measure of the magnitude of the difference. Further, it provides a standardised value which can be compared with items measures on a different scale. For this, the difference between the means is divided by the pooled average of standard deviations. For this, the group sizes have to be similar. The effects can be classified in three sizes: small (0,2 < d < 0,5), medium (0,5 < d < 0,8) and large effects (d > 0,8) (Saunders, 2012).

3.7. Methodological Limitations

The introduced methodology was a viable design for the study given the time, budget, and access constraints. However, it led to some methodological limitations which are discussed below.

One limitation concerns the sampling method and size. Due to the non-probability sampling method, the results might not be representative and generalizable (Malhotra, 2012; Saunders, 2012). The time, access, and financial constraints did not allow a probability sample. However, the combination of convenience and snowball sampling enabled to recruit as many participants as possible for the study and thus, allowed to achieve a larger sample size. In terms of sample size, the maximum number of participants to which the author had access was recruited. It may still represent a relatively small sample size. Further, as the participants were recruited from the social networks from the author, there might be some biases, one of them concerning the fact that the majority came from Germany. Still, the results indicate a direction which can be verified by probability sample with a larger sample. Thus, the results give a first idea about the divergences among the two cohorts.

Another limitation applies to the data analysis method. Descriptive statistics were applied to analyse the data. Due to the time and scope limitation of this thesis, the analysis is limited to descriptive statistics. The thesis thus gives first indications of the differences, which can then be analysed in the future with the help of inferential statistics. In that sense, multigroup analysis could be used to analyse the relationships among the variables and compare those among both generations.

3.8. Overview of Methodology

To achieve the research objective and analyse the differences among millennials and Gen Z, a quantitative research approach was chosen. A standardised questionnaire was designed using previously approved constructs and items measures on a 7-point Likert scale. The online survey consisted of the questionnaire and further included an experiment which was included to increase the accuracy of the results. In terms of sampling, a non-probability sampling method had to be chosen because of its viability. Finally, the primary data were collected online.

The collected data were prepared and analysed, mainly using descriptive statistics. Cronbach's alpha assessed the validity of the constructs. Then, the means and standard deviation of each variable were calculated. After comparing the absolute numerical difference, depending on the homogeneity of variances, independent *t*-tests and Mann Whitney U tests were conducted to assess the statistical significance of the differences in means. Lastly, Cohen's d was calculated to assess the magnitude of the differences.

Even though there are methodological limitations, the chosen methodology is considered viable and suitable for the research approach. As there is no research on generational differences in terms of AR experience, it allows the first classifications of differences. A quantitative approach therefore gives a rough idea of the direction of the differences among millennials and Gen Z.

4. DATA ANALYSIS

The following chapter first provides characteristics of the sample as a whole and split by generation. It then introduces the data analysis by presenting the main results and applied statistical methods, including Cronbach's alpha to calculate the reliability of constructs, results of the independent *t*-test and Mann Whitney U test to assess statistical differences and Cohen's d to measure the magnitude of those differences.

4.1. Sample Characteristics

A total number of 209 people participated in the online survey and experiment. During the data preparation eleven observations were removed as their age was above 41 years, thus not matching the criteria for neither generation, making a final number of N = 198 observations. Finally, 97 observations were assigned to millennials and 101 observations to Gen Z, making them almost equally distributed among the two generations. Table 3 shows the sample characteristics in absolute and relative terms.

Table 3 Sample characteristics

Characteristic	**Total Sample** *% (Frequency)*	**Gen Z** *% (Frequency)*	**Millennials** *% (Frequency)*
Sample size	*N* = 198	*n* = 101	*n* = 97
Age *(in years)*			
Range	13 – 41	13 – 25	26 – 41
Mean	26,06	20,45	31,91
Standard deviation	6,92	3,16	4,47
Gender			
Female	58,6 (116)	65,3 (66)	51,5 (50)
Male	41,4 (82)	34,7 (35)	48,5 (47)
Country of Origin			
Germany	87,9 (174)	87,1 (88)	88,7 (86)
Other	12,1 (24)	12,9 (13)	11,3 (11)
Occupation			
Pupil	14,1 (28)	27,7 (28)	0 (0)
Student	34,3 (68)	48,5 (49)	19,6 (19)
Employed	47,0 (93)	23,8 (24)	71,1 (69)
Self-employed	4,5 (9)	0 (0)	9,3 (9)
Online shopping frequency			
Several times a week	6,1 (12)	5,0 (5)	7,2 (7)
Once a week	10,6 (21)	5,0 (5)	16,5 (16)
Once every 2 weeks	22,7 (45)	18,8 (19)	26,8 (26)
Once a month	24,7 (49)	25,7 (26)	23,7 (23)
Less than once a month	35,9 (71)	45,5 (46)	25,8 (25)
Previous AR experience			
Never heard about it	19,7 (39)	25,7 (26)	13,4 (13)
Heard about it	80,3 (159)	74,3 (75)	86,6 (84)
Never used it	68,7 (136)	77,2 (78)	59,8 (58)
Used it	31,3 (62)	22,8 (23)	40,2 (39)

Source: Own elaboration

The age range of the whole sample varies from 13 to 41 years. The observations among Gen Z are distributed in an age range between 13 and 25 years with a mean age of 20,45 years and a standard deviation of 3,16 years. Millennials are distributed between 26 and 41 years with a mean age of 31,91 years and a standard deviation of 4,47 years. As Figure 8 shows, among both generations, there are slightly more female participants (65,3% female participants in Gen Z, 51,5% female millennials). Most of the participants (87,9%) come from Germany (see Table 3).

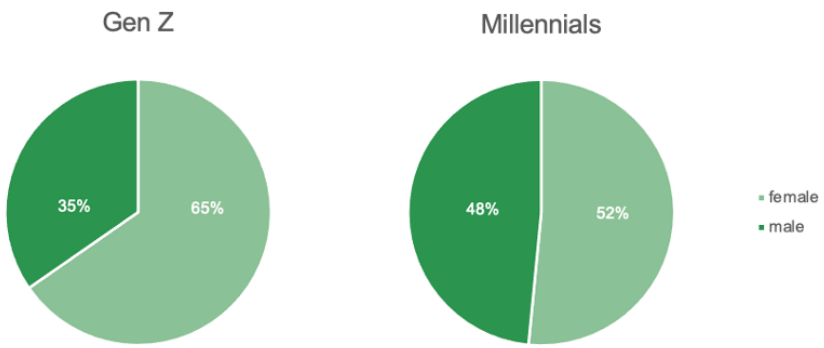


Figure 8 Gender distribution among millennials and Gen Z
Source: Own elaboration

The occupations among the two generational cohort are distributed differently which is also due to the young age of some participants of Gen Z. Figure 9 shows that a large part of Gen Z accounting to 76,2% are either pupils or student while 23,8% are employed. For millennials, the reverse case applies. A majority of millennials accounting to 80,4% have reached working life already and are employed or self-employed while 19,6% are students.

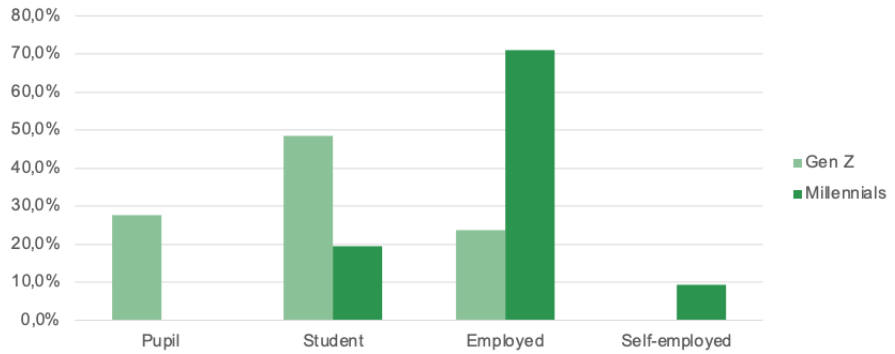


Figure 9 Occupation among millennials and Gen Z
Source: Own elaboration

Regarding their online shopping behaviour there is a left-skewed distribution of the online shopping frequency of both generations (see Figure 10). However, there are slight differences between the two. The majority of Gen Z accounting to 45,5% shops less than once a month, 25,7% once a month and 18,8% biweekly. Only a minority of 10,0% does online shopping on a weekly basis. For millennials the distribution can be divided in quarters. Roughly a quarter accounting to 23,7% shops online at least once a week while another 26,8% shop once every two weeks, 23,7% once a month and 25,8% less than once a month. The more equal distribution among millennials indicates their more frequent online shopping. The lower online shopping frequency of Gen Z could be linked to their occupation, more specifically to their pupil or student status which may constraining financial resources and therefore limiting current purchasing behaviour.

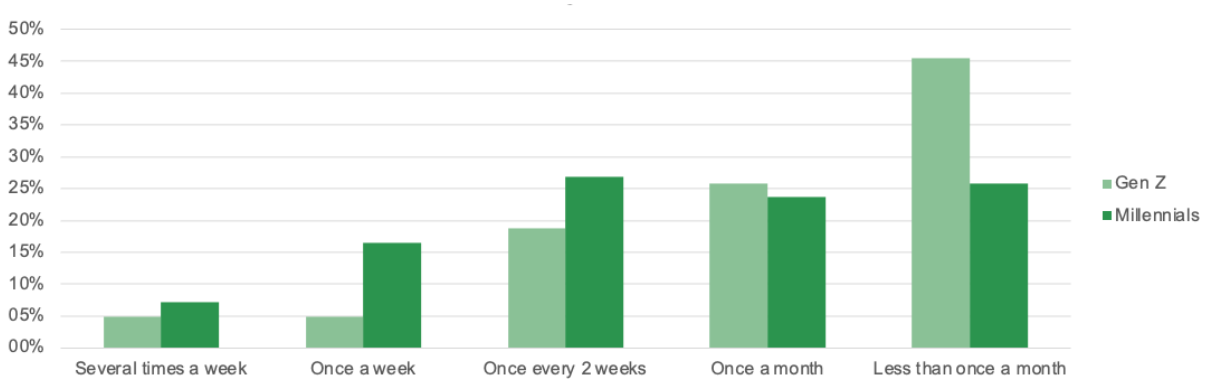


Figure 10 Online shopping frequency among millennials and Gen Z
Source: Own elaboration

Figure 11 shows the previous AR experience of millennials and Gen Z. Among all observations, most of the participants accounting to 80,3% have had previous AR experience. They either tried it or have heard about it. However, it is interesting that a larger part of 25,7% of Gen Z compared to 13,4% of millennials has not heard about AR yet. According to the study, a larger

part of the millennials accounting to 40,2% has tried AR in the past. Based on these results, it seems like there is a tendency that millennials have rather experienced AR compared to Gen Z.

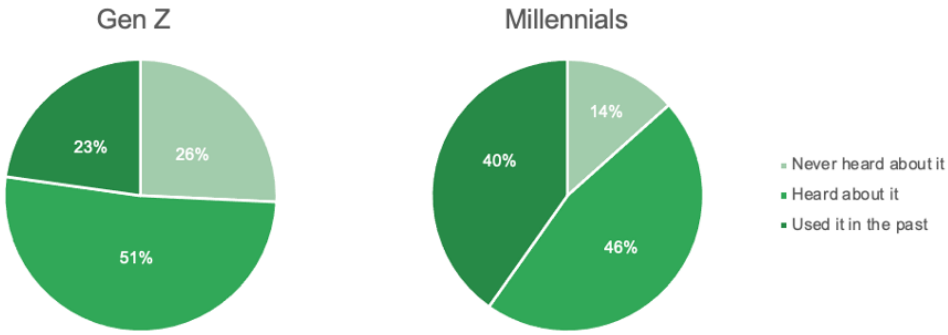


Figure 11 Previous AR experience among millennials and Gen Z
Source: Own elaboration

4.2. Reliability of Constructs

The questionnaire consists of various construct that are measured by several items. To assess the reliability of the constructs, Cronbach's alpha was calculated for each construct. The measure assesses if the corresponding items measure the same construct. A score above 0,7 is to be considered acceptable (Tavakol & Dennick, 2011).

Table 4 shows an overview of the number of items per construct and the calculated reliability statistic, Cronbach's alpha. A value above 0,7 indicates that the items measure the construct reliably (Saunders, 2012; Tavakol & Dennick, 2011). For the study, the items and constructs were taken from existing research and studies, therefore, all values meet the threshold of 0,7 and can be classified as reliable. As the constructs are measured reliably by the items, the following calculations are based on the constructs.

Table 4 Reliability statistic Cronbach's Alpha

Measure	**Number of items**	**Reliability statistics Cronbach's Alpha α**	**Comment on level of reliability (α > 0,7)**
Pre-usage hedonic value	3	0,79	acceptable
Pre-usage utilitarian value	3	0,92	acceptable
Pre-usage purchase intention	2	0,88	acceptable
Hedonic value	3	0,82	acceptable
Utilitarian value	3	0,90	acceptable
Ease of use	4	0,79	acceptable
Attitude towards using	2	0,71	acceptable
Purchase intention	3	0,82	acceptable
Spatial presence	2	0,86	acceptable
Need for touch	2	0,86	acceptable

Source: Own elaboration

4.3. Comparing Means

The next section aims to compare the means among the variables in two stages: first comparing the means of pre- and post-usage and secondly, the means between millennials and Gen Z.

4.3.1. Comparing Pre- and Post-Usage

Before comparing the means of variables of both generations, pre- and post-usage scenarios were compared to assess whether the usage of the VTO has an effect and to be able to specific if the post-usage differences are related to the AR experience. For this, the means of the pre-usage and post-usage were compared. Table 5 shows that there are numerical differences between the means of pre- and post-usage variables.

Table 5 Overview mean comparing scores pre- and post-usage

Measure	**Pre-usage** *Mean (SD)*	**Post-usage** *Mean (SD)*	**Difference in means d**	**Pre- and post-usage** *Mean (SD)*
Hedonic	4,46 (1,05)	5,66 (0,89)	***1,20***	5,06
Utilitarian	5,54 (1,01)	5,84 (1,01)	***0,30***	5,69
Purchase intention	4,66 (1,23)	5,38 (1,07)	***0,72***	5,02

Source: Own elaboration

As for all variables the assumption of equal variances is assumed (see Table 6), the independent *t*-test was conducted. Its results confirm the differences between variables comparing pre- and post-usage are significantly different ($p < 0,05$).

Table 6 Results of independent t-test on significance of difference between pre- and post-usage

Measure	**Levene's Test for Equality of Variances**		**t-test for Equality of Means**			
	F	*Sig.*	*t*	*df*	*p*	*Mean difference d*
Equal variances assumed as Sig. > 0,05						
Hedonic	5,33	0,02	-12,30	394	0*	1,20
Utilitarian	0,99	0,32	-2,96	394	0,003*	0,30
Purchase intention	1,53	0,22	-6,18	394	0*	0,72

Note: * = significant at $p < 0,05$

Source: Own elaboration

4.3.2. Comparing Generation Z and Millennials

Figure 12 displays the mean scores of both generations as a bar chart while the horizontal axis represents the items, and the vertical axis represents the applied scale. All means score above 4. As the items were measured on a 7-point Likert scale from 1 ‘strongly disagree’ to 7 ‘strongly agree’, 4 is considered the neutral midpoint. It is apparent that in terms of absolute mean values, Gen Z generally achieves higher values than millennials. This applies to all items except post-usage hedonic motivation, spatial presence and need for touch in which millennials score higher.

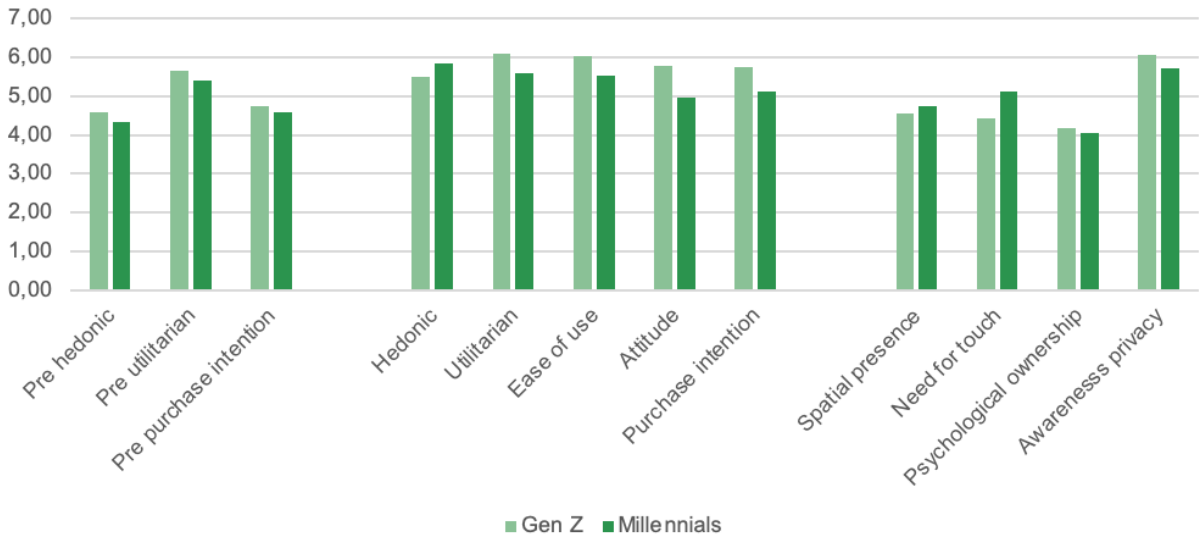


Figure 12 Overview of mean scores
Source: Own elaboration

The concrete values of means and standard deviations of each measure and differences in means are illustrated in Table 7. Among both cohorts, the means vary between 4,04 (psychological ownership) and 6,08 (utilitarian motivation).

The third column highlights the numerical difference between the respective means of millennials and Gen Z while positive values indicate higher mean scores among Gen Z and negative values indicate higher mean scores among millennials. The lowest difference between means applies to psychological ownership ($d = 0,13$; $m_{genz} = 4,17$; $m_{mill} = 4,04$) and the highest to attitude towards using ($d = 0,81$; $m_{genz} = 5,77$; $m_{mill} = 4,96$).

The standard deviation provides information on the dispersion of the observation of each variable around the respective mean (Saunders, 2012). Comparing the respective standard deviations, it is possible to identify the difference in the dispersions of the variables across both generations. Overall, the standard deviations ranged from 0,64 (ease of use) and 1,61 (psychological ownership). The smaller the standard deviation, the more closely the values are clustered to the respective mean, the more representative is the mean.

Table 7 Overview of mean scores comparing generations

Measure	**Gen Z** *Mean (SD)*	**Millennials** *Mean (SD)*	**Difference in means d**	**Total sample** *Mean (SD)*
Pre-usage variables				
Prehedonic	4,58 (0,97)	4,33 (1,12)	***0,25***	4,46 (1,05)
Preutilitarian	5,66 (1,05)	5,42 (0,96)	***0,25***	5,54 (1,01)
Prepurchaseintention	4,74 (1,16)	4,57 (1,31)	***0,17***	4,66 (1,23)
Post-usage variables				
Hedonic	5,5 (0,93)	5,83 (0,81)	***-0,33***	5,66 (0,89)
Utilitarian	6,08 (0,9)	5,59 (1,05)	***0,49***	5,84 (1,01)
Easeofuse	6,02 (0,64)	5,53 (1,09)	***0,49***	5,78 (0,92)
Attitude	5,77 (0,71)	4,96 (1,09)	***0,81***	5,37 (1)
Purchaseintention	5,75 (0,93)	5,11 (0,89)	***0,64***	5,44 (0,96)
AR-specific variables				
Spatial presence	4,55 (1,24)	4,75 (1,17)	***-0,2***	4,65 (1,2)
Need for touch	4,42 (1,54)	5,11 (1,03)	***-0,69***	4,77 (1,35)
Psychological ownership	4,17 (1,3)	4,04 (1,61)	***0,13***	4,11 (1,46)
Awareness for privacy concerns	6,07 (1,14)	5,7 (1,44)	***0,37***	5,89 (1,31)

Source: Own elaboration

4.4. Significance of Differences

After comparing the numerical values and the differences in mean scores, it is essential to determine whether the differences are statistically significant. For some constructs Levene's test of equality variances revealed that the null hypothesis can be accepted ($p > 0,05$), therefore the independent *t*-test was applied (Pandis, 2015). As the other variables do not meet the assumption, the Mann Whitney U test was applied (Kasuya, 2001).

The independent *t*-test revealed statistically significant differences in post-usage utilitarian motivation, although no differences in the pre-usage variables or spatial presence (see Table 8). In this case, the pre-usage variables including hedonic, utilitarian motivation and purchase intention are compared between generations. The *t*-test revealed no differences between the generations in the pre-usage stage but then significant differences in the respective post-usage variable shows that the differences are closely related to the AR experience.

Table 8 Results of independent t-test on significance of difference between generations

Measure	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	*Sig.*	*t*	*df*	*p*	*Mean difference d*
Equal variances assumed as Sig. > 0,05						
Pre-usage hedonic motivation	3,81	0,05	1,69	196	0,093	0,25
Pre-usage utilitarian motivation	3,15	0,08	1,73	196	0,085	0,25
Pre-usage purchase intention	1,61	0,21	0,97	196	0,333	0,17
Utilitarian motivation	3,78	0,05	3,54	196	0,001*	0,49
Spatial presence	0,02	0,90	-1,19	196	0,237	-0,20
Equal variances not assumed as Sig. < 0,05						
Hedonic motivation	3,98	0,04	-2,66			
Ease of use	36,94	0	3,85			
Attitude	19,95	0	6,23			
Purchase intention	0,48	0,49	4,93			
Need for touch	11,87	0,001	-3,7			
Psychological ownership	12,44	0,001	0,61			
Awareness of privacy practices	6,92	0,01	2			

Note: * = significant at p < 0,05

Source: Own elaboration

The Mann Whitney U test revealed statistically significant differences in hedonic motivation, ease of use, attitude, purchase intention and need for touch (see Table 9).

Table 9 Results of Mann Whitney U test on significance of difference

	Gen Z Mean rank	Millennials Mean rank	Mann-Whitney U	Asymp. Sig. (2-tailed) p
Hedonic motivation	88,55	110,9	3793	0,006*
Ease of use	109,93	88,64	3845	0,009*
Attitude towards using	121,2	76,9	2706,5	0*
Purchase intention	119,45	78,73	2883,5	0*
Need for touch	86,64	111,85	3651,5	0,002*
Psychological ownership	99,77	99,22	4871	0,944
Awareness of privacy practices	105,85	92,89	4257	0,092

Note: * = significant at p < 0,05

Source: Own elaboration

4.5. Magnitude of Differences

To measure the magnitude of the differences, hence the effect size, Cohen's d was calculated for those variables. Table 10 shows the score of Cohen's d and the interpretation of the value. Hedonic motivation has a small sized effect (r = -0,38) while attitude has a large-sized effect (r = 0,89). All other measures have medium-sized effects with value between 0,5 and 0,7.

Table 10 Results of Cohen's d

Measure	Cohen's d Point Estimate r	Effect size
Hedonic motivation	-0,38	small
Utilitarian motivation	0,50	medium
Ease of use	0,55	medium
Attitude	0,89	large
Purchase intention	0,70	medium
Need for touch	-0,53	medium

Note: 0,2 < r < 0,5: small; 0,5 < r < 0,8: medium, r > 0,8: large effect size
Source: Own elaboration

4.6. Analysis of Results

In pre-usage stage, there are no significant differences among the variables even though the numerical values of Gen Z are higher in all variables. This changes in the post-usage stage. Generally, overall, Gen Z reaches higher scores in the majority of variables.

Firstly, the variables of the TAM model are analysed. Millennials experience higher hedonic motivations when using AR (M = 5,5; SD = 0,93) than Gen Z (M = 5,83; SD = 0,81). This difference is significant at a level of p = 0,006 representing a small-sized effect at r = -0,38. In contrast, Gen Z experiences higher utilitarian motivation with a significant difference at p = 0,001. The effect is larger at r = 0,5. Further, the ease of use of Gen z is higher with a significance level of p = 0,009 and an effect of r = 0,55. Also their attitude is higher (p = 0) with a large effect size of 0,89. Most interesting is the purchase intention, which is also higher for Gen Z (p = 0) and a medium-sized effect of 0,7.

Secondly, the AR-specific variables are analysed. In terms of spatial presence, on average millennials have higher numerical values (M = 4,75; SD = 1,17) compared to Gen Z (M = 4,55; SD = 1,22). However, the *t*-test revealed that this difference in means of 0,2 is not significant p > 2,4, supported by a very small effect size of r = 0,17. The need for touch seems to be larger for millennials. The difference in means of d = -0,69 is statistically significant at p < 0,002 and has a medium-sized effect of r = -0,53. The AR experience may generate a feeling of psychological ownership to the product. In terms of differences among the generations, the numerical values are very similar with a little difference between means of d = 0,13. The U test further approves that there seems to be no statistically significant difference among the two cohorts with p = 0,95 and an effect size below r = 0,08. The awareness for privacy concerns for both generations is very high (M_{genz} = 6,07; SD_{genz} = 1,14; M_{mill} = 5,7; SD_{mill} = 1,44) with an average difference in means of d = 0,37. Altough, there there is no significant difference.

5. RESEARCH FINDINGS

After the data analysis, the following chapter interprets the results to derive theoretical and practical implications. It further addresses the limitations of this research and lastly it gives implications for future research.

5.1. Main Findings

The aim of the thesis is to determine the difference in the AR experiences between millennials and Gen Z. For this, several variables were included. Pre- and post-usage measures were adapted from the frequently used TAM model and added by further AR-specific variables. A quantitative online survey and experiment were conducted. Descriptive statistics were applied to assess whether there are differences among the variables, the significance and effect size of differences. While there are no significant differences among the pre-usage measures, various post-usage variables differ significantly. Except of hedonic motivation, Gen Z scores higher values in variables of the TAM of Gen Z, including utilitarian motivation, ease of use, attitude towards using and purchase intention compared to millennials. In those variables, the generations significantly differ from each other with different effect sizes. Regarding the post-usage AR-specific measures, Gen Z on average has a higher need for touch compared to millennials. In terms of spatial presence and psychological ownership, there are no significant differences. Lastly, both generations equally value awareness of privacy practices highly scoring.

5.2. Practical Implications

Based on the analysis, there were no significant differences when comparing pre-usage motivations and purchase intention. After the AR-usage the scores of the variables significantly increased. It means that the usage of the VTO had an influence on those variables and positively affected hedonic, utilitarian motivation and purchase intention when compared with a usual product page. Hence, the first hypothesis can be accepted that AR significantly influences the experience of users in terms of hedonic, utilitarian motivation and purchase intention.

H1: The usage of a VTO feature in online retail has an impact on (1) hedonic motivation, (2) utilitarian motivation, and (3) purchase intention.

The results show that in terms of AR experience millennials and Gen Z differ in various aspects. In online retail, hedonic utilitarian motivation drive consumer purchase behaviour and purchase decisions (Agrawal, 2022). Considering the benefits individually for each generation in absolute terms, the two generations score high in the two variables. This confirms that using AR generates both utilitarian and hedonic benefits. The developed hypotheses assumed that Gen Z experiences higher hedonic benefits while millennials experience higher utilitarian benefits.

H2: Using an VTO Gen Z experience higher hedonic benefits than millennials.
H3: Using an VTO millennials experience higher utilitarian benefits than Gen Z.

However, the analysis showed that there are significant differences in hedonic and utilitarian benefits between millennials and Gen Z. Different other than initially expected, millennials score significantly higher on hedonic and Gen Z on utilitarian motivation. The effect size of the difference in utilitarian value is to be considered medium. This could have different causes. Gen Z makes the majority of the daily users of social networks like Snapchat or TikTok (Dixon, 2022) where they are often unconsciously exposed to AR by for instance using filters to their stories. As such, they are familiar with such AR and may therefore be less impressed by the VTO. Hence, millennials may perceive it more of a playful gimmick and therefore perceive it more enjoyable than Gen Z (Agrawal, 2022; Scholz & Smith, 2016).

In contrast to this, Gen Z perceived higher utilitarian benefits which means they perceive AR as more informative and useful and focus more on the functional aspect rather than on its playful nature. This could be related to the reasons mentioned above. Being used to the application of AR through social networks, Gen Z might focus on the perceived informativeness. Gen Z has a different online shopping behaviour than millennials with an intrinsic desire to use new technologies, the urge to impress with their purchases and more intuitive purchases which may influence their utilitarian motivation (Agrawal, 2022). Furthermore, among all generations, Gen Z has the highest interest for sustainability (Saggau & Connell, 2021). In a broader context, this may also affect their utilitarian perception of the AR experience by recognizing the VTO as a sustainable option in online retail. These findings are supported by generational shopping behaviour analysis of Agrawal (2022). It supports that millennials and Gen Z differ in terms of motivation with millennials focusing rather on hedonic benefits, Gen Z on utilitarian benefits. Concluding the hedonic and utilitarian benefits, both raised hypotheses can be rejected. In terms of practical implications, practitioners should focus on hedonic, hence experiential values when targeting millennials and rather on utilitarian values, hence rational and informative values when targeting Gen Z.

Both cohorts experience the VTO as easy to use and have a positive attitude towards using. High scores on ease of use and attitude were expected as both generations are used to the use of technology in daily life. Although, those are significantly higher for Gen Z. This may be related to the lower technology anxiety of Gen Z (Laguna & Babcock, 1997). Gen Z was born into the digital world while millennials experienced the digital transition affecting their perception and adaptability to new technologies. Other studies also show that the ease of use of technologies declines with age (Bradley et al., 2013; Morris & Venkatesh, 2000) which may apply in this case as well.

The high scores on purchase intention show that the AR experience influenced both cohorts and may increase conversions. Also here, it is significantly higher for Gen Z with a middle-sized effect. Thereafter, Gen Z seems to have higher purchase intentions after using AR. This may relate to the higher scores among utilitarian benefits, higher ease of use and higher attitude towards using. As the product return rates among Gen Z are higher (Statista, 2022c), it may be that Gen Z experiences AR as a useful tool that counteracts against the burden not being able to visualise a product prior the purchase, hence resulting in higher scores. Concluding, the hypothesis comprising the three variables can be accepted.

H4: Using an VTO feature Gen Z perceive (1) a higher ease of use and (2) attitude towards using, resulting in (3) higher purchase intention compared to millennials.

The selected AR-specific variables address spatial presence, psychological ownership and need for touch. Previous studies showed that the immersion of an AR experience may create psychological ownership of the respective product (Song et al., 2019). This is in line with the obtained results and average scores above 4. Still, compared to the other values those scores are relatively small which might be because the VTO features created a low level of immersion solely by placing digital glasses on the user's face. Further, the hypotheses assumed that there are generational differences. This cannot be approved by the data showing that there are no significant differences in the two variables among the generations. As there is no significant difference in spatial presence, it is not surprising that there is neither difference in psychological ownership. From the analysis, it seems like millennials and Gen Z experience the same spatial presence and psychological ownership. These findings differ from the results of McGlynn et al. (2018) who found that there are age-related differences in spatial presence in VR experiences. However, this might differ as it is an AR experience with a VTO. It could further confirm the relation to the low immersion level.

Millennials experienced a significant higher need for touch. Those findings are in line with results of other studies. Gatter et al. (2022) imply that a higher need for touch comes with higher hedonic motivation which is also the case here as millennials reach higher scores in hedonic motivation and need for touch. Results of another study point out that a larger proportion of millennials accounting to 26.16% rates its need for touch as a hurdle compared to Gen Z accounting 18.4% (CMS Connected, 2018). With younger generations, the proportions seem to decline.

H5: Millennials and Gen Z experience different (1) spatial presence, (2) psychological ownership and (3) need for touch when using VTOs.

In terms of spatial presence and psychological ownership the hypotheses have to be rejected. Although, it can be approved regarding difference in need for touch which is significantly higher for millennials.

H6: Using AR millennials have a higher awareness towards privacy practices than Gen Z.

Data privacy and security is a crucial aspect in online retail and hence, raises high awareness. Even though in absolute numerical terms Gen Z seem to score higher, there are no significant differences among both cohorts. The hypothesis assumed that because of age, the awareness should be higher among millennials. One reason why there is no significant difference could be that the issue of data privacy has gained greater importance in recent times, especially with increasing cybercrime. This seems to have a high influence on Gen Z, who therefore have the same high awareness as millennials Although there is no difference between the generations, both generations score high on the variable. It can be concluded that their awareness towards privacy practices is equally high, and the hypothesis has to be rejected. Therefore, regardless of the generation, practitioners should pay special attention to data security and make their AR features secure and privacy friendly. Policies and privacy practices should be clearly

communicated and easily accessible to customers. In addition to the request for camera access, further data privacy information or where to find it could be displayed to emphasise the importance of data privacy and applied practices.

5.3. Limitations

The findings are subject to several limitations. The first limitation concerns the sampling method and sample size. Due to access constraints, a non-probability sampling method was chosen to be able to obtain as many observations as possible by applying a combination of convenience and snowball sampling. This causes a bias among participants with a majority coming from Germany. Further, the small sample size may be insufficient to provide representative results; therefore, the results may not be generalisable (Saunders, 2012). Future research could use a probability sampling method and larger sample size to validate the results.

The second limitation is related to the experimental design of the study. The online experiment was designed involving the VTO of glasses. It is therefore limited to one kind of product of a particular product category, which is common in AR-research (Baytar et al., 2020; Hilken et al., 2018; Kumar, 2021). However, participants may be biased by the product choice or mainly refer their answers to this particular product ignoring other possible use cases of AR. For instance, a participant who is not wearing glasses may not be fascinated by selected VTO. The same experimental setup and AR feature applied on another product like make-up or furniture may change the customer's attitude and result in different answers. Therefore, it would be interesting to involve various different AR applications and products to be able to generalize the effects of the AR usage across product categories. Furthermore, a cross-validation at multiple points in time might increase confidence of the results (T. D. Cook & Campbell, 1979; Saunders, 2012).

Lastly, the study uses descriptive statistics to analyse the data set, and therefore leaves out the analysis and comparison of relationships and their strengths. The hypotheses are tested based on the means of the variable. There is a need for future research to proceed by applying inferential statistics to analyse the relationships among the variables and compare the differences between the two generations. The first conducted attempts showed some interesting insight through the application of multigroup analysis in SmartPLS. Due to capability constraints, those findings could not be included in this Master's thesis and will be elaborated on at a later stage.

5.4. Implications for Future Research

The limitations of this research give a direction for future research to address. As mentioned above, following the developed research objective and applying a similar methodology, research may validate the results with a different sampling method, larger sample sizes and an extended experimental design. Also, research could expand this study by further analysing the data with inferential statistics, running tests on the TAM model to analyse the different relationships among the variables and how they differ between millennials and Gen Z.

Furthermore, technology is evolving fast. Also, AR is increasingly being adopted in daily life. Therefore, studies may apply a longitudinal study to assess potential differences and changes with time.

6. CONCLUSION

In the light of an increasing AR potential and a growing online retail market, the present thesis aimed to identify differences among millennials and Gen Z in terms of AR experience based on the example of VTOs. VTOs are one of the many examples of how AR can be implemented in online retail. Based on a quantitative analysis conducted through an online survey and experiment, the results of the study confirm significant differences in several aspects.

Firstly, the results confirm that using VTOs significantly increases the hedonic, utilitarian value and purchase intention among both generations. Further, different than previously hypothesised, millennials perceived significantly higher hedonic values while Gen Z perceived higher utilitarian values. Considering other variables of the TAM, there is evidence for higher ease of use, attitude towards using VTOs and purchase intentions among Gen Z compared to millennials. The higher values among Gen Z may have resulted from their higher tech-aversity and stronger familiarity with technologies. Millennials, in turn, have a stronger focus on playfulness, one of the key characteristics of AR. Similar functionalities of AR are applied in social networks, where Gen Z represent the largest share of users. It seems that Gen Z may be accustomed to such functionalities, thus shifting their focus from the playful factor to the utility. Further, in a broader context, the literature suggests Gen Z have a higher interest in sustainability, which could also make them perceive stronger usefulness of VTOs compared to millennials. AR has the potential to create spatial presence and thus, psychological ownership; however, no differences have been identified between the two cohorts in this regard. Lastly, the awareness for data privacy practices remains equally important among both generations.

Based on the findings, practical implications can be derived. The findings reveal significant differences between the two generations that practitioners should consider to be able to develop appropriate strategies explicitly targeting one or the other generation. When targeting millennials, it is essential to support the playful and joyful component of the experience as their focus is on the hedonic value. Further, when integrating AR, practitioners should prioritise data privacy practices and design the practices to be easily accessible to ensure data security. In turn, when targeting Gen Z, the focus should be on the utilitarian value. Thereby, practitioners may highlight the enhancement of the product information or integrate further helpful information to increase the utilitarian perception of Gen Z.

The research conducted addresses a research gap and thus contributes to two fields of research, AR, and generational marketing, by pointing out differences between the two generations under investigation. AR can be considered a relatively novel technology, which is increasingly being used in daily life. As the purchasing power of Gen Z grows, the focus will be increasingly shifting to this generation and thus, together with millennials, they will become the primary target group of such technologies. This research gives the first indications of the differences between the two generations. However, further research is needed to analyse the relationships across the variables and compare them for each generation.

Furthermore, in this context, sustainability wins attention as AR can contribute to making online retail more sustainable as it offers a solution to one of the disadvantages of online retail: VTOs allow the evaluation of the products' fit and may thus contribute to reducing product returns. As such, it may reduce unnecessary shipping and returns and thus help decrease related emissions. It would also save customers' travelling to stores, further reducing emissions.

To conclude, the benefits go beyond the economic perspective, as AR has a high potential to increase the environmental sustainability of online retail; thus, if AR has been appropriately implemented, the respective generational differences have been taken into account, and data protection has been ensured, AR can be an effective and powerful marketing tool (Gatter et al., 2022; Rauschnabel et al., 2022).

REFERENCES

Agrawal, D. K. (2022). Determining behavioural differences of Y and Z generational cohorts in online shopping. *International Journal of Retail & Distribution Management*, *50*(7), 880–895. https://doi.org/10.1108/IJRDM-12-2020-0527

Aksoy, C., & Ergen, A. (2020). Changes in consumer behavior of Gen Y'ers in Covid-19 pandemic [Article]. *AURUM Sosyal Bilimler Dergisi*, *5*(2), 127–147.

Alvarez, & Marsal. (2021, June 25). *Europe: leading product returners online 2021*. Statista. https://www-statista-com.sire.ub.edu/statistics/1257082/average-return-rates-among-digital-shoppers-in-europe/

Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments*, *6*, 355–385. https://doi.org/https://doi.org/10.1162/pres.1997.6.4.355

Baytar, F., Chung, T., & Shin, E. (2020). Evaluating garments in augmented reality when shopping online. *Journal of Fashion Marketing and Management*, *24*(4), 667–683. https://doi.org/10.1108/JFMM-05-2018-0077

Berman, B., & Pollack, D. (2021). Strategies for the successful implementation of augmented reality. *Business Horizons*, *64*(5), 621–630. https://doi.org/10.1016/j.bushor.2021.02.027

Bonnin, G. (2020). The roles of perceived risk, attractiveness of the online store and familiarity with AR in the influence of AR on patronage intention. *Journal of Retailing and Consumer Services*, *52*. https://doi.org/10.1016/j.jretconser.2019.101938

Bradley, M., Goodman-Deane, J., Waller, S., Tenneti, R., Langdon, P., & Clarkson, P. (2013). Age, technology prior experience and ease of use. In *Contemporary Ergonomics and Human Factors 2013* (pp. 363–369). Taylor & Francis. https://doi.org/10.1201/b13826-77

Brosdahl, D. J. C., & Carpenter, J. M. (2011). Shopping orientations of US males: A generational cohort comparison. *Journal of Retailing and Consumer Services*, *18*(6), 548–554. https://doi.org/10.1016/J.JRETCONSER.2011.07.005

Caboni, F., & Hagberg, J. (2019). Augmented reality in retailing: a review of features, applications and value. In *International Journal of Retail and Distribution Management* (Vol. 47, Issue 11, pp. 1125–1140). Emerald Group Holdings Ltd. https://doi.org/10.1108/IJRDM-12-2018-0263

Chandon, P., Wansink, B., & Laurent, G. (1999). Hedonic and utilitarian consumer benefits of sales promotions. *Marketing Science Institute*, 99–109.

Chaney, D., Touzani, M., & ben Slimane, K. (2017). Marketing to the (new) generations: summary and perspectives. *Journal of Strategic Marketing*, *25*(3), 179–189. https://doi.org/10.1080/0965254X.2017.1291173

Chen, L. da, Gillenson, M. L., & Sherrell, D. L. (2002). Enticing online consumers: an extended technology acceptance perspective. *Information & Management*, *39*(8), 705–719. https://doi.org/10.1016/S0378-7206(01)00127-6

Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior [Article]. *Journal of Retailing*, *77*(4), 511–535. https://doi.org/10.1016/S0022-4359(01)00056-2

Chylinski M, Heller J, Hilken T, Keeling D.I., Mahr D, & de Ruyter K. (2020). Augmented reality marketing: a technology-enabled approach to situated customer experience. *Australasian Marketing Journal*, *28*(4), 374–384. https://doi.org/10.1016/j.ausmj.2020.04.004.

CMS Connected. (2018). *Generational consumer shopping behavior comes into focus*. https://www.cms-connected.com/News-Archive/October-2018/Generational-Consumer-Shopping-Behavior-Comes-Into-Focus

Cohen, R. (2020, April 14). *Privacy and surveillance: How Generation Z and millennials see the internet of things*. F5. https://www.f5.com/labs/articles/threat-intelligence/privacy-and-surveillance--how-generation-z-and-millennials-see-t

Cook, A., Ohri, L., Kusumoto, L., Reynolds, C., & Schwertzel, E. (2020). *Augmented shopping: The quiet revolution Uncovering value for retailers and customers through 3D technology*. https://www2.deloitte.com/content/dam/insights/us/articles/6367_Augmented-shopping/DI_Augmented-shopping.pdf

Cook, T. D., & Campbell, D. T. (1979). Quasi-experimentation: Design and analysis issues for field settings. *Houghton Mifflin*.

Cuomo, M. T., Tortora, D., Festa, G., Ceruti, F., & Metallo, G. (2020). Managing omni-customer brand experience via augmented reality: A qualitative investigation in the Italian fashion retailing system. *Qualitative Market Research*, *23*(3), 427–445. https://doi.org/10.1108/QMR-11-2017-0142

Dacko, S. G. (2017). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting and Social Change*, *124*, 243–256. https://doi.org/10.1016/j.techfore.2016.09.032

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Dixon, S. (2022, March 22). *Average age of Snapchat users 2021*. Statista. https://www.statista.com/statistics/933948/snapchat-global-user-age-distribution/

Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A. S., Kumar, V., Rahman, M. M., Raman, R., Rauschnabel, P. A., Rowley, J., Salo, J., Tran, G. A., & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management*, *59*. https://doi.org/10.1016/j.ijinfomgt.2020.102168

ecommerceDB. (2021). eCommerce in Europe 2021. In *2021*. https://www.statista.com/study/108944/ecommerce-in-europe-2021/

Europa Press. (2018, November 28). *Fielmann announces multi-million investment in augmented reality leader Fittingbox*. https://www.europapress.es/comunicados/internacional-00907/noticia-comunicado-fielmann-announces-multi-million-investment-in-augmented-reality-leader-fittingbox-20181128161755.html

Flavian, C., Ibanez-Sanchez, S., & Orus, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience [Article]. *Journal of Business Research*, *100*, 547–560. https://doi.org/10.1016/j.jbusres.2018.10.050

Fortune Business Insights. (2022). *Augmented reality market size, share and forecast 2028*. https://www.fortunebusinessinsights.com/augmented-reality-ar-market-102553

Gatter, S., Hüttl-Maack, V., & Rauschnabel, P. A. (2022). Can augmented reality satisfy consumers' need for touch? *Psychology and Marketing*, *39*(3), 508–523. https://doi.org/10.1002/mar.21618

Hartmann, T., Wirth, W., Schramm, H., Klimmt, C., Vorderer, P., Gysbers, A., Böcking, S., Ravaja, N., Laarni, J., Saari, T., Gouveia, F., & Maria Sacau, A. (2016). The spatial presence experience scale (SPES) [Article]. *Journal of Media Psychology*, *28*(1), 1–15. https://doi.org/10.1027/1864-1105/a000137

Hausman, A. v, & Siekpe, J. S. (2009). The effect of web interface features on consumer online purchase intentions [Article]. *Journal of Business Research*, *62*(1), 5–13. https://doi.org/10.1016/j.jbusres.2008.01.018

Heller, J., Chylinski, M., de Ruyter, K., Mahr, D., & Keeling, D. I. (2019). Touching the untouchable: exploring multi-sensory augmented reality in the context of online retailing [Article]. *Journal of Retailing*, *95*(4), 219–234. https://doi.org/10.1016/j.jretai.2019.10.008

Hilken, T., de Ruyter, K., Chylinski, M., Mahr, D., & Keeling, D. I. (2017). Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance

online service experiences [Article]. *Journal of the Academy of Marketing Science*, *45*(6), 884–905. https://doi.org/10.1007/s11747-017-0541-x

Hilken, T., Heller, J., Chylinski, M., Keeling, D. I., Mahr, D., & de Ruyter, K. (2018). Making omnichannel an augmented reality: the current and future state of the art [Article]. *Journal of Research in Interactive Marketing*, *12*(4), 509–523. https://doi.org/10.1108/JRIM-01-2018-0023

Hinsch, C., Felix, R., & Rauschnabel, P. A. (2020). Nostalgia beats the wow-effect: Inspiration, awe and meaningful associations in augmented reality marketing [Article]. *Journal of Retailing and Consumer Services*, *53*, 101987. https://doi.org/10.1016/j.jretconser.2019.101987

Huang, T.-L., & Liao, S. (2014). A model of acceptance of augmented-reality interactive technology: the moderating role of cognitive innovativeness [Article]. *Electronic Commerce Research*, *15*(2), 269–295. https://doi.org/10.1007/s10660-014-9163-2

IKEA. (2022). *Augmented Reality mit der IKEA Place App - IKEA Deutschland*. https://www.ikea.com/de/de/this-is-ikea/corporate-blog/ikea-place-app-augmented-reality-puba55c67c0

Javornik, A. (2016). Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behaviour [Article]. *Journal of Retailing and Consumer Services*, *30*, 252–261. https://doi.org/10.1016/j.jretconser.2016.02.004

Jessen, A., Hilken, T., Chylinski, M., Mahr, D., Heller, J., Keeling, D. I., & de Ruyter, K. (2020). The playground effect: How augmented reality drives creative customer engagement [Article]. *Journal of Business Research*, *116*, 85–98. https://doi.org/10.1016/j.jbusres.2020.05.002

Johnson, J. (2022, May 30). *Change in the awareness level of GDPR in Europe 2022*. Statista. https://www.statista.com/statistics/1311126/gdpr-awareness-european-countries/

Kasuya, E. (2001). Mann–Whitney U test when variances are unequal [Article]. *Animal Behaviour*, *61*(6), 1247–1249. https://doi.org/10.1006/anbe.2001.1691

Klarna. (2022, April 1). *Germany: Most wanted e-commerce innovations 2022*. Statista. https://www-statista-com.sire.ub.edu/statistics/1307361/most-wanted-e-commerce-innovations-by-generation-germany/

Kumar, H. (2021). Augmented reality in online retailing: a systematic review and research agenda. *International Journal of Retail and Distribution Management*. https://doi.org/10.1108/IJRDM-06-2021-0287

Laguna, K., & Babcock, R. L. (1997). Computer anxiety in young and older adults: Implications for human-computer interactions in older populations. *Computers in Human Behavior*, *13*(3), 317–326. https://doi.org/10.1016/S0747-5632(97)00012-5

Latkovikj, M. T., & Borota Popovska, M. (2020, December 22). *How millennials, Gen Z, And technology are changing the workplace design?* https://www.researchgate.net/publication/348154231

Leung, L. (2013). Generational differences in content generation in social media: The roles of the gratifications sought and of narcissism [Article]. *Computers in Human Behavior*, *29*(3), 997–1006. https://doi.org/10.1016/j.chb.2012.12.028

L'Oréal Paris. (2022). *Virtual try-on of L'Oréal Paris*. https://www.loreal-paris.co.uk/virtual-try-on

Malhotra, N. K. (2012). *Marketing research : an applied approach* (D. F. Birks & P. Wills, Eds.; 4th ed.) [Book]. Pearson Education.

Malhotra, N. K., Kim, S. S., & Agarwal, J. (2004). Internet Users' Information Privacy Concerns (IUIPC): The Construct, the Scale, and a Causal Model. *Information Systems Research*, *15*(4), 336–355. https://doi.org/10.1287/isre.1040.0032

McGlynn, S. A., Sundaresan, R. M., & Rogers, W. A. (2018). Investigating age-related differences in spatial presence in virtual reality. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *62*(1), 1782–1786. https://doi.org/10.1177/1541931218621404

McLean, G., & Wilson, A. (2019). Shopping in the digital world: Examining customer engagement through augmented reality mobile applications [Article]. *Computers in Human Behavior*, *101*, 210–224. https://doi.org/10.1016/j.chb.2019.07.002

Merriman, M. (2015). The next big disruptor: Gen Z. In *EY*. https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/digital/ey-rise-of-gen-z-new-challenge-for-retailers.pdf

Microsoft. (2022). *Microsoft HoloLens: Tecnología de realidad mixta para empresas*. https://www.microsoft.com/es-es/hololens

Mishra, A., Shukla, A., Rana, N. P., & Dwivedi, Y. K. (2021). From "touch" to a "multisensory" experience: The impact of technology interface and product type on consumer responses [Article]. *Psychology & Marketing*, *38*(3), 385–396. https://doi.org/10.1002/mar.21436

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: implications for a changing work force. *Personnel Psychology*, *53*(2), 375–403. https://doi.org/10.1111/j.1744-6570.2000.tb00206.x

Nikhashemi, S. R., Knight, H. H., Nusair, K., & Liat, C. B. (2021). Augmented reality in smart retailing: A symmetric approach to continuous intention to use retail brands' mobile AR apps [Article]. *Journal of Retailing and Consumer Services*, *60*, 102464. https://doi.org/10.1016/j.jretconser.2021.102464

Nuszbaum, M., Voss, A., Klauer, K. C., & Betsch, T. (2010). Assessing individual differences in the use of haptic information using a German translation of the need for touch scale [Article]. *Social Psychology (Göttingen, Germany)*, *41*(4), 263–274. https://doi.org/10.1027/1864-9335/a000035

Pandey, J., Sadh, A., & Billore, A. (2017). *Need for Touch: A Barrier in Online Shopping—Identifying Compensatory Factors in an Online Context* (pp. 1349–1357). https://doi.org/10.1007/978-3-319-45596-9_247

Pandis, N. (2015). Comparison of 2 means (independent z test or independent t test) [Article]. *American Journal of Orthodontics and Dentofacial Orthopedics*, *148*(2), 350–351. https://doi.org/10.1016/j.ajodo.2015.05.012

Pantano, E., Rese, A., & Baier, D. (2017). Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets [Article]. *Journal of Retailing and Consumer Services*, *38*, 81–95. https://doi.org/10.1016/j.jretconser.2017.05.011

Pierce, J. L., Kostova, T., & Dirks, K. T. (2001). Toward a theory of psychological ownership in organizations [Article]. *The Academy of Management Review*, *26*(2), 298–310. https://doi.org/10.5465/AMR.2001.4378028

Plotkina, D., & Saurel, H. (2019). Me or just like me? The role of virtual try-on and physical appearance in apparel M-retailing [Article]. *Journal of Retailing and Consumer Services*, *51*, 362–377. https://doi.org/10.1016/j.jretconser.2019.07.002

Pollard, A. (2021, November 21). *Gen z has $360 billion to spend, trick is getting them to buy*. Bloomberg. https://www.bloomberg.com/news/articles/2022-06-13/elon-musk-to-address-twitter-staff-for-first-time-since-deal

Posnick-Goodwin, S. (2010). Meet generation Z. *California Educator*, *14*(5), 8–18.

Poushneh, A. (2018). Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality [Article]. *Journal of Retailing and Consumer Services*, *41*, 169–176. https://doi.org/10.1016/j.jretconser.2017.12.010

Prensky, M. (2001). Digital natives, digital immigrants [Article]. *On the Horizon*, *9*(5), 1–6. https://doi.org/10.1108/10748120110424816

Qin, H., Peak, D. A., & Prybutok, V. (2021). A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? [Article]. *Journal of Retailing and Consumer Services*, *58*. https://doi.org/10.1016/j.jretconser.2020.102337

Rathee, R., & Rajain, P. (2019). Online shopping environments and consumer's Need for Touch. *Journal of Advances in Management Research*, *16*(5), 814–826. https://doi.org/10.1108/JAMR-12-2018-0116

Rauschnabel, P. A. (2018). Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses [Article]. *Psychology & Marketing*, *35*(8), 557–572. https://doi.org/10.1002/mar.21106

Rauschnabel, P. A., Babin, B. J., tom Dieck, M. C., Krey, N., & Jung, T. (2022). What is augmented reality marketing? Its definition, complexity, and future. *Journal of Business Research*, *142*, 1140–1150. https://doi.org/10.1016/j.jbusres.2021.12.084

Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior*, *133*, 107289. https://doi.org/10.1016/j.chb.2022.107289

Rauschnabel, P. A., Reto, F., & Hinsch, C. (2019). Augmented reality marketing: How mobile AR-apps can improve brands through inspiration [Article]. *Journal of Retailing and Consumer Services*, *49*, 43–53. https://doi.org/10.1016/j.jretconser.2019.03.004

Rese, A., Baier, D., Geyer-Schulz, A., & Schreiber, S. (2017). How augmented reality apps are accepted by consumers: A comparative analysis using scales and opinions. *Technological Forecasting and Social Change*, *124*, 306–319. https://doi.org/10.1016/j.techfore.2016.10.010

Romano, B., Sands, S., & Pallant, J. I. (2020). Augmented reality and the customer journey: An exploratory study. *Australasian Marketing Journal*, *29*(4), 354–363. https://doi.org/10.1016/j.ausmj.2020.06.010

Romano, B., Sands, S., & Pallant, J. I. (2022). Virtual shopping: segmenting consumer attitudes towards augmented reality as a shopping tool. *International Journal of Retail and Distribution Management*. https://doi.org/10.1108/IJRDM-10-2021-0493

Saggau, C., & Connell, M. (2021). *Gen Z and Millennials - The generational gap in sustainable consumption*.

Saunders, M. (2012). *Research methods for business students* (P. Lewis & A. Thornhill, Eds.; 6th ed.) [Book]. Pearson.

Scholz, J., & Duffy, K. (2018). We ARe at home: How augmented reality reshapes mobile marketing and consumer-brand relationships [Article]. *Journal of Retailing and Consumer Services*, *44*, 11–23. https://doi.org/10.1016/j.jretconser.2018.05.004

Scholz, J., & Smith, A. N. (2016). Augmented reality: Designing immersive experiences that maximize consumer engagement [Article]. *Business Horizons*, *59*(2), 149–161. https://doi.org/10.1016/j.bushor.2015.10.003

Smink, A. R., Frowijn, S., van Reijmersdal, E. A., van Noort, G., & Neijens, P. C. (2019). Try online before you buy: How does shopping with augmented reality affect brand responses and personal data disclosure [Article]. *Electronic Commerce Research and Applications*, *35*, 100854. https://doi.org/10.1016/j.elerap.2019.100854

Smink, A. R., van Reijmersdal, E. A., van Noort, G., & Neijens, P. C. (2020). Shopping in augmented reality: The effects of spatial presence, personalization and intrusiveness on app and brand responses [Article]. *Journal of Business Research*, *118*, 474–485. https://doi.org/10.1016/j.jbusres.2020.07.018

Song, H. K., Baek, E., & Choo, H. J. (2019). Try-on experience with augmented reality comforts your decision. *Information Technology & People*, *33*(4), 1214–1234. https://doi.org/10.1108/ITP-02-2019-0092

Sparkes, M. (2021). What is a metaverse. *New Scientist*, *251*(3348), 18.

Statista. (2022a, February). *Global interest in trying virtual or online experiences 2022*. https://www.statista.com/statistics/1304932/interest-in-trying-virtual-or-online-experiences-worldwide/

Statista. (2022b, April 21). *Distribution of TikTok users worldwide as of April 2022, by age and gender*. Statista. https://www.statista.com/statistics/1299771/tiktok-global-user-age-distribution/

Statista. (2022c, May 20). *Returns of online purchases by category in Germany 2022*. https://www.statista.com/forecasts/998730/returns-of-online-purchases-by-category-in-germany

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha [Article]. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

The Insight Partners. (2022, March 14). *Augmented reality (AR), virtual reality (VR), and mixed reality (MR) market size worldwide in 2021 and 2028 (in billion U.S. dollars)*. Statista. https://www-statista-com.sire.ub.edu/statistics/591181/global-augmented-virtual-reality-market-size/

United Nations. (2022). *UN sustainable development goals*. https://sdgs.un.org/goals

Vine, T., Clark, J., Richards, S., & Weir, D. (2018). *Ethnographic research and analysis : anxiety, identity and self* (T. Vine, J. Clark, S. Richards, & D. Weir, Eds.) [Book]. Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-58555-4

Wang, S., & Zhang, Y. (2018). Spatial presence: How to induce an immersive feeling in a virtual environment? *Advances in Psychological Science*, *26*(8), 1383. https://doi.org/10.3724/SP.J.1042.2018.01383

Wilson, E. V., Dobrzykowski, D. D., & Cazier, J. A. (2008). The influence of media trust and internet trust on privacy-risking uses of e-health [Article]. *International Journal of Information Security and Privacy*, *2*(3), 84–97. https://doi.org/10.4018/jisp.2008070107

Yim, M. Y.-C., Chu, S.-C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective [Article]. *Journal of Interactive Marketing*, *39*, 89–103. https://doi.org/10.1016/j.intmar.2017.04.001

Yim, M. Y.-C., & Park, S.-Y. (2019). "I am not satisfied with my body, so I like augmented reality (AR)"; Consumer responses to AR-based product presentations [Article]. *Journal of Business Research*, *100*, 581. https://doi.org/10.1016/j.jbusres.2018.10.041

Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality [Article]. *Journal of Marketing*, *60*(2), 31–46. https://doi.org/10.1177/002224299606000203

ANNEXES

Annex 1 Pre-usage questionnaire

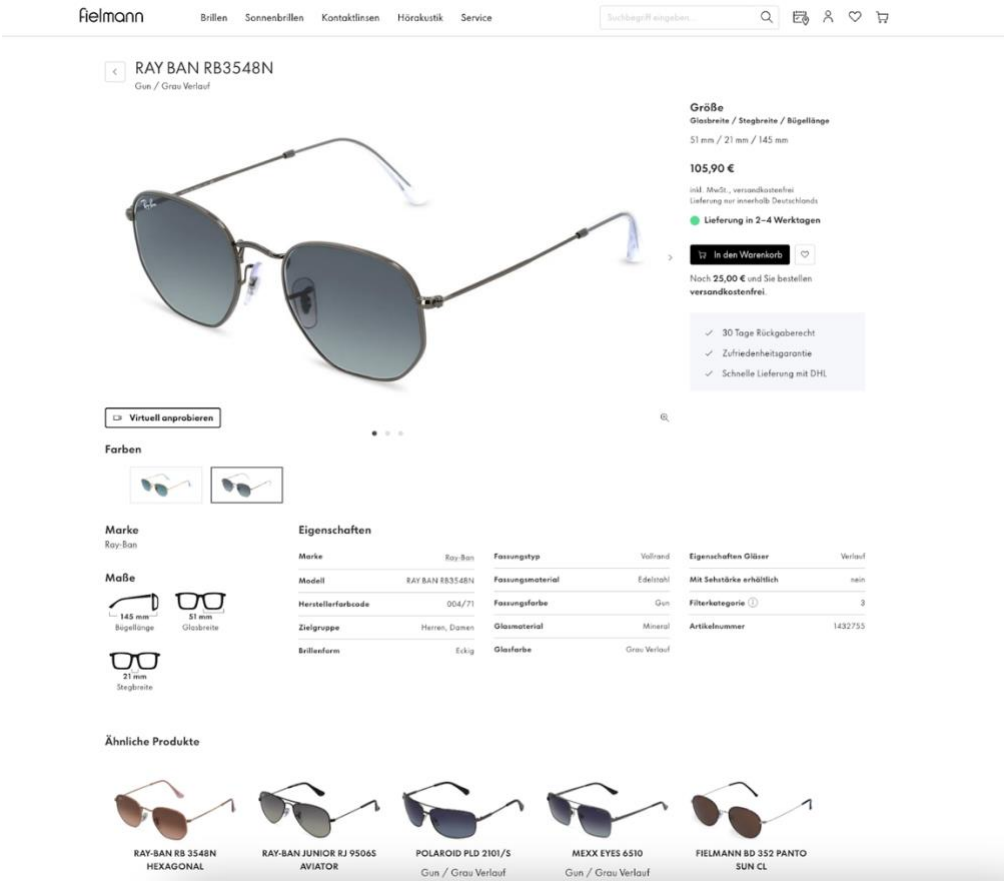
Demographic questions:

Measure	Type of data	Measurement scale
Age	Quantitative, numerical	Open field
Gender	Qualitative, categorical	Female, male, prefer not to answer
Country of origin	Qualitative, categorical	List of countries
Education	Qualitative, categorical	List of degrees
Occupation	Qualitative, categorical	List of occupations

Questions on online shopping behaviour and prior AR experience:

Measure	Measurement scale
Online shopping behaviour	*Online shopping frequency:* How often in a month do you buy retail products online (e.g., clothes, glasses, …)? () Several times a week () Once a week () Once every 2 weeks () Once a month () Less than once a month
Prior AR experience	*Prior experience or familiarity with VTO feature:* Have you ever used a virtual try-on in an online shop? () Yes, I have used this function () Yes, I have used something like this () No, I haven't used it, but I have heard of it / I know it exists () No, I have never used it and never heard of it () I don't know / I am not sure

Evaluation of pre-usage measures (see Annex 2) based on the following screenshot:



Annex 2 Operationalization of Constructs and Measurement of Items

Construct	Item	Measurement	Reference
Pre-usage variables			
Hedonic value (perceived enjoyment)	pre_hed1 pre_hed2 pre_hed3	The online shopping experience with the product page is exciting. The online shopping experience with the product page is boring. (R) The online shopping experience with the product page is enjoyable.	Adapted from Childers et al. (2001)
Utilitarian value (perceived informativeness)	pre_util1 pre_util2 pre_util3	The product page provides detailed information about the glasses. The product page provides information that helps me in my decision. I find the product page useful for online shopping.	Adapted from Davis (1989)
Purchase intention	pre_purchaseint1 pre_purchaseint2	I would consider this online retailer as one of my first choices to buy glasses online. I would encourage friends and relatives buy from this online retailer.	Adapted from Zeithaml et al. (1996)
Post-usage variables			
Hedonic value (perceived enjoyment)	hed1 hed2 hed3	The online shopping experience with the virtual try-on is exciting. The online shopping experience with the virtual try-on is boring. (R) The online shopping experience with the virtual try-on is enjoyable.	Adapted from Childers et al. (2001)
Utilitarian value (perceived informativeness)	util1 util2 util3	Using the virtual try-on improves my performance in evaluating the product during online shopping. I find the virtual try-on to be useful for online shopping. Using the virtual try-on enhances my effectiveness in online shopping.	Adapted from Davis (1989)
Perceived ease of use	easeofuse1 easeofuse2 easeofuse3 easeofuse4	I found the virtual try-on to be very easy to use. The virtual try-on was intuitive to use. It was difficult to learn how to use the virtual try-on. (R) Handling the camera function was easy.	Adapted from Davis (1989)
Attitude towards using	attitude1 attitude2	The VTO is a good online shopping technology feature. Assuming I had access to the VTO feature, I intend to use it.	Adapted from Chen et al. (2002)
Purchase intention	purchaseint1 purchaseint2 purchaseint3	I would consider this online retailer as one of my first choices to buy glasses online. I would encourage friends and relatives to buy from this online retailer. I would encourage friends and relatives to try virtual try-ons in online shops.	Adapted from Zeithaml et al. (1996)
AR-specific variables			
Spatial presence	spatpre1 spatpre2	I felt like the glasses were actually there in the real world. It was as though the true location of the glasses had shifted into the real-world environment.	Adapted from Hartmann et al. (2016)
Psychological ownership	own1	During the virtual try-on I felt like I own these glasses.	Adapted from Pierce et al. (2001)
Awareness of privacy practices	privacy1	It is very important to me that I am aware and knowledgeable about how my personal information and images will be used.	Adapted from Wilson et al. (2008)
Need for touch	touch1 touch2	If I cannot touch a product, I am reluctant to purchase it. I place more trust in products that can be touched before purchase.	Adapted from Malhotra et al. (2004)

Notes: All items were measured on a 7-point Likert scale of 1 (strongly disagree) to 7 (strongly agree)
R = reverse-coded