THE INFLUENCE OF AUGMENTED REALITY IN CONSUMER PURCHASE INTENTIONS AND SUSTAINABLE DEVELOPMENT

Dissertation to Universidade Católica Portuguesa to obtain a Master's Degree in Psychology Business and Economics

By

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Under the supervision of Professor Doctor Daniel Fernandes

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Dedicatory

To my grandmother,

For her wisdom, complicity, and inspiration.

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To my family,

For their understanding, patience, and support.

To my colleagues and friends,

For their presence, motivation, and friendship.

To my supervisor,

For his availability, incentive, and knowledge.

Abstract

The current production and consumption model has been one of the main problems in the process of environmental degradation, in which the population, encouraged by commercial advertising, acquires unnecessary products, often returning them to the seller, which intensifies the destruction of nature and its resources.

The technological evolution of recent years has created a disruptive effect on business models and consumer behavior. Transcending borders and distances, e-commerce has digitized the world into a single platform, contributing to the exponential growth of online commerce. Today's companies have developed omnichannel strategies in order to impact consumers during the entire purchase decision process.

To reduce sensory limitations (visual and touch) in the online buying process, several technologies have been created and implemented, such as Augmented Reality.

Thus, the objective of this dissertation was to analyze the effect of the application of Augmented Reality technology on purchase intentions and on intentions to return products, compared to the traditional online sampling model based on 2D product image display, currently implemented in most online stores.

In this regard, the effects of perceptions (hedonic value, utilitarian value and perceived risk) and sensations (sense of control, attractiveness and confidence) during a shopping experience were studied. It has been proven that, in fact, Augmented Reality technology has a stronger effect on increasing purchase intentions than its traditional 2D alternative, but not on decreasing product return intentions.

Keywords: Augmented Reality, Purchase Intentions, Return Intentions, Hedonic Value, Utilitarian Value, Perceived Risk, Sense of Control, Attractiveness, Confidence.

Resumo

O atual modelo de produção e consumo tem sido um dos principais problemas no processo de degradação ambiental, em que a população incentivada por propaganda comercial, adquire produtos desnecessários, devolve-os muitas vezes ao vendedor, intensificando a destruição da natureza e dos seus recursos.

A evolução tecnológica dos últimos anos tem criado um efeito disruptivo nos modelos de negócio e no comportamento dos consumidores. Transcendendo fronteiras e distâncias, o *e-commerce* digitalizou o mundo numa única plataforma, contribuindo para o crescimento exponencial do comércio *online*. As empresas atuais têm desenvolvido estratégias de *omnichannel* com o intuito de impactar os consumidores durante todo o processo de decisão de compra.

Para diminuir as limitações sensoriais (visuais e tato) durante o processo de compra *online*, diversas tecnologias têm sido criadas e implementadas, como é o caso da Realidade Aumentada.

Assim, o objetivo desta dissertação foi o de analisar o efeito da aplicação de tecnologia de Realidade Aumentada nas intenções de compra e nas intenções de devolução de produtos, comparativamente com o modelo tradicional de compras *online* baseado na exibição de imagens de produtos em 2D, atualmente implementado na maioria das lojas *online*.

Para tal, foram estudados os efeitos das perceções (valor hedónico, valor utilitário e perceção do risco) e das sensações (sensação de controlo, atratividade e confiança) durante uma experiência de compra, tendo-se comprovado que, efetivamente, a tecnologia de Realidade Aumentada tem um efeito mais acentuado no aumento das intenções de compra do que a alternativa 2D, mas não na diminuição das intenções de devolução de produtos.

Palavras-chave: Realidade Aumentada, Intenções de Compra, Intenções de Devoluções, Valor Hedónico, Valor Utilitário, Risco Percebido, Sensação de Controlo, Atratividade, Confiança.

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CHAPTER 1 – INTRODUCTION

Despite sunglasses being one of the most ubiquitous fashion accessories in the world, they also play a very important role in protecting our eyes from possible damage caused by exposure to UV rays.

The Vision Council of America estimates that over 4 billion adults in the world wear glasses. About 75% of adults worldwide rely on some sight correction product and 64% wear prescription glasses, statistics reveal. Meanwhile, the remaining 11% have opted for contact lenses. It's also interesting to note that a whopping 85% of the world's adult population reports wearing sunglasses (Fashion Discounts, 2022).

The online purchase of eyewear products like eyeglasses, sunglasses and contact lenses has been gaining momentum due to a significant shift of consumers to online platforms like e-commerce sites, which gives them a greater number of varieties and an expanded product portfolio to choose from (Research and Markets, 2021).

This paradigm shift in the purchase process has been accelerated by the introduction of new technologies such as Augmented Reality. Augmented Reality is a technology that allows you to insert virtual objects into real environments, providing user interaction with the object and improving your perception and sensation about how the object would be arranged in the physical environment.

Although the in-store shopping trend for eyewear is on the decline, it is still at 76,3% versus 23,7% of the online shopping trend (The Shades Hut, 2022).

On the other hand, the increase in the number of purchases through e-commerce has corresponded to a significant increase in the number of returns, which constitutes a huge economic and environmental problem. For example, in the United States of America, retail returns averaged 16,6% in 2021 (National Retail Federation and Appriss Retail, 2022).

The main objective of this research work is to investigate the influence that Augmented Reality can have on consumers' purchase intentions and on consumers' return intentions, which is something that is believed to have a positive impact on the sustainability factor of a developing economy. This research work also aims to analyze the effects that this technology can produce on consumer perceptions and sensations during the online shopping process, to test the usefulness of this innovative tool.

CHAPTER 2 – LITERATURE REVIEW

2.1 - Augmented Reality

2.1.1 – Definition

Augmented Reality technology has been largely investigated in the areas of computer technology and human-computer interaction. The most relevant definitions of Augmented Reality have been developed in these fields.

The formulation of Augmented Reality by Azuma, currently recognized as the most accepted one, says that an Augmented Reality system complements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world (Azuma et al., 2001).

According to other authors, Augmented Reality consists of an interface that creates an altered reality that allows consumers to perceive virtual consumption as authentic (Huang et al., 2019).

From the latter's perspective, multi-sensory Augmented Reality blends the perception of a consumer's physical environment with digitally enhanced interactive visual, auditory and tactile sensory information. From the latter's perspective, multi-sensory Augmented Reality blends the perception of a consumer's physical environment with digitally enhanced interactive visual, auditory and tactile sensory information (Heller et al., 2019).

2.1.2 - Characteristics

There are different types of Augmented Reality that are used in different types of businesses depending on the result you want to achieve. However, they all have the same basic characteristics. Here is a summary of its main features (Javornik, A., 2016).

Interactivity (Steuer, 1992; Lister et al., 2008) has been extensively investigated and remains one of the core concepts for assessing digital and virtual media. Although no final consensus about its meaning has been reached, it is most often referred to as "...the degree to which two or more communication parties can act on each other, on the communication medium, and on the messages and the degree to which such influences are synchronized" (Liu and Shrum, 2002).

Hypertextuality is a synonym and a proxy for the number of linked sources (Hoffman and Novak, 1996) and refers to the non-sequential connections among different data or

navigability (Sundar, 2009) and is associated with the actions of users moving through a mediated environment and the interface that offers a large number of linked sources and different paths of how they are related together.

Modality refers to the types of content provided by the medium (Hoffman and Novak, 1996; Sundar, 2009) and can appear in audio and visual formats, such as music, voice narrative, video, images, text and others, all represent information in a different way which impacts the communication process.

Connectivity (Hoffman & Novak, 1996) refers to the type of communication model that is considered a revolutionary trait of social media: the transformation of the one-to-one or one-to-many communication model into many-to-many models of interactions where all sides can participate in the exchange of messages and are simultaneously potential senders and receivers. While AR is often embedded in the applications that contain features for such connectivity, the AR view as such does not yet allow (at least not the current commercial applications) connectivity with as many other parties as for instance social media. However, integration with social platforms and higher connectivity is expected to be more present in the future versions.

Location-specificity refers to the GPS system that allows tracking of the user location through personal devices and delivering location-specific information. With Augmented Reality, location is relevant in a different way. The content delivery is not linked to the GPS position but to the elements that the camera tracks in its immediate surroundings based on which the augmented content is delivered. Some Augmented Reality content is delivered without spatial tracking and just appears on the screen, seemingly fitting in the physical environment.

Portability or mobility (the characteristic of mobile devices being effortless to carry around) indicates a device's affordance for spatial dynamism (Rohm et al., 2012), which also included wearability (like with Apple Watch, FitBit or GoogleGlass). The extent to which Augmented Reality is mobile, depends on the type of device it is used on. Fixed interactive screens, situated in a retail store, do not allow mobility, while smart devices can be carried around and allow Augmented Reality to be mobile, which then also affects the type of content that can be displayed based on the location.

Virtuality refers to the media's ability to show virtual elements or virtual worlds as experienced by the user through immersion or telepresence in the environment created by computer graphics or visual elements (Lister et al., 2008; Steuer, 1992). In Augmented Reality, only a part of what the user sees is computer generated, while the rest corresponds to physical reality and therefore there is no disconnect between the physical and the virtual. According to these criteria, Augmented Reality is closer to physical reality than virtual reality, but it has elements of virtuality.

2.1.3 – Applications

Both virtual reality and Augmented Reality were introduced in gaming, now they are being used in various fields (Leena, Poonam Lakra, Preeti Verma, 2017).

Augmented Reality in Gaming and entertainment

The entertainment industry has been using Augmented Reality for some years now. Augmented Reality apps succeed in terms of interactivity offered by them. If taken to its maximum potential, Augmented Reality can create an environment where users can interact with immersive games or even movie characters. Augmented Reality and gaming are expected to come together in the near future. Its unique nature adds much needed features to users.

Augmented Reality in Education

The education sector has arguably been a little slow to embrace new technologies. In the current world of e learning. Knowledge seekers are keen to learn using the latest apps, e classrooms etc. Although there are various apps like Google Sky maps (learning astronomy), Geogoggle (learning Geography), Zooburst (story telling) etc., only a few Augmented Reality apps can change the face of learning in a classroom environment. Augmented Reality is a trend that is worth following as new apps and technologies emerge to make learning interesting, innovative and fun.

Augmented Reality in Travel and Tourism

GPS mobile apps with Augmented Reality can show tourist routes and directions, translate the signs on the street, give information about sightseeing etc. for their desired destinations.

Augmented Reality in Social Media

Social media companies like META (Facebook) and SNAP (Snapchat) are actively taking steps to incorporate augmented reality into their platform. META is incentivizing Augmented Reality developers to use location, object recognition and real-time image processing on its app Facebook, while Snapchat is once again headed towards being more than a photo sharing app by also offering virtual ad space to brands to announce on.

Augmented Reality in Marketing

Marketing is the study and management of exchange relationships. The American Marketing Association has defined marketing as "the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value to customers, clients, partners and society at large". In the process of delivering values to the customers, sellers are committed to modernize their processes and deliver superior values to their clients. In this scenario, Augmented Reality serves as an added advantage over physical forms of marketing. It is viewed as the ideal way of delivering persuasive messages to a technologically minded audience. It has gained wide acceptance by offering following advantages It helps consumers in creating their personalized experience as the technology is unique and noticeable.

It helps them to share their personalized content i.e., viral Augmented Reality marketing. It enables users to create their own unique featured products. Interactivity maintains retention of users and promotes the digital world.

2.1.4 - The future

Before Augmented Reality technology can reach its full potential, it must become more than an afterthought on mobile devices. "For Augmented Reality to become truly useful, somebody will have to make a platform for it that could host a variety of apps and services," claims tech industry consultant Tim Bajarin in his 2017 Time article. "Why This Futuristic Tech Will Be The Future Of Computing."

Once Augmented Reality finds a compelling, full-featured platform and it becomes clear that a vast number of consumers are becoming Augmented Reality proficient, the potential of Augmented Reality will begin to be fully realized. Every industry from architecture to

education, sports, military training, and retail commerce will benefit by embracing Augmented Reality.

Total Immersion™ itemizes the various industries that will see increased Augmented Reality activity in the near future in its *t-immersion.com blog* post, "The Future Of Augmented Reality." These industries include:

E-Commerce – Many companies will be integrating Augmented Reality into their websites and mobile apps. In retail, this will result in applications that seamlessly "clothe" a user in sunglasses, jackets, footwear, and jewelry via the camera in the person's smartphone.

Digital Marketing – Augmented Reality technologies will continue to improve the way customers engage with brands. Marketing Augmented Reality will likely be seen in packaging, on street signs, through gaming apps, and through interactions with other products.

Geolocation – The ability of mobile devices to inform us of our surroundings will be greatly improved over time. Augmented Reality could benefit everything from real-time travel advisories to restaurant suggestions.

Educational Resources – Researchers are already attempting to find new and beneficial ways to use Augmented Reality in training situations. The military and healthcare industries, in particular, are developing powerful Augmented Reality training simulations.

2.2 - Consumer Perceptions

2.2.1 - Hedonic Value

Hedonic consumption relates multisensory and emotional involvement to consumer experiences and their expectations of products/services (Holdbrook and Hirschman, 1982). This type of consumption causes different emotions on the part of the consumer, such as excitement, happiness, pleasure, freedom, fantasy fulfillment and escapism (Holbrook and Hirschman, 1982).

The hedonic shopping experience can be evaluated in three main phases, namely: anticipatory, on-the-spot and reflexive (Filep and Deery, 2010). The on-site assessment will trigger the most intense emotional experience, which tends to diminish after the visit (Strauss

and Allen, 2006). In this regard, Gardner (1985: 281) reiterates that "feelings play a major role in shaping consumer attitude and brand selection".

2.2.2 - Utilitarian Value

Utilitarian consumption focuses on the rational component of the purchase and is motivated by rationally recognized needs such as the fulfillment of goals that present lower risks (Batra and Ahtola, 1991). Utility consumption occurs when the consumer wants to obtain a functional or practical benefit from the purchase of a product or service (Solomon, 2002).

Value perceptions associated with a shopping experience are essential components of satisfaction. There are several studies that relate hedonic and utilitarian values to satisfaction (Babin et al., 1994; Babin et al., 2005).

2.2.3 - Perceived Risk

Perceived risk is the expectation of losses (Schierz et al., 2010). The greater the loss expectations, the greater the degree of risk consumers will perceive. Specified Perceived risk as negative insights from unpredictable and changing outcomes of purchased products (Laroche et al., 2005).

Meanwhile, Ko et al. (2004) defined the concept of Perceived risk as the perception of consumers about the changeable and contrary results of the purchase of a product or service. The concept includes two elements, which are indecisions and consequences. Indecisions are defined as the probability of unfavorable outcomes and consequences are defined as the importance of losses (Laroche et al., 2005).

Perceived risk plays a significant role in determining consumers' purchase intentions. Consumers' perception of risk is crucial to determining their assessments and purchasing behavior (Ko et al., 2004).

Six components of perceived risk associated with shopping have been identified as physical, social, product, convenience, financial, and psychological risks (Jacoby and Kaplan, 1972; Peter and Tarpey, 1975).

Among the six types of risk associated with shopping, product and financial risks have been shown to have a significant negative influence on consumers' Internet purchase intentions (Bhatnagar and Ghose, 2004; Lu, Hsu, and Hsu, 2005). Privacy risk, also referred to as

psychological risk, is getting more attention as both male and female online shoppers show growing concerns regarding the security of their personal information during online transactions (Shop.org, n.d.).

For this work, the most significant risks are Financial risk and Psychological risk, concepts that can be defined as follows.

Financial risk means the potential cash outlay associated with the initial purchase price as well as the subsequent maintenance cost of the product (Andrade, E. B., 2000).

Psychological risk implies that the selection or performance of the product will have a negative effect on the consumer's peace of mind or self-perception (Almousa, M., 2014).

2.3 - Consumer Sensations

2.3.1 - Sense of Control

Sense of control measures the level of trust in one's own capacity to control the evolution of an online search session (Huang, 2003).

From another perspective, sense of control in a self-service context can be considered as the amount of control a customer feels they have over the service process or outcome (Shamdasani et al., 2008).

Several authors have found that, in the self-service context, a sense of control is essential for customers to obtain the service results they desire (Collier and Sherrell, 2010; Dabholkar, 1996; Oyedele and Simpson, 2007). sense of control is the perception that users can change the service process to suit their preferences by freely navigating the site. A stronger sense of control over site features, such as visual images, functions, and the order and complexity of information presented, provides users with more enjoyable experiences (Deng and Poole, 2010; Tandon et al., 2015).

2.3.2 – Attractiveness

The concept of customer attractiveness is not new to marketing. There is broad research consensus that, in business relationships, attractiveness is a matter of economic outcomes for the parties, and customer attractiveness is conceived as the "expected economic and social cost-reward outcomes of the relationship over time." (Halinen, 1997, page 59).

In the business-to-business context, customer attractiveness has been considered in relation to important concepts such as value, trust, commitment, collaboration and satisfaction.

The suggestion that being attractive to a customer can be profitable is recognized in the literature. The same can be said for the need for business customers to manage their attractiveness to reap the potential benefits (Cordon and Vollmann, 2002; Mortensen et al., 2008; Schiele et al., 2011). It is an established maxim in management that it is only possible to manage what can be measured. Thus, the concept of customer attractiveness only becomes useful in managerial practice if it can be evaluated. Measuring customer attractiveness is complex because a large number of characteristics can contribute to customer attractiveness and also because of the relational nature of customer attractiveness.

2.3.3 – Confidence

Mayer, Davis and Schoorman (1995) define confidence as "The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party".

For a better understanding of confidence in the context of e-commerce, two key dimensions were attributed to this concept: integrity and benevolence (Gefen, 2000; McKnight and Chervany, 2001; Hajli, 2014). Integrity indicates the degree of certainty that the consumer feels in the sincerity of the deal and the fact that it will deliver on its promises.

Benevolence refers to the consumer's belief that the company is interested in their well-being, that it has no intention of having opportunistic behaviors and that it is motivated by the search for joint benefit (Flavián and Guinalíu, 2006).

There are many studies that mention the reasons that affect online confidence. According to Bart. et al (2005) website characteristics, privacy and customer service are very influential factors in online confidence.

In addition to the reasons mentioned above, age and gender can affect confidence online. Younger users tend to trust information more easily, while older users are generally more skeptical of everything they find. Women, on the other hand, trust professional websites more and men tend to trust more personal websites. Annual income and education level negatively affect people's confidence in the information they find online (Yoo et al., 2009).

2.4 - Consumer Intentions

2.4.1 – Purchase Intentions

Purchase intentions is a type of decision-making that studies the consumer's reason for purchasing a particular brand (Shah et al., 2012).

Purchase intentions is an important concept of marketing and in the literature, authors consider and analyze purchase intentions in a different way. Mirabi et al. (2015) consider the purchase intentions as a complex process, which is associated to the behavior, perceptions and attitudes of consumers, being an effective tool to predict the buying process. In addition, Kotler and Armstrong (2011) argue that buying intention is formed before the consumer makes the final purchase decision.

Another interesting aspect is the fact that the impact of object interactivity on mental images probably influences purchase intentions more than attitudes. Kahneman and Tversky (1982) argue that "there seem to be many situations in which questions about events are answered by an operation that resembles running a simulation model".

2.4.2 – Return Intentions

A return policy is one of the after-sales services provided by retailers. It allows customers who are dissatisfied with their purchase to receive their money back if they return the product within a certain period of time (Davis et al., 1995). Generous return policies reduce customers' pre-purchase uncertainty (Heiman et al., 2001), making them more likely to buy (Suwelack et al., 2011). However, generous return policies also increase companies' costs associated with the reverse logistics process (Horvath et al., 2005).

Customers return products for a variety of reasons. Product returns are inefficient from a business operations and customer service perspective, potentially doubling or tripling cost and time compared to regular deliveries (Edwards, J. et al., 2011). Furthermore, the inefficiency of reverse logistics activities can generate substantial emissions and resource consumption (Sarkis, J. et al., 2004; Kang, P., Song, G., Xu, M. et al., 2021).

Research into the environmental impacts of products returned from online shopping is important but still poorly understood, especially given the ongoing shift to online shopping due to COVID-19 and the development of digital commerce.

2.5 – Sustainable Development

2.5.1 – Definition

Currently, humanity is facing greater environmental challenges than ever before, a lot of them being a result of man-made activities.

While it may seem easier to encourage consumption through short-term price promotions, in the long term this is not a viable strategy to promote a greener economy. Such promotions may cause sales spikes, but not long-term behavioral changes among consumers (Pauwels et al., 2002) or even negative effects on purchase intentions due to the association of price with consumer quality (Ngobo, 2011). Rather, it should be the goal of sustainability marketing to persuade consumers and engage them in more sustainable behavior. Retailers and researchers have placed a lot of emphasis on examining whether point-of-sale advertising messages can activate consumers' eco-friendly values and attitudes and thus lead to more sustainable purchasing decisions (Cho et al., 2018; Frank and Brock, 2018).

Currently, retail managers and researchers turn to new digital technologies in stores as a new opportunity to engage consumers (Dennis et al., 2012; Grewal et al., 2017). Technological solutions are becoming more sophisticated and diverse as the necessary hardware becomes cheaper (Hagberg et al., 2016; Javornik, 2016b), but their impact on consumers has barely been investigated scientifically until now. In particular, its potential to increase sustainable consumption has been overlooked. According to early studies, in-store technologies such as AR displays may be able to address consumers emotionally and intellectually (Dennis et al., 2014; Javornik, 2016a), so research should further investigate the potential technology to promote sustainable products.

After all, sustainable development depends deeply on its relationship with technological development (Bashtannyk et al., 2020).

From this perspective, the development of Industry 4.0 can drive a new type of progress that strives for resource optimization, waste management and other sustainable practices (Machado et al., 2020), themes widely addressed in the 2030 Agenda of the United Nations Organization.

2.5.2 – Dimensions

The concept of sustainable development emerged as opposed to traditional development, which previously was based on economic growth.

However, what is involved here is more than just another new economic programme; nor is it simply another concept from the fields of environmental protection or nature conservation. Rather, sustainable development marks an attempt to formulate a programme that will integrate different spheres of human activity that had mostly been seen as separate in earlier times. The basis for this has been a moral conviction as to humankind's responsibility for nature, expressed in terms of the principle that "sustainable development is development that meets the needs of the present, without compromising the abilities of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Integration must thus denote the achievement of order in each dimensions in question, which it is supposed to include (Pawlowski, 2006):

- the moral;
- the ecological;
- the social;
- the economic;
- the legal;
- the technical;
- the political.

The integration of these different dimensions would seem of particular importance in light of the ongoing specialization in the scientific disciplines and the different views of nature that are being adopted. For now, most publications only include ecological, social and economic issues (Kozlowski, 2005). However, the basis for this discussion must be a moral reflection on humanity's responsibility to nature.

2.5.3 – The future

As e-commerce expands globally, economic giants are looking to the digital world and larger markets for their products. Therefore, it became necessary to study how different factors influence users in developing countries to adopt e-commerce. This will help policymakers

and global companies make plans to implement e-commerce globally and fulfill a dream of a sustainable digital world.

By using Augmented Reality accurately, customers can be driven to select the right choice to purchase products.

Thus, the development of sustainable e-commerce solutions requires the contribution of all the actors involved (government, companies, consumers, financial sector, etc.). From an environmental point of view, the growing importance of e-commerce for the economy and the environment makes companies in the future incorporate environmental demands as part of their strategies. The key question regarding business is: Why should companies prioritize aspects that positively affect the environment?

Knowing that the main objectives of companies within the scope of their strategic management are to obtain profit and maintain competitiveness, the answer to the previous question may involve ethical issues and others of a strategic nature, such as the incorporation of questions environmental factors in its business model, because they can influence the company's competitiveness (Porter and van der Linde, 1995; World Business Council for Sustainable Development, 2001), so this could be the way forward in the future in e-commerce.

CHAPTER 3 – CONCEPTUAL FRAMEWORK

3.1 - Hypothesis Development

After drafting the problem statement and in order to find an adequate explanation for the phenomena under study, twelve hypotheses were formulated with the objective of performing a data analysis that would allow testing these hypotheses, in order to prove, or not, their veracity.

All hypotheses were formulated based on a possible intention to purchase unisex sunglasses by a consumer through an e-commerce platform.

H1: The use of Augmented Reality positively affects consumers' purchase intentions.

H2: The use of Augmented Reality negatively affects consumers' return intentions.

H3: The use of Augmented Reality positively affects the hedonic value.

H4: The use of Augmented Reality positively affects the utilitarian value.

H5: The use of Augmented Reality negatively affects the perceived risk.

H6: The use of Augmented Reality positively affects the sense of control.

H7: The use of Augmented Reality positively affects the attractiveness of the product.

H8: The use of Augmented Reality positively affects consumers' confidence.

H9: The positive relationship between Augmented Reality and consumers' purchase intentions is mediated by the effect of Perceptions (Hedonic Value (H9a), Utilitarian Value (H9b) and Perceived Risk (H9c)).

H10: The positive relationship between Augmented Reality and consumers' return intentions is mediated by the effect of Perceptions (Hedonic Value (H10a), Utilitarian Value (H10b) and Perceived Risk (H10c)).

H11: The positive relationship between Augmented Reality and consumers' purchase intentions is mediated by the effect of Sensations (Sense of control (H11a), Attractiveness (H11b) and Confidence (H11c)).

H12: The positive relationship between Augmented Reality and consumers' return intentions is mediated by the effect of Sensations (Sense of control (H12a), Attractiveness (H12b) and Confidence (H12c)).

3.2 - Conceptual Framework

The conceptual framework below (Figure 1) aims to guide the elaboration of the research study, providing an overview of the assumptions that need to be validated to solve the proposed problem. It also facilitates the understanding of the interdependence relationships existing between the different variables under analysis.

FIGURE 1 - Conceptual Framework
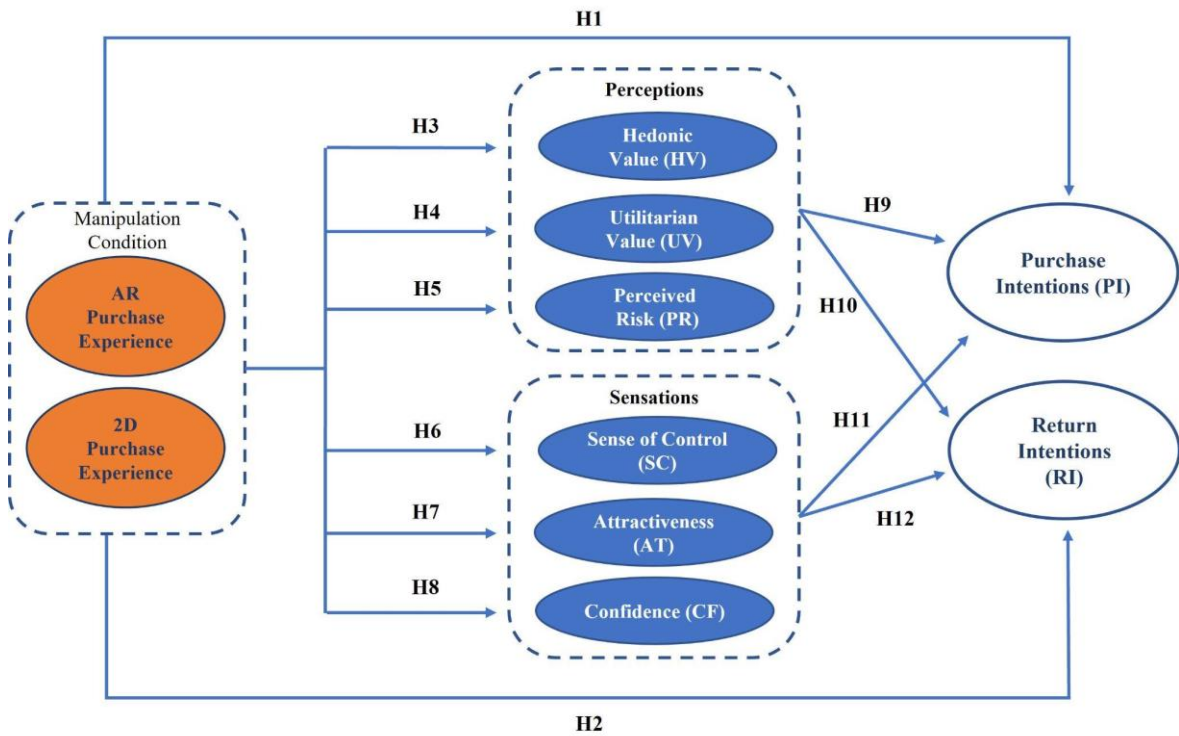
Source: Developed by the author

CHAPTER 4 – METHODOLOGY

4.1 - Research Approach

A quantitative research approach was carried out to collect primary data that would allow testing the twelve hypotheses previously formulated. The main objective was to understand the effects of the application of Augmented Reality in e-commerce environments and its usefulness in the online commerce of optical articles, in order to generate purchase intentions and consumers' return intentions.

A comparison between an Augmented Reality enabled shopping experience and a traditional e-commerce website that uses the 2D alternative display was established.

The online data research methodology was used to materialize the present study. The questionnaires were prepared in Portuguese and English through the Qualtrics platform and contained ten closed questions and one open question (participant age). All questions and statements that make up the questionnaire were of mandatory fill (force response).

Display logics were used to create personalized surveys for each respondent depending on their response to questions about their language and gender. The randomizer function was also used in the research flow to separate the control group from the experimental group.

The data was collected in the period September 19 to October 24, 2022, classified, coded and analyzed using the SPSS statistics platform.

4.2 - Design

The present research study was designed to analyze how e-commerce consumers react to two completely different shopping experiences (Augmented Reality exposure versus 2D exposure).

Eight versions of the original questionnaire were conceptualized: Augmented Reality/Female/Portuguese, Augmented Reality/Female/English, Augmented Reality/Male/Portuguese, Augmented Reality/Male/English, 2D/Female/Portuguese, 2D/Female/English, 2D/Male/Portuguese and 2D/Male/English.

All participants were randomly distributed among the eight manipulation conditions, given the previous choices made in the display logics questions (Language and Gender). In each

questionnaire, participants were exposed to a manipulation condition and asked to state their level of agreement with various statements.

Participants exposed to Augmented Reality manipulation were part of the experimental group (*Appendix A*) (English version), while participants exposed to 2D manipulation were part of the control group (*Appendix B*) (English version).

The objective was to establish a comparison between the two sales strategies to understand the added value that the application of Augmented Reality could have as a facilitator in the process of selling optical items in e-commerce environments.

For this, a concept test approach was materialized through a video format. A fictitious online store (SAGGA) was created to test the participants' behavior.

The video demonstration was made up of a live screen recording video of the online website that was developed specifically for the fictitious brand of this research work (SAGGA). This website was done on Wix.com and used several elements to ensure the experience feels as similar as possible to a real online sunglasses brand's website. A futuristic trailer was also developed to enhance the overall experience, look and feel of the website. The live screen recording video started by taking participants to explore the brand's website, showing the existing product offering, followed by choosing which product to buy which focused on the unisex sunglasses model SAGGA-Z04.

It should be noted that, intentionally, no background music was inserted in the videos in order to keep the experience as authentic as possible, without parallel distractions that could influence the aspects that were intended to be studied in this Dissertation.

In practice, 3 separate videos had to be created. One for Augmented Reality - female experience, another for Augmented Reality - male experience and a third video for the 2D - female and male experience.

Then, the participants were exposed to the manipulation condition. For Experimental Group individuals, the proof-of-concept video illustrated a simulation of an Augmented Reality-enabled service experience, through the Virtual Try-on technology, with the selected product offering, showing how it would look when in use (*Appendix C*). In contrast, participants in the Control Group condition were exposed to a simulation of a traditional 2D product image display experience (*Appendix C*).

4.3 - Procedure

Before implementing the research study, a pre-test was carried out with the main objective of evaluating the structure and flow of the questionnaires and the perception of future participants.

The feedback obtained allowed us to make some adjustments, both in the text of the questions and in the videos, which we consider to have been very important in reducing the probability of abandoning the questionnaire due to difficulties in interpretation or existing inconsistencies.

The surveys were distributed via email to friends, relatives and acquaintances of the author. Support in the distribution was also requested by the Universidade dos Açores and social media platforms, in order to reach the necessary number of responses for a reliable sample.

The questionnaire started with an introductory message, indicating the purpose of the study and emphasizing that it would be anonymous and the results obtained would be used strictly for academic purposes. It was also mentioned that there were no right or wrong answers, so they were asked to respond spontaneously and sincerely to all questions.

Finally, it was mentioned that the completion of the questionnaire took approximately 7 minutes.

A screening question was included in this study to know if the participant is a regular user of sunglasses, however, considering that a person who does not wear sunglasses may still be a potential buyer of this type of item for other purposes, this question followed the default flow of the questionnaire.

Thus, all participants in the sample were uniformly and randomly assigned to one of the manipulating conditions (Augmented Reality exposure versus 2D exposure).

Then, a message was displayed to instruct the participants to respond to the statements that they continued imagining that they had just performed the experiment illustrated in the video.

The level of agreement of the participants with several statements about the constructs under analysis was evaluated, using the measures presented. For this, the items presented in subchapter 4.4. Measures were used.

At the beginning of the questionnaire, the participants answered socio-demographic questions about gender, age and net monthly income level to allow the characterization of the sample.

At the end of the questionnaire, a message was presented to appreciate the participation in this survey and inform that their responses had been successfully registered.

4.4 - Measures

The construction of the questionnaire was carried out using the majority of previously existing scales and validated by other researchers in the development of their studies, in order to ensure the highest possible level of reliability.

Due to the particular nature of the information that is intended to be collected in order to verify the hypotheses, it was not always possible to fully use a previously validated scale, having opted for the partial use of different existing scales, complementing them with scales developed by the author specifically in the context of the present investigation (***Appendix D***).

In the present study, 8 constructs were defined: purchase intentions, return intentions, hedonic value, utilitarian value, perceived risk, sense of control, attractiveness and confidence. Each construct was checked through 3 items. To ensure the cohesion of the implemented scales, all constructs were measured on a seven-point Likert scale ("Totally Disagree" = 1; "Totally Agree" = 7).

The constructs hedonic value, utilitarian value and perceived risk were grouped under Perceptions, while the constructs sense of control, attractiveness and confidence were grouped under Sensations.

Basically, the questions in the questionnaire were divided into 8 Sections: Language, Socio-demographic data, Screening, Consumption habits, Purchase intentions, Return intentions, Perceptions and Sensations.

The Sections, Language, Socio-demographic data, Screening and Consumption habits, were assessed on 1, 2, 3 or 4 items (e.g., "Please choose language.", "Please indicate your gender." or "Please indicate how important the use of sunglasses is for you."), since the purpose of these questions was only to classify the sample (***Appendix D***).

A three-item measure (e.g., "In the future, I would buy sunglasses through this online store") was implemented to assess consumers' purchase intentions, based on items adapted from (Lian & Yen, 2014) and from (Hilken et al., 2017) (***Appendix D***).

Another three-item measure was used (e.g., "I think I will be satisfied with the purchase of these sunglasses in this online store") to assess consumers' return intentions based on items adapted from (Pavlou, P. A., et al., 2007) (***Appendix D***).

In the Perceptions Section, the hedonic value and utilitarian value (e.g., "The Virtual Try-on in the video was exciting.") were determined using an adapted scale (Childers et al., 2001 and Hilken et al., 2017). The perceived risk (e.g., "The shopping experience on the product page observed in the video would contribute to reducing the risk of purchase item not meeting my expectations.") was measured using an adapted scale (Crespo, A. H., et al., 2009 and Jarvenpaa, S. L., et al., 1999) (***Appendix D***).

In the Sensations Section, to assess consumers' level of sense of control in an online purchase, three items were established (e.g., "I had the feeling that I could touch the item practically") based on (Heller et al., 2019). The level of attractiveness was also evaluated through three items (e.g., "Using the product page observed in the video makes the product more attractive") based on (Wirtz, B., et al., 2013). Finally, confidence was assessed on a three-item scale (e.g., "The information conveyed from the Virtual Try-on application seemed honest and sincere") adapted from (Pavlou, P. A., 2003) (***Appendix D***).

CHAPTER 5 – RESULTS

5.1 - Sample Characterization

Through the data collection period, a total of 393 responses were collected. After analyzing the survey results, 119 participants were excluded for not answering all survey questions. So, the final sample consisted of only 274 participants, randomly distributed between the experimental group and the control group.

Thus, the experimental group was composed of 132 individuals (GenderEG = 48,88% Male and 50,76% Female; AgeEG = 35,95 years old of average age; Monthly IncomeEG = 63,64% between less than 600€ and 1000€), and the control group included 142 participants (GenderEG = 53,52% Male and 45,77% Female; AgeEG = 37,39 years old of average age; Monthly IncomeEG = 63,52% between less than 600€ and 1000€) (***Table 4 - Appendix E***).

Additionally, the importance given by the individuals in the sample to the use of sunglasses was also evaluated through a seven-point Likert scale ("Totally Disagree" = 1; "Totally Agree" = 7).

To do this, the mean of this item was calculated (4,64) (***Table 5 - Appendix E***) and the sample was divided between high (> 4,64) and low (< 4,64) level of importance (***Table 6 - Appendix E***).

A dummy variable was constructed to proceed with the analysis ("High Importance" = 1; "Low Importance" = 0).

The individuals who made up the sample revealed that they mostly attributed a high level of importance to wearing sunglasses (HighImportanceEG = 53,03%, LowImportanceEG = 46,97%; HighImportanceCG = 61,97%, LowImportanceCG = 38,03%) and mainly prefer to make their sunglasses purchase on Optical stores (Preference OsEG = 45,68%; Preference OsCG = 55,09%).

5.2 - Constructs Validity and Reliability

Whenever possible, constructs and items implemented in previous research were used to ensure that the results' validity and accuracy were not compromised. Nevertheless, the scales' reliability amongst the sample was analyzed.

The internal consistency of the scales allows identifying and describing the extent to which the items of a given group measure the same concept or construct, thus referring to the relationship between the items used (Tavakol and Dennick, 2011) and is an important aspect in the interpretation of the results obtained (Henson, 2001). Thus, and with the purpose of measuring the internal consistency of the scales used in the survey applied in this study, we calculated Cronbach's alpha, which is expressed through a value between 0 and 1.

The results of Cronbach's alpha test showed the existence of 2 items that had the opposite direction to the other items of the scale. Thus, the values assigned to the items "It would be likely to return the sunglasses bought on this online store (RI3)" (both groups survey) and "The Virtual Try-on experience observed in the video made me feel bored (HV2)" (experimental group survey) and "The shopping experience on the product page observed in the video made me feel bored (HV2)" (control group survey), were inverted, so that the reading of these data was the correct one.

Also, the test acceptance threshold, which indicates inter-scale consistency when Cronbach's alpha > 0,7, revealed the necessity to adapt the number of items initially used to assess the Return Intentions construct (initial Cronbach's Alpha test = ,450) and the Hedonic Value construct (initial Cronbach's Alpha test = ,665) (*Table 7 - Appendix E*). Therefore, the items "It would be likely to return the sunglasses bought on this online store (RI3)" (both groups) and the items "The Virtual Try-on experience observed in the video made me feel bored (HV2)" (experimental group survey) and "The shopping experience on the product page observed in the video made me feel bored (HV2)" (control group survey)" was eliminated from their scales.

Cronbach's Alpha values were between ,831 and ,942 (*Table 7 - Appendix E*).

Based on the sample size and its homogeneity characteristics, normality of the distribution was assumed. Thus, specific parametric tests were performed to test the veracity of the research hypotheses (p < ,050).

5.3 - Hypotheses Testing

To determine if "**H1**: The use of Augmented Reality positively affects consumers' purchase intentions.", a simple linear regression was conducted between the exposure to the Augmented Reality manipulation ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and purchase intentions. Results illustrated a significant effect ($F_{(1,272)} = 9,996$, $p < ,050$, R Square = ,035), therefore indicating that the exposure to Augmented Reality positively influences consumers' purchase intentions in e-commerce environments ($\beta = ,592$, $t_{(272)} = 3,162$, $p < ,050$) (***Table 1***). Thus, the first hypothesis is accepted.

To investigate if "**H2**: The use of Augmented Reality negatively affects consumers' return intentions.", a simple linear regression was employed between the exposure to the Augmented Reality manipulation ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and return intentions. The results show that there is no significant effect between the two constructs ($F_{(1,272)} = 2,240$, $p > ,050$, R Square = ,008), and it cannot be confirmed that Augmented Reality exposure positively influences consumers' return intentions in e-commerce environments ($\beta = -,313$, $t_{(272)} = -1,497$, $p > ,050$) (***Table 1***). Thus, the second hypothesis is not accepted.

To understand if "**H3**: The use of Augmented Reality positively affects the hedonic value.", the results of a simple linear regression were analyzed. The statistically significant procedure ($F_{(1,272)} = 21,197$, $p < ,001$, R Square = ,072) allowed to conclude that Augmented Reality application has a positive relationship with consumers' hedonic value perceptions of the e-commerce experience ($\beta = ,851$, $t_{(272)} = 4,604$, $p < ,001$) (***Table 1***). Subsequently, supporting the acceptance of the third hypothesis.

To understand if "**H4**: The use of Augmented Reality positively affects the utilitarian value.", a simple linear regression conducted between the exposure to Augmented Reality ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and consumers' utilitarian value perceptions of the service experience, illustrated the significant relationship between this two variables ($F_{(1,272)} = 23,385$, $p < ,001$, R Square = ,079). The exposure to Augmented Reality demonstrates to have a positive effect on consumers' utilitarian value perceptions of the service experience when purchasing sunglasses in e-commerce environments ($\beta = 1,001$, $t_{(272)} = 4,836$, $p < ,001$) (***Table 1***). This confirms the fourth hypothesis.

Regarding "**H5**: The use of Augmented Reality negatively affects the perceived risk.", results of a simple linear regression indicated a significant relation between the exposure to Augmented Reality ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and consumers' perceived risk in a online service experience (F (1,272) = 16,919, p < ,001, R Square = ,059). So, it can be stated that the Augmented Reality experience has a positive effect on consumers' perceived risk on e-commerce platforms (β = ,760, t (272) = 4,113, p < ,001) (*Table 1*). The fifth hypothesis was so accepted.

To investigate if "**H6**: The use of Augmented Reality positively affects the sense of control.", the results of a simple linear regression were assessed. It has been proven that he exposure to Augmented Reality ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and consumers' sense of control have a significant relationship (F (1,272) = 13,442, p < ,001, R Square = ,047). Thus, it was concluded that the application of Augmented Reality has a positive effect on consumers' sense of control over a virtual product offering in e-commerce (β = ,725, t (272) = 3,666, p < ,001) (*Table 1*). Therefore, the sixth hypothesis was accepted.

To determine if "**H7**: The use of Augmented Reality positively affects the attractiveness of the product.", a simple linear regression was conducted between the exposure to the Augmented Reality manipulation ("Exposure to Augmented Reality" = 1; "Exposure to 2D" = 0) and attractiveness. Results illustrated a significant effect (F (1,272) = 27,675, p < ,001, R Square = ,092), therefore indicating that the exposure to Augmented Reality positively influences the attractiveness of the product in e-commerce environments (β = 1,079, t (272) = 5,261, p < ,001) (*Table 1*). So, the seventh hypothesis was accepted.

To understand if "**H8**: The use of Augmented Reality positively affects consumers' confidence.", a simple linear regression conducted between Augmented Reality exposure ("Augmented Reality exposure" = 1; "2D exposure" = 0) and consumers' confidence in an online shopping experience, illustrated the significant relationship between this two variables (F (1,272) = 17,646, p < ,001, R Square = ,061). Augmented Reality exposure has been shown to have a positive effect on consumers' confidence about sunglasses shopping experience in e-commerce (β = ,806, t (272) = 4,201, p < ,001) (*Table 1*). This confirms the eighth hypothesis.

TABLE 1 - Simple Linear Regression Results

Hypotheses	Independent variable	Dependent variable	Model Summary & ANOVA				Coefficient		
			R Square	F	df	Sig.	β	t	Sig.
H1	Exposure to Augmented Reality	Purchase intentions	,035	9,996	1	,002	,592	3,162	,002
H2		Return intentions	,008	2,240	1	,136	-,313	-1,497	,136
H3		Hedonic value	,072	21,197	1	,000	,851	4,604	,000
H4		Utilitarian value	,079	23,385	1	,000	1,001	4,836	,000
H5		Perceived risk	,059	16,919	1	,000	,760	4,113	,000
H6		Sense of control	,047	13,442	1	,000	,725	3,666	,000
H7		Attractiveness	,092	27,675	1	,000	1,079	5,261	,000
H8		Confidence	,061	17,646	1	,000	,806	4,201	,000

Source: Developed by the author based on the results obtained in the online survey (2022)

Keller (2003) claims that in consumer behaviour, perception refers to the way of stimuli which interact and integrate by the consumer towards the products. In other words, perception is the process by which individuals choose, organize and interpret their stimuli that relates to their choice of buying decision. In the same situation, each customer may have different point of view (Dave G., 2013).

The whole process of perception is made up of three different stages. First stage is called the exposure, next is attention and lastly is interpretation. The brain is the one who stimulates in the attention stage and interprets the stimuli according to the previous experience and what the individual desires in the interpretation stage (Solomon et al., 2013).

In this study, we include in the perceptions category, three interdependent mediating variables (Hedonic value, Utilitarian value and Perceived value).

The subjectivity of Augmented Reality's effect on purchase intentions, and the effects of the consumer's hedonic value (H9a), utilitarian value (H9b) and perceived risk (H9c) on an online purchase were also analyzed.

For that, one serial path mediation were conducted using Hayes' PROCESS macro (Model 6 with 3 mediators), based on a confidence interval of 95%. Results of a bootstrap procedure (5.000 samples) indicated the significance of:

(a) the indirect effect of Augmented Reality on purchase intentions, through the hedonic value (β = ,3416, p = ,000, CI [,1534, ,5644]) *(Figure 2)*;

(b) the indirect effect of Augmented Reality on purchase intentions, through the hedonic value and utilitarian value in serial (β = ,1815, p = ,000, CI [,0441, ,3798]) *(Figure 2)*;

(c) the indirect effect of Augmented Reality on purchase intentions, through the hedonic value, utilitarian value and perceived risk in serial (β = ,0707, p < ,050, CI [,0073, ,1506]) *(Figure 2)*;

(d) the direct effect of Augmented Reality on purchase intentions (β = ,5920, p < ,050, CI [,2234, ,9607]) *(Figure 2)*.

The same test indicated the not significance of:

(a) the indirect effect of Augmented Reality on purchase intentions, through the utilitarian value (β = ,0461, p > ,050, CI [-,0066, ,1222] *(Figure 2)*;

(b) the indirect effect of Augmented Reality on purchase intentions, through the perceived risk (β = ,0050, p > ,050, CI [-,0291, ,0503]) *(Figure 2)*;

(c) the indirect effect of Augmented Reality on purchase intentions, through the hedonic value and perceived risk in serial (β = ,0159, p > ,050, CI [-,0053, ,0579]) *(Figure 2)*;

(d) the indirect effect of Augmented Reality on purchase intentions, through the utilitarian value and perceived risk in serial (β = ,0187, p > ,050, CI [-,0028, ,0578]) *(Figure 2)*.

Since the total effect of Augmented Reality on purchase intentions was statistically significant (β = ,5920, p = ,000, CI [,2234, ,9607]), we can conclude that "**H9**: The positive relationship between Augmented Reality and consumers' purchase intentions is mediated by

the effect of perceptions (hedonic value (H9a), utilitarian value (H9b) and perceived risk (H9c))." was confirmed.

FIGURE 2 - Mediation by the effect of consumers' Perceptions on the effect of exposure to Augmented Reality on Purchase Intentions

Standardized coefficients: * denotes p < ,001; ** denotes p < ,050

Source: Developed by the author based on the results obtained in the online survey (2022)

The subjectivity of Augmented Reality's effect on return intentions, and the effects of the consumer's hedonic value (H10a), utilitarian value (H10b) and perceived risk (H10c) on an online purchase were also analyzed.

For that, one serial path mediation were conducted using Hayes' PROCESS macro (Model 6 with 3 mediators), based on a confidence interval of 95%. Results of a bootstrap procedure (5.000 samples) indicated the significance of:

(a) the indirect effect of Augmented Reality on return intentions, through the hedonic value (β = -,2095, p = ,000, CI [-,4291, -,0265]) *(Figure 3)*;

(b) the indirect effect of Augmented Reality on return intentions, through the hedonic value and utilitarian value in serial (β = -,2964, p = ,000, CI [-,5645, -,1102]) *(Figure 3)*;

(c) the indirect effect of Augmented Reality on return intentions, through the hedonic value, utilitarian value and perceived risk in serial (β = -,1528, p = ,000, CI [-,2580, -,0634]) *(Figure 3)*.

The same test indicated the not significance of:

(a) the indirect effect of Augmented Reality on return intentions, through the utilitarian value (β = -,0752, p > ,050, CI [-,1873, ,0092]) *(Figure 3)*;

(b) the indirect effect of Augmented Reality on return intentions, through the perceived risk (β = -,0104, p > ,050, CI [-,0974, ,0558]) *(Figure 3)*;

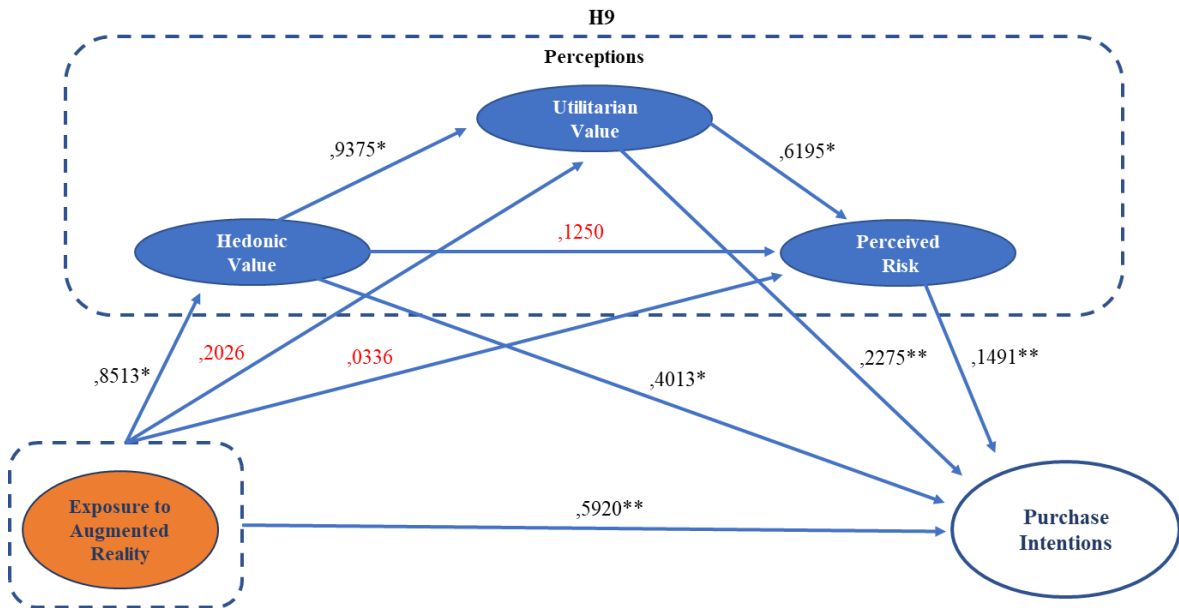(c) the indirect effect of Augmented Reality on return intentions, through the hedonic value and perceived risk in serial (β = -,0329, p > ,050, CI [-,1013, ,0117]) *(Figure 3)*;

(d) the indirect effect of Augmented Reality on return intentions, through the utilitarian value and perceived risk in serial (β = -,0388, p > ,050, CI [-,1027, ,0048]) *(Figure 3)*;

(e) the direct effect of Augmented Reality on return intentions (β = -,3127, p > ,050, CI [-,7240, ,0987]) *(Figure 3)*.

Since the total effect of Augmented Reality on return intentions was not statistically significant (β = -,3127, p > ,050, CI [-,7240, ,0987]), we can conclude that "**H10**: The positive relationship between Augmented Reality and consumers' return intentions is mediated by the effect of Perceptions (Hedonic Value (H10a), Utilitarian Value (H10b) and Perceived Risk (H10c))." was not confirmed.

FIGURE 3 - Mediation by the effect of consumers' Perceptions on the effect of exposure to Augmented Reality on Return Intentions
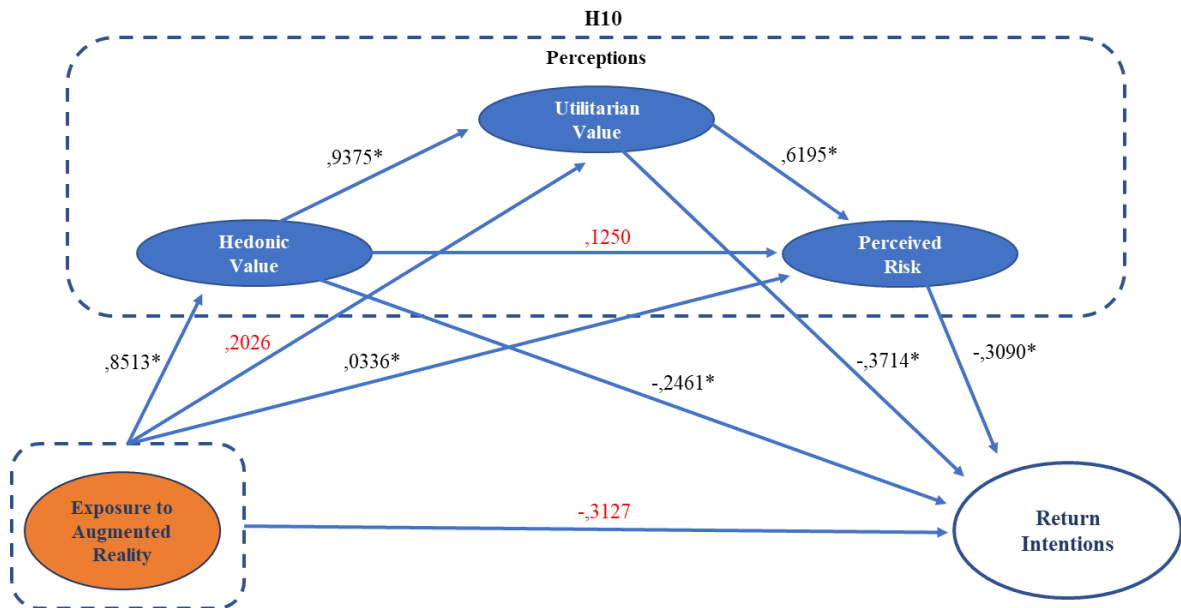
Standardized coefficients: * denotes p < ,001

Source: Developed by the author based on the results obtained in the online survey (2022)

In our everyday experiences, sensation and perception merge into a continuous process. According to Myers (2017), "sensation is the process by which our sensory receptors and nervous system receive and represent energies of stimuli from the environment."

Also per Feldman (2015), he states that human sensory capabilities go far beyond the five basic senses: sight, hearing, taste, smell, and touch.

In this study, we include in the sensations category, three interdependent mediating variables (Sense of control, Attractiveness and Confidence).

The subjectivity of Augmented Reality's effect on purchase intentions, and the effects of sense of control (H11a), attractiveness (H11b) and confidence (H11c) on an online purchase were analyzed too.

For that, one serial path mediation were conducted using Hayes' PROCESS macro (Model 6 with 3 mediators), based on a confidence interval of 95%. Results of a bootstrap procedure (5.000 samples) indicated the significance of:

(a) the indirect effect of Augmented Reality on purchase intentions, through the sense of control (β = ,1629, p = ,000, CI [,0445, ,3196]) *(Figure 4)*;

(b) the indirect effect of Augmented Reality on purchase intentions, through the attractiveness (β = ,1426, p = ,000, CI [,0183, ,3100]) *(Figure 4)*;

(c) the indirect effect of Augmented Reality on purchase intentions, through the sense of control and attractiveness in serial (β = ,1424, p = ,000, CI [,0201, ,2819]) *(Figure 4)*;

(d) the direct effect of Augmented Reality on purchase intentions (β = ,5920, p = ,000, CI [,2234, ,9607]) *(Figure 4)*.

The same test indicated the not significance of:

(a) the indirect effect of Augmented Reality on purchase intentions, through the confidence (β = -,0127, p > ,050, CI [-,0676, ,0238]) *(Figure 4)*;

(b) the indirect effect of Augmented Reality on purchase intentions, through the sense of control and confidence in serial (β = ,0132, p > ,050, CI [-,0015, ,0375]) *(Figure 4)*;

(c) the indirect effect of Augmented Reality on purchase intentions, through the attractiveness and confidence in serial (β = ,0724, p > ,050, CI [-,0001, ,1749]) *(Figure 4)*;

(d) the indirect effect of Augmented Reality on purchase intentions, through the sense of control, attractiveness and confidence in serial (β = ,0722, p > ,050, CI [,0000, ,1846]) *(Figure 4)*.

Since the total effect of Augmented Reality on purchase intentions was statistically significant (β = ,5920, p = ,000, CI [,2234, ,9607]), we can conclude that "**H11**: The positive relationship between Augmented Reality and consumers' purchase intentions is mediated by the effect of Sensations (Sense of control (H11a), Attractiveness (H11b) and Confidence (H11c))." was confirmed.

FIGURE 4 - Mediation by the effect of consumers' Sensations on the effect of exposure to Augmented Reality on Purchase Intentions

Standardized coefficients: * denotes p < ,001; ** denotes p < ,050

Source: Developed by the author based on the results obtained in the online survey (2022)

The subjectivity of Augmented Reality's effect on return intentions, and the effects of sense of control (H12a), attractiveness (H12b) and confidence (H12c) on an online purchase were also analyzed.

For that, one serial path mediation were conducted using Hayes' PROCESS macro (Model 6 with 3 mediators), based on a confidence interval of 95%. Results of a bootstrap procedure (5.000 samples) indicated the significance of:

(a) the indirect effect of Augmented Reality on return intentions, through the attractiveness (β = -,2138, p = ,000, CI [-,4316, -,0537]) *(Figure 5)*;

(b) the indirect effect of Augmented Reality on return intentions, through the sense of control and attractiveness in serial (β = -,2134, p = ,000, CI [-,3961, -,0621]) *(Figure 5)*;
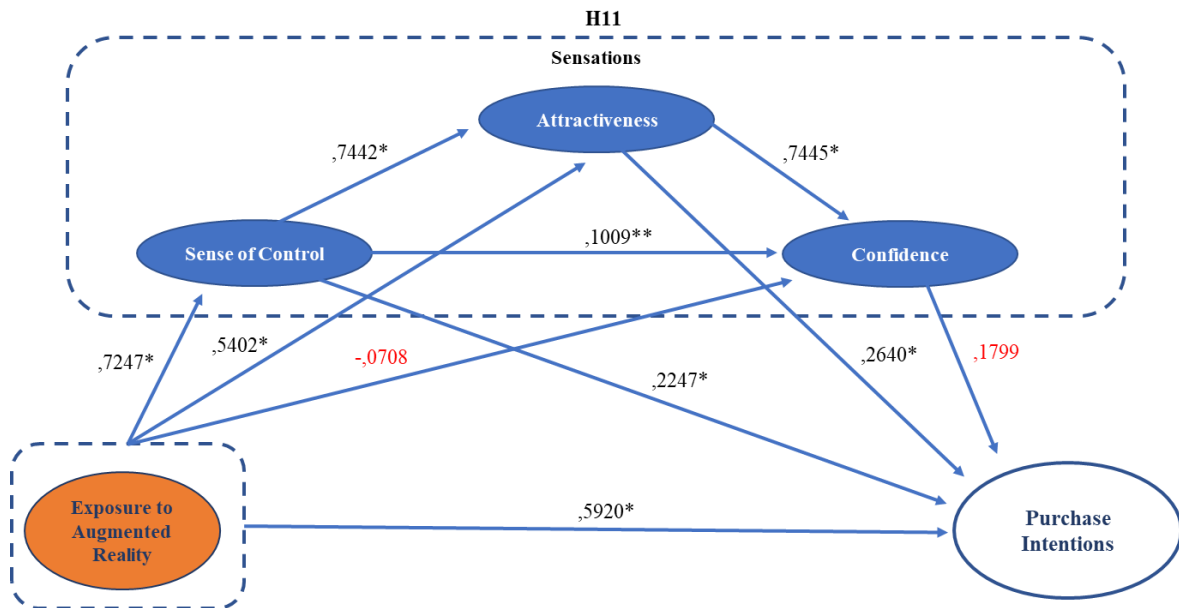
(c) the indirect effect of Augmented Reality on return intentions, through the sense of control and confidence in serial (β = -,0230, p < ,050, CI [-,0596, -,0002]) *(Figure 5)*;

(d) the indirect effect of Augmented Reality on return intentions, through the attractiveness and confidence in serial (β = -,1263, p = ,000, CI [-,2657, -,0321]) *(Figure 5)*;

(e) the indirect effect of Augmented Reality on return intentions, through the sense of control, attractiveness and confidence in serial (β = -,1261, p = ,000, CI [-,2784, -,0292]) *(Figure 5)*;

(f) the direct effect of Augmented Reality on return intentions (β = -,3127, p = ,000, CI [-,7240, ,0987]) *(Figure 5)*.

The same test indicated the not significance of:

(a) the indirect effect of Augmented Reality on return intentions, through the sense of control (β = -,0626, p > ,050, CI [-,2101, ,0539]) *(Figure 5)*;

(b) the indirect effect of Augmented Reality on return intentions, through the confidence (β = ,0223, p > ,050, CI [-,0433, ,1078]) *(Figure 5)*;

Since the total effect of Augmented Reality on return intentions was not statistically significant (β = -,3127, p > ,050, CI [-,7240, ,0987]), we can conclude that "**H12**: The positive relationship between Augmented Reality and consumers' return intentions is mediated by the effect of Sensations (Sense of control (H12a), Attractiveness (H12b) and Confidence (H12c))." was not confirmed.

FIGURE 5 - Mediation by the effect of consumers' Sensations on the effect of exposure to Augmented Reality on Return Intentions
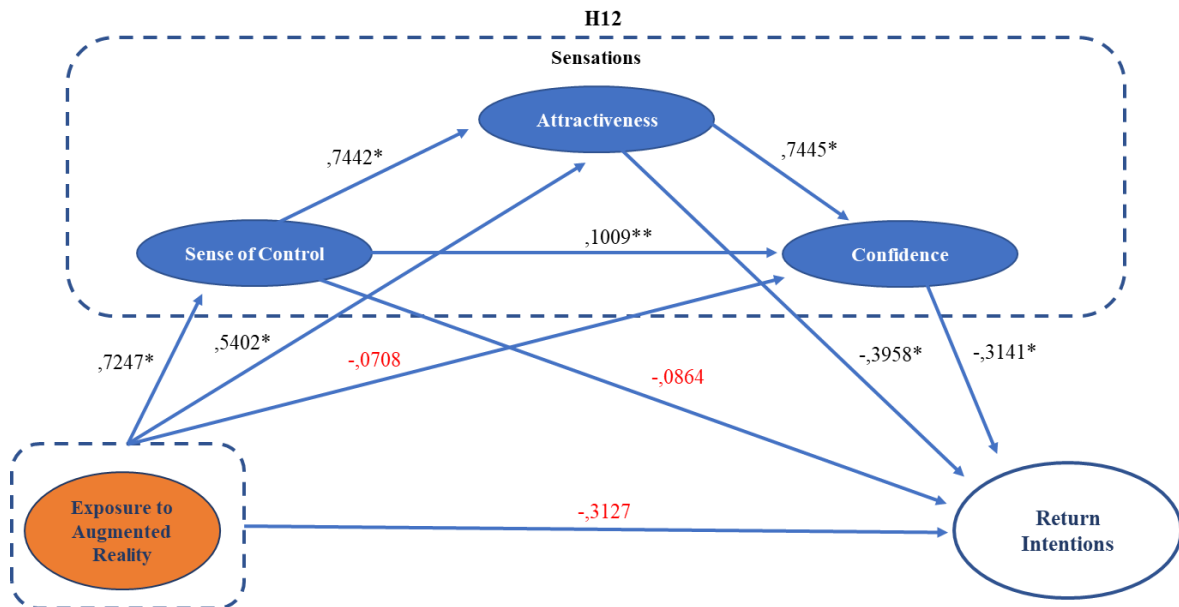
Standardized coefficients: * denotes p < ,001; ** denotes p < ,050; ***denotes p > ,050

Source: Developed by the author based on the results obtained in the online survey (2022)

5.4 - Further Relevant Analysis

The simultaneous direct effect of all existing variables in the perceptions and sensations categories on purchase intentions and product returns and their subjectivity according to the type of manipulation experienced (Augmented Reality versus 2D) was also analyzed. For this, four multiple linear regression models were conducted.

The experimental group model's outcome reported the simultaneous effect of the constructs on the purchase intentions to be significant ($F_{(6,125)} = 26,944$, $p = ,000$, R Square = ,564).

To allow a comparison between the various variables under study, the standardized Beta was used. Thus, it was verified the existence of significant positive relation between the direct effect of consumer's hedonic value perceptions ($\beta = ,279$, $t_{(125)} = 2,401$, $p = ,027$) and sense of control ($\beta = ,215$, $t_{(125)} = 2,401$, $p = ,022$) driven Augmented Reality

experience and consumers' purchase intentions. The direct effect of consumers' utilitarian value perceptions (β = ,269, t (125) = 1,886, p = ,062), perceived risk (β = ,017, t (125) = ,133, p = ,894), attractiveness (β = -,008, t (125) = -,054, p = ,957) and confidence (β = ,051, t (125) = ,346, p = ,730) demonstrated not to be significant when simultaneously analyzed with the direct effect of the constructs above presented *(Table 8 – Appendix E)*.

With regard to the control group the results demonstrated the simultaneous effect of the constructs on purchase intentions to be significant (F (6,135) = 30,074, p = ,000, R Square = ,572).

A significant positive direct effect of hedonic value perceptions (β = ,432, t (135) = 4,188, p = ,000), utilitarian value (β = ,247, t (135) = 2,029, p = ,044) and perceived risk (β = ,214, t (135) = 2,454, p = ,015) was found to be present in this 2D experiment. In the opposite direction, the same study showed not to be significant the direct effect of sense of control (β = -,070, t (135) = -,834, p = ,406), attractiveness (β = ,131, t (135) = 1,109, p = ,269) and confidence (β = -,146, t (135) = -1,310, p = ,192) *(Table 9 – Appendix E)*.

Identical analyses were done with respect to the dependent variable Return Intentions.

Also here, the experimental group model's outcome reported the simultaneous effect of the constructs on the dependent variable to be significant (F (6,125) = 46,395, p = ,000, R Square = ,690).

This analysis proved the existence of significant positive relation between the direct effect of consumer's utilitarian value perceptions (β = ,294, t (125) = -2,445, p = ,016) driven Augmented Reality experience and consumers' return intentions. The direct effect of consumers' hedonic value perceptions (β = -,138, t (125) = -1,317, p = ,190), perceived risk (β = -,171, t (125) = -1,549, p = ,124), sense of control (β = -,025, t (125) = -,323, p = ,747), attractiveness (β = -,237, t (125) = -1,893, p = ,061) and confidence (β = -,030, t (125) = -,244, p = ,808) demonstrated not to be significant when analyzed with the direct effect of the constructs above presented *(Table 8 – Appendix E)*.

Results of the control group's model demonstrated the significance of the independent variables' simultaneous effect on return intentions (F (6,135) = 34,862, p = ,000, R Square = ,608).

A significant direct effect of hedonic value perceptions (β = -,250, t (135) = -2,527, p = ,013), utilitarian value (β = -,349, t (135) = -2,988, p = ,003) and perceived risk (β = -,296, t (135) = -3,541, p = ,000) was found to be present in this 2D experiment. In the opposite direction, the same study showed not to be significant the direct effect of sense of control (β = ,128, t (135) = 1,591, p = ,114), attractiveness (β = -,082, t (135) = -,724, p = ,470) and confidence (β = ,012, t (135) = ,112, p = ,911) *(Table 9 – Appendix E)*.

The discrepancy of the models (*Figure 6*) illustrates the volatility of purchase intentions and return intentions in e-commerce environments, according to the typology of the shopping experience performed.

In case of using Augmented Reality as a service enabler in e-commerce environments, purchase intention is most affected by the hedonic value, utilitarian value and sense of control. In contrast, for a traditional 2D selling strategy, purchase intentions are directly driven by hedonic value, utilitarian value and perceived risk. These analyses allowed us to conclude that Augmented Reality technology does have a significant influence in increasing purchase intentions, compared to its 2D alternative (M_{PI_EG} = 3,37, M_{PI_CG} = 2,78).

FIGURE 6 - Multiple Linear Regression Model: Augmented Reality versus 2D in Purchase Intentions

EXPERIMENTAL GROUP – AUGMENTED REALITY CONDITION

CONTROL GROUP – 2D CONDITION

Hedonic Value Mean = 4,04 — β = ,285 — Purchase Intentions Mean = 3,37
Utilitarian Value Mean = 4,58 — β = ,241
Perceived Risk Mean = 4,39 — β = ,018
Sense of Control Mean = 3,62 — β = ,211
Attractiveness Mean = 4,66 — β = -,007
Confidence Mean = 4,78 — β = ,051

Hedonic Value Mean = 3,19 — β = ,434 — Purchase Intentions Mean = 2,78
Utilitarian Value Mean = 3,58 — β = ,228
Perceived Risk Mean = 3,63 — β = ,213
Sense of Control Mean = 2,90 — β = -,064
Attractiveness Mean = 3,58 — β = ,117
Confidence Mean = 3,97 — β = -,139

PI_{EG} = -,073 + ,285HV + ,241UV + ,018PR + ,211SC - ,007AT + ,051CF

PI_{CG} = ,130 + ,434HV + ,228UV + ,213PR - ,064SC + ,117AT - ,139CF

Source: Developed by the author based on the results obtained in the online survey (2022)

As for product return intentions, the two models studied did not reveal significant differences (M_{PI_EG} = 4,11, M_{PI_CG} = 4,42) (**Figure 7**). In the case of using Augmented Reality as a service enabler in e-commerce environments, return intention is most affected by perceptions of utilitarian value, perceived risk and attractiveness. For a traditional 2D selling strategy, return intentions are directly driven by perceptions of hedonic value, utilitarian value, and perceived risk.

FIGURE 7 - Multiple Linear Regression Model: Augmented Reality versus 2D in Return Intentions

EXPERIMENTAL GROUP – AUGMENTED REALITY CONDITION

Hedonic Value Mean = 4,04 — β = -,150
Utilitarian Value Mean = 4,58 — β = -,280
Perceived Risk Mean = 4,39 — β = -,187
Sense of Control Mean = 3,62 — β = -,026
Attractiveness Mean = 4,66 — β = -,234
Confidence Mean = 4,78 — β = -,032
Return Intentions Mean = 4,11

$PI_{EG} = 8,157 - ,150HV - ,280UV - ,187PR - ,026SC - ,234AT - ,032CF$

CONTROL GROUP – 2D CONDITION

Hedonic Value Mean = 3,19 — β = -,296
Utilitarian Value Mean = 3,58 — β = -,380
Perceived Risk Mean = 3,63 — β = -,348
Sense of Control Mean = 2,90 — β = ,138
Attractiveness Mean = 3,58 — β = -,086
Confidence Mean = 3,97 — β = ,013
Return Intentions Mean = 4,42

$PI_{CG} = 7,844 - ,296HV - ,380UV - ,348PR + ,138SC - ,086AT + ,013CF$

Source: Developed by the author based on the results obtained in the online survey (2022)

CHAPTER 6 – CONCLUSIONS

6.1 - Discussion of Results

The main purpose of this study was to investigate the influence Augmented Reality may have on increasing consumers' purchase intentions and return intentions for products purchased online.

Being seemingly two antagonistic concepts, the research was designed to test these effects separately. To conduct this study, we defined a set of six variables that were grouped into two distinct blocks (Perceptions and Sensations), in order to study and test the direct effects arising from shopping experiences using Augmented Reality technology and traditional 2D product image display through these variables. For this, simple linear regressions were used.

Before starting this discussion of results, it is worth remembering that the sample was constituted as follows:

- Experimental group (n = 132 participants; M_{AGE} = 35,95 years old; $M_{USE\_SUNGLASSES}$ = 77,27%; M_{BUY_ONLINE} = 13,58%)
- Control group (n = 142 participants; M_{AGE} = 37,39 years old; $M_{USE\_SUNGLASSES}$ = 81,69%; M_{BUY_ONLINE} = 10,18%)

The test proved that the exposure to Augmented Reality manipulation effectively contributed to the increased consumers' purchase intentions in online retail environments **(H1)**. It should be noted that in this study the use of Augmented Reality explains only a 3,5% of the variation in the increase in consumers' purchase intentions, so other factors will be responsible for the remaining variation. This result falls short of other known studies and statistics, where the importance of this type of technology translates into an increase in conversions around 25% (MADE.com) and 40% (Forbes). Proof of this is the fact that the world's leading eyewear brands (Ray-Ban, Prada, Gucci, Louis Vuitton, Guess, Diesel, Oakley, etc.) already use Augmented Reality (Virtual Try-on) on their sites.

On the other hand, it was not possible to prove that the use of Augmented Reality in the online sales process could reduce the return intentions **(H2)**. A possible explanation for this result may be related to the fact that an item was eliminated "It would be likely to return the sunglasses bought on this online store" in the question that tested the intentions of returning

products, leaving only two items. On the other hand, some studies report a 40% decrease in returns from 3D visualization (Shopify).

The acceptance of the third hypothesis is not surprising, given the fact that numerous studies prove that virtual experimentation through Augmented Reality provides the perception of hedonic value, offering customers a sense of comfort at a fundamental stage of decision making (HILKEN et al., 2017) **(H3)**.

Likewise, it was perfectly expected that the use of Augmented Reality would positively affect the utilitarian value, since the shopping experience would be much more rational, given the fact that the buyer could "try on" the article itself, before deciding to buy **(H4)**.

The use of Virtual Try-on makes the purchase process more efficient and safer, since it shows the item from all angles on the buyer himself, unlike 2D product image display, thus reducing the risk perceived by the buyer. Also, in this study it was proved that the use of Augmented Reality negatively affects the perceived risk, that is, they have opposite directions **(H5)**.

The sense of control is the most relevant and differentiating aspect between a purchase with Augmented Reality technology and a purchase in the traditional 2D model. This aspect translates into the feeling of being able to touch and manipulate an object, a situation that can only be experienced through immersive technologies. Thus, the acceptance of the hypothesis was expected as it actually happened **(H6)**.

The emotions users feel when using a product, such as joy or enthusiasm, influence the attractiveness they attribute to it. Experiences such as Augmented Reality contribute significantly to increasing the attractiveness of a purchase because they are the result of a complex cognitive process, where value, trust, commitment, collaboration and satisfaction are of relevant importance.

In this research, the use of Augmented Reality positively affected the sensation of attractiveness, as evidenced by the results obtained in the simple linear regression. It should be noted that in this study the use of Augmented Reality explains 9,2% of the variation in the increase in attractiveness, which is the construct where the variation is most significant **(H7)**.

No consumer likes to make a purchase decision when they are not completely sure and secure about it. However, this scenario is real. Augmented Reality, through virtual simulation with holograms, aims to solve this problem and give the customer more certainty in his decision, while increasing confidence and satisfaction in the product tried and viewed, facilitating the purchase process. This aspect was tested in this research, proving, as expected, its validity **(H8)**.

Continuing the study, we proceeded to analyze the effects of Augmented Reality on purchase intentions using 3 mediators (hedonic value (H9a), utilitarian value (H9b), and perceived risk (H9c)) **(H9)**.

To do so, one serial mediation was performed using Hayes' macro PROCESS (Model 6 with 3 mediators), based on a 95% confidence interval with a bootstrap procedure of 5,000 samples.

The results showed statistical significance in the indirect effects through the hedonic value, through the hedonic value and utilitarian value in serial, through the hedonic value, utilitarian value and perceived risk in serial and the direct effect of Augmented Reality on purchase intentions.

The same study showed not to be significant the indirect effect through the utilitarian value, perceived risk, hedonic value and perceived risk in serial and utilitarian value and perceived risk in serial.

The reported non-significances indirect effects result mainly from unproven direct effects between variables, namely Augmented Reality on utilitarian value and Augmented Reality on perceived value, and also hedonic value on perceived value.

However, as the total effect of Augmented Reality on purchase intentions was statistically significant, the hypothesis under study was confirmed.

An identical test was conducted to analyze the effects of Augmented Reality on return intentions using 3 mediators (sense of control (H10a), attractiveness (H10b), and confidence (H10c)) **(H10)**.

The results showed statistical significance in the indirect effects through the hedonic value, through the hedonic value and utilitarian value in serial, through the hedonic value, utilitarian value and perceived risk in serial.

The same study showed not to be significant the indirect effect through the utilitarian value, perceived risk, hedonic value and perceived risk in serial and utilitarian value and perceived risk in serial and direct effect of Augmented Reality on return intentions.

The reported non-significances indirect effects result mainly from unproven direct effects between variables, namely Augmented Reality on utilitarian value and Augmented Reality on perceived value and hedonic value on perceived value.

As the total effect of Augmented Reality on return intentions was not statistically significant, the hypothesis under study was not confirmed.

A third test was run to analyze the effects of Augmented Reality on purchase intentions using 3 mediators (sense of control (H11a), attractiveness (H11b), and confidence (H11c)) (**H11**).

The results showed statistical significance in the indirect effects through the sense of control, through the attractiveness, sense of control and attractiveness in serial, and the direct effect of Augmented Reality on purchase intentions.

The same test did not reveal statistical significance of the indirect effect through the confidence, sense of control and confidence in serial, attractiveness and confidence in serial and sense of control, attractiveness and confidence in serial.

Again, the justification for non-significance is related to unproven direct effects between variables, namely Augmented Reality on confidence and confidence on purchase intentions.

However, as the total effect of Augmented Reality on purchase intentions was statistically significant, the hypothesis under study was confirmed.

Finally, a fourth analysis was conducted to analyze the effects of Augmented Reality on product return intentions using 3 mediators (sense of control (H12a), attractiveness (H12b), and confidence (H12c)) (**H12**).

The results highlighted statistical significance in the indirect effects through the attractiveness, sense of control and attractiveness in serial, sense of control and confidence

in serial, attractiveness and confidence in serial, sense of control, attractiveness and confidence in serial, and the direct effect of Augmented Reality on return intentions.

Also, in this analysis there were two direct effects between variables that were not statistically significant. These were the cases of Augmented Reality on sense of control and Augmented Reality on confidence.

Again, as the total effect of Augmented Reality on return intentions was not statistically significant, this hypothesis cannot be accepted.

To complement the study conducted earlier, it was also decided to analyze the direct and simultaneous effect of all variables on purchase intentions and returns intentions, according to the type of manipulation experienced (Augmented Reality versus 2D). To this end, four multiple linear regression models were conducted.

The first analysis was conducted only with participants in the experimental group (n=132) and aimed to study the simultaneous effect of all variables on purchase intentions. The final results demonstrated the simultaneous effect of the constructs on purchase intentions were significant.

To allow a comparison between the six variables under study, the standardized Beta was used. Thus, a significant positive relationship was found to exist between the direct effects of hedonic value and sense of control on consumers' purchase intentions.

The direct effects of utilitarian value, perceived risk, attractiveness and confidence proved not to be significant when analyzed simultaneously.

The same experiment was run with the control group members (n=142), and again the results showed the simultaneous effect of the various variables on purchase intentions to be significant.

A significant positive direct effect of hedonic value, utilitarian value and perceived risk was also confirmed in this 2D experiment. In the opposite direction, the same study showed the direct effects of sense of control, attractiveness and confidence to be non-significant.

Identical analyses were done with respect to the dependent variable return intentions.

Also here, the experimental group model's outcome reported the simultaneous effect of the constructs on the return intentions to be significant.

This analysis proved the existence of a significant positive relationship between the direct effect of utilitarian value and return intentions when Augmented Reality technology was used.

The direct effects of hedonic value, perceived risk, sense of control, attractiveness and confidence proved not to be significant when analyzed simultaneously.

The same experiment with the control group also highlighted the simultaneous effect of the independent variables on return intentions.

A significant direct effect of hedonic value, utilitarian value and perceived risk was verified in this 2D experiment. Contrarily, the direct effects of sense of control, attractiveness and confidence were not significant.

To finalize this study, four more specific analyses were performed to see which variables most influenced consumers' purchase intentions and return intentions, both in an experiment using Augmented Reality technology and through 2D product image display.

In the case of using Augmented Reality in an e-commerce environment, purchase intention is most affected by hedonic value, utilitarian value and sense of control. In contrast, for a traditional strategy of selling through 2D product image display, purchase intentions are directly driven by hedonic value, utilitarian value and perceived risk.

In summary, the final data from these studies allowed us to conclude that the use of Augmented Reality in e-commerce was a factor that increased purchase intentions compared to the sales model using traditional e-commerce 2D images.

However, the factor that contributed most to the difference in consumer purchase intentions in the two models, was sense of control. The divergence of its effect strength present in the analysis of the models reveals the ability of Augmented Reality to generate an added value for sellers, since it leads to greater security in the buying experience, translating into an improvement in consumers' purchase intention in the e-commerce environment.

With regard to return intentions, it was found that the most significant aspects related to the use of Augmented Reality were utilitarian value, perceived risk and attractiveness, while in traditional e-commerce (2D) were hedonic value, utilitarian value and perceived risk.

On the other hand, the analyses carried out to verify the influence of the two types of technologies on return intentions showed very similar results, and therefore it cannot be said that the use of Augmented Reality technology also contributed to reducing returns intentions in e-commerce.

In summary, we can conclude that the main findings of this dissertation point in the direction that the use of Augmented Reality technology in e-commerce effectively contributes to generate a competitive advantage compared to the traditional (2D) sales model. This advantage comes from the improvement of the consumer's shopping experience, both in terms of the perceptions of hedonic and utilitarian values and the perceived risk inherent in any distance purchase, and in terms of the sensations of attractiveness, confidence and, especially, the sense of control.

The findings of this dissertation are of extreme relevance for the optimization and exploitation of the potential of e-commerce, as well as for the development of unique online customer experiences that overcome sensory limitations, making it an experience similar to that offered in a physical store environment.

As a conclusion, we can state that this dissertation brings knowledge, since it approaches an innovative perspective of Augmented Reality, studying the direct and simultaneous effects of several variables on Purchase Intentions and Return Intentions in e-commerce.

6.2 - Implications for the Study Area

The results of the study demonstrate the disruption of a contribution to the existing literature in several ways. Previous research has looked at the effects of Augmented Reality on the variables used in the present study, but always from a perspective of individual analysis without interdependencies among them. However, the direct impact of each variable and the simultaneous direct effect on purchase intentions and return intentions when Augmented Reality is present have not been previously evaluated. Thus, the present study contributes to future literature by exploring the discrepancy in the behaviors of the various variables and their influence on purchase intentions and product devolution intentions when the service

experience is provided by a solution based on Augmented Reality platforms versus traditional 2D product image display.

Subsequently, the establishment of existing mediations by the effect of perceptions (hedonic value, utilitarian value and perceived risk) and sensations (sense of control, attractiveness and confidence) on the effect of Augmented Reality on purchase intentions and return intentions expands existing research by introducing a set of new analyses.

This research study elaborates an analysis focused on the e-commerce of an optical product (sunglasses), and its findings may contribute to research on the adoption of new methods of online sales that overcome the existing sensory inadequacies in this type of distance sales and contribute to the increase of more sustainable purchase intentions.

6.3 - Research Limitations

The realization of the present research study faced several constraints. The scarcity of resources available to build the conditions for Augmented Reality manipulation are identified as the first major constraint. The inaccessibility to technological resources to develop a real Augmented Reality interface led to the decision to use test videos that simulated shopping experiences based on this innovative technology.

The experimentation would be more convincing if it were carried out in a real Augmented Reality environment, where participants could actually test the experiment model themselves.

Also in the technological field, the existing limitations of the Qualtrics platform license used, namely the impossibility of embedding videos to the questionnaires, forced the adoption of a alternative solution that involved the use of a YouTube link to access the video, where participants would have to copy and paste it into another page and, after viewing the video, go back to the previous page and finish answering the survey questions. This additional step was the factor that most contributed to participants dropping out. Another factor that had a lot of importance was the fact that many participants answered the survey via mobile devices, where the video viewing experience was not the best, which influenced how the participants answered the questions related to the shopping experience.

These dropouts, combined with other factors that conditioned the distribution of the survey, namely the lack of a database that could be used for academic purposes, meant that the sample was not more extensive and therefore more representative.

We also highlight that most of the survey results point to the fact that people on average prefer to buy sunglasses in physical optical stores, making up for 50,46% of responses, while only 11,85% prefer online platforms for this purpose, which limits, in a way, the object under study that was based, essentially, on an e-commerce environment.

The high average age of the participants (36,69 years old) may have been the biggest limitation of this study, since for younger age groups, where the understanding and acceptance of immersive technologies such as Augmented Reality is much greater, the answers could have been different and, consequently, the results to the survey, eventually leading to different conclusions than those accepted in this project.

As for the Augmented Reality experience itself, we highlight the fact that it focused only on the visual aspect, and did not take into consideration other sensory aspects that could be important in the consumer's decision-making process, such as the sensation of touch, texture, etc.

Finally, given the research method and the means used in the experiment, the analysis and conclusions reached in this study may not be possible to transpose to other types of products in the optics industry, such as contact lenses, prescription glasses, etc.

6.4 - Suggestions for Future Research

It would be important to reanalyze the hypothesis not validated in this study, that is, whether the use of Augmented Reality negatively affects the intentions of returning products purchased in an e-commerce environment, since there are studies in other business areas that prove this trend.

Future research is recommended to focus on understanding and clarifying the influence of sensory stimuli other than visual on shopping experiences through online platforms using Augmented Reality technology.

It is also considered very important to study in depth the relationship between purchase intentions and product return intentions, as this factor may become a determinant for the sustainable development of the planet with regard to online shopping.

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Appendices

APPENDIX A - EXPERIMENTAL GROUP SURVEY (ENGLISH VERSION)

Introduction

Dear participant

This questionnaire is part of a Master's in Psychology in Business and Economics at the Faculty for Human Sciences of the Catholic University of Lisbon and aims to analyze consumer opinions regarding the purchase intentions of sunglasses through online sales channels.

The questionnaire is anonymous and the results obtained will be used for academic purposes only. There are no right or wrong answers. Therefore, we ask that you respond spontaneously and sincerely to all questions.

The duration of this questionnaire is approximately 7 minutes.

Thank you in advance for your cooperation.

Section 1: Language

Q1: Please choose a language.

    o Portuguese (1)

    o English (2)

Section 2: Socio-demographic data

Q2: Please indicate your gender.

    o Female (1)

    o Male (2)

    o Prefer not to say (3)

Q3: Please indicate your age.

    _____

Q4: Please indicate your net monthly income level.

    o < 600 € (1)

    o 601 € - 1.000 € (2)

    o 1.001 € - 1.500 € (3)

    o 1.501 € - 2.000 € (4)

    o > 2.001 € (5)

Section 3: Screening

Q5: Do you use sunglasses?

    o Yes (1)

    o No (2)

Q6: Please indicate how important the use of sunglasses is for you. (Rate from 1 = Not Important to 7 = Extremely Important)

	1 = Not important (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Extremely important (7)
Importance of wearing sunglasses (CH1).	o	o	o	o	o	o	o

Q7: Please indicate where you usually buy sunglasses.

    o Optical Stores (1)

    o Official brand stores (2)

    o Online Stores (3)

    o Others (4)

Dear participant

SAGGA is an emerging unisex eyewear brand that launched its first online store this year.

Please watch the video below imagining you are experiencing the following experience:

You need to buy a new pair of good quality sunglasses. One day, you click on an advertisement that takes you to the website of the sunglasses brand SAGGA. Start by exploring the online store's homepage to find out about the different sunglasses offers available.

You like the SAGGA-Z04 model, which happen to be one of the most popular models of the brand. Click to open the product page and within that page you will see that there is a Virtual Try-on feature, where you have the possibility to virtually check how the sunglasses look on your face.

At the end of the experience, decide to purchase this model through the Virtual Try-on functionality, completing the purchase process.

After you finish watching the video, I ask you to return to this questionnaire and answer the questions that follow, based on your experience.

To watch the video, copy and paste this link into a new page:
https://youtu.be/bS3_Y6E1fXo

Q8: Please indicate your level of agreement with the following statements. (Rate from 1 =
Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I intend to buy some sunglasses through this online store (PI1).	o	o	o	o	o	o	o
In the future, I would buy sunglasses through this online store (PI2).	o	o	o	o	o	o	o
I would consider this online store as one of my first choices for buying sunglasses (PI3).	o	o	o	o	o	o	o

Q9: Please indicate your level of agreement with the following statements. (Rate from 1 = Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I think I will be satisfied with the purchase of these sunglasses in this online store (RI1).	○	○	○	○	○	○	○
I don't think I will regret having bought these sunglasses in this online store (RI2).	○	○	○	○	○	○	○
It would be likely to return the sunglasses bought on this online store (RI3).	○	○	○	○	○	○	○

Q10: Please state the extent to which you identify with the following statements. (Rate from 1 = Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
The experience with the *Virtual Try-on* observed in the video made me feel good (HV1).	○	○	○	○	○	○	○
Virtual Try-on experience observed in the video made me feel bored (HV2).	○	○	○	○	○	○	○
The Virtual Try-on experience observed in the video was exciting (HV3).	○	○	○	○	○	○	○
The experience with the Virtual Try-on observed in the video was crucial for an efficient purchase (UV1).	○	○	○	○	○	○	○
The Virtual Try-on experience observed in the video would improve my ability to buy sunglasses from online stores (UV2).	○	○	○	○	○	○	○
The Virtual Try-on experience observed in the video would contribute to a successful purchase (UV3).	○	○	○	○	○	○	○

The experience with the Virtual Try-on observed in the video would help to reduce the risk of the purchased item not meeting my expectations (PR1).	o	o	o	o	o	o	o
The experience with the Virtual Try-on observed in the video would contribute to decreasing the probability of paying more money for an article than it is actually worth (PR2).	o	o	o	o	o	o	o
The experience with the Virtual Try-on observed in the video would contribute to reducing the probability of regret for the purchase made (PR3).	o	o	o	o	o	o	o

Q11: Please indicate your level of agreement with the following statements. (Rate from 1 = Strongly disagree to 7 = Strongly agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I had the feeling that I could touch the article virtually (SC1).	o	o	o	o	o	o	o
I had the feeling that I was using the article really (SC2).	o	o	o	o	o	o	o
I had the feeling that I could move the article with my hands (SC3).	o	o	o	o	o	o	o
The use of the Virtual Try-on makes the product more attractive (AT1).	o	o	o	o	o	o	o
The use of the Virtual Try-on could be a criterion of choice when making an online purchase (AT2).	o	o	o	o	o	o	o
If you weren't looking for sunglasses, using the Virtual Try-on could make that purchase more attractive (AT3).	o	o	o	o	o	o	o

The Virtual Try-on application inspires confidence (CF1).	o	o	o	o	o	o	o
The Virtual Try-on application allows the consumer to get closer to the product to buy (CF2).	o	o	o	o	o	o	o
The transmitted information from the Virtual Try-on application seemed honest and sincere (CF3).	o	o	o	o	o	o	o

Ending message

We appreciate your participation in this survey. Your reply has been successfully registered.

APPENDIX B - CONTROL GROUP SURVEY (ENGLISH VERSION)

Introduction

Dear participant

This questionnaire is part of a Master's in Psychology in Business and Economics at the Faculty for Human Sciences of the Catholic University of Lisbon and aims to analyze consumer opinions regarding the purchase intentions of sunglasses through online sales channels.

The questionnaire is anonymous and the results obtained will be used for academic purposes only. There are no right or wrong answers. Therefore, we ask that you respond spontaneously and sincerely to all questions.

The duration of this questionnaire is approximately 7 minutes.

Thank you in advance for your cooperation.

Q1: Please choose a language.

    o Portuguese (1)

    o English (2)

Q2: Please indicate your gender.

    o Female (1)

    o Male (2)

    o Prefer not to say (3)

Q3: Please indicate your age.

_____

Q4: Please indicate your net monthly income level.

    o < 600 € (1)

    o 601 € - 1.000 € (2)

    o 1.001 € - 1.500 € (3)

    o 1.501 € - 2.000 € (4)

    o > 2.001 € (5)

Q5: Do you use sunglasses?

    o Yes (1)

    o No (2)

Q6: Please indicate how important the use of sunglasses is for you. (Rate from 1 = Not Important to 7 = Extremely Important)

	1 = Not important (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Extremely important (7)
Importance of wearing sunglasses (CH1).	o	o	o	o	o	o	o

Q7: Please indicate where you usually buy sunglasses.

o Optical Stores (1)

o Official brand stores (2)

o Online Stores (3)

o Others (4)

Dear participant

SAGGA is an emerging unisex eyewear brand that launched its first online store this year.

 Please watch the video below imagining you are experiencing the following experience:

You need to buy a new pair of good quality sunglasses. One day, you click on an advertisement that takes you to the website of the sunglasses brand SAGGA. Start by exploring the online store's homepage to find out about the different sunglasses offers available.

You like the SAGGA-Z04 model, which happen to be one of the most popular models of the brand. Click to open the product page and at the end of the experience, decide to purchase this model, completing the purchase process.

After you finish watching the video, I ask you to return to this questionnaire and answer the questions that follow, based on your experience.

To watch the video, copy and paste this link into a new page:
https://youtu.be/bS3_Y6E1fXo

Q8: Please indicate your level of agreement with the following statements. (Rate from 1 = Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I intend to buy some sunglasses through this online store (PI1).	o	o	o	o	o	o	o
In the future, I would buy sunglasses through this online store (PI2).	o	o	o	o	o	o	o
I would consider this online store as one of my first choices for buying sunglasses (PI3).	o	o	o	o	o	o	o

Q9: Please indicate your level of agreement with the following statements. (Rate from 1 = Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I think I will be satisfied with the purchase of these sunglasses in this online store (RI1).	○	○	○	○	○	○	○
I don't think I will regret having bought these sunglasses in this online store (RI2).	○	○	○	○	○	○	○
It would be likely to return the sunglasses bought on this online store (RI3).	○	○	○	○	○	○	○

Q10: Please state the extent to which you identify with the following statements. (Rate from 1 = Totally disagree to 7 = Totally agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
The shopping experience on the product page observed in the video made me feel good (HV1).	○	○	○	○	○	○	○
The shopping experience on the product page observed in the video made me feel bored (HV2).	○	○	○	○	○	○	○
The shopping experience on the product page observed in the video was exciting (HV3).	○	○	○	○	○	○	○
The shopping experience on the product page observed in the video was crucial for an efficient purchase (UV1).	○	○	○	○	○	○	○
The shopping experience on the product page observed in the video would improve my ability to buy sunglasses from online stores (UV2).	○	○	○	○	○	○	○
The shopping experience on the product page observed in the video would contribute to a successful purchase (UV3).	○	○	○	○	○	○	○

The shopping experience on the product page observed in the video would contribute to reducing the risk of the purchased item not meeting my expectations (PR1).	O	O	O	O	O	O	O
The shopping experience on the product page observed in the video would contribute to reducing the likelihood of paying more money for an item than it is actually worth (PR2).	O	O	O	O	O	O	O
The shopping experience on the product page observed in the video would contribute to reducing the likelihood of regret for the purchase made (PR3).	O	O	O	O	O	O	O

Section 8: Sensations

Q11: Please indicate your level of agreement with the following statements. (Rate from 1 = Strongly disagree to 7 = Strongly agree)

	1 = Totally disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 = Totally agree (7)
I had the feeling that I could touch the article virtually (SC1).	o	o	o	o	o	o	o
I had the feeling that I was using the article really (SC2).	o	o	o	o	o	o	o
I had the feeling that I could move the article with my hands (SC3).	o	o	o	o	o	o	o
The use of the product page observed in the video makes the product more attractive (AT1).	o	o	o	o	o	o	o
The use of the product page observed in the video could be a choice criterion when making an online purchase (AT2).	o	o	o	o	o	o	o
If you weren't looking for sunglasses, using the product page observed in the video could make that purchase more attractive (AT3).	o	o	o	o	o	o	o

The product page observed in the video inspires confidence (CF1).	o	o	o	o	o	o	o
The product page observed in the video allows the consumer to be closer to the item to buy (CF2).	o	o	o	o	o	o	o
The information conveyed by the product page observed in the video seemed sincere and honest (CF3).	o	o	o	o	o	o	o

Ending message

We appreciate your participation in this survey. Your reply has been successfully registered.

APPENDIX C - MANIPULATION CONDITIONS

FIGURE 8 - Experimental Group - Augmented Reality Manipulation Conditions - Female Experience

Step 1 - Login to the SAGGA homepage

Step 2 - Exploration of the SAGGA website

Step 3 - Using Virtual Try-on

Source - Developed by the author

For the Augmented Reality manipulation, a video was used where participants were instructed to imagine themselves using the Virtual Try-on (Step 3).

The Augmented Reality manipulation video - Female Experience, can be found at: https://youtu.be/bS3_Y6E1fXo

FIGURE 9 - Experimental Group - Augmented Reality Manipulation Conditions - Male Experience

Step 1 - Login to the SAGGA homepage

Step 2 - Exploration of the SAGGA website

Step 3 - Using Virtual Try-on
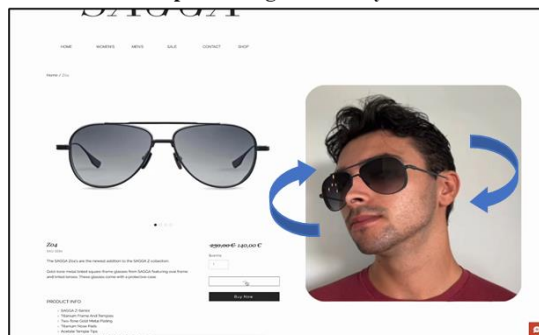
Source - Developed by the author

For the Augmented Reality manipulation, a video was used where participants were instructed to imagine themselves using the Virtual Try-on (Step 3).

The Augmented Reality manipulation video - Male Experience, can be found at: https://youtu.be/6JCVD7-QSoE

FIGURE 10 - Control Group - 2D Manipulation Conditions - Female and Male Experience
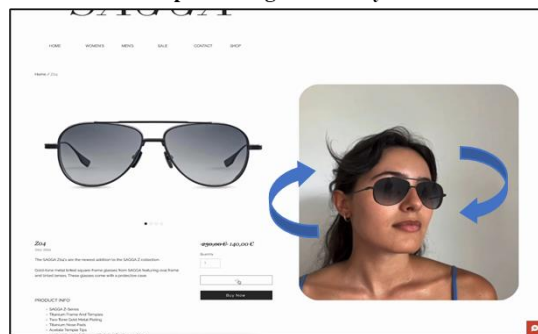
Step 1 - Login to the SAGGA homepage

Step 2 - Exploration of the SAGGA website

Source - Developed by the author

For the 2D manipulation, the participants were instructed to imagine themselves using the traditional online sampling model (Step 2).

The 2D manipulation video - Female and Male Experience, can be found at: https://youtu.be/61Q3MxWzY_Y

APPENDIX D - MEASUREMENTS (ENGLISH VERSION)

TABLE 2 - Experimental Group Measurement Scales

Topics	Items	Measurement scales	Support Literature
Language	**Q1**: Please choose a language.	o Portuguese o English	Developed by the author
Socio-demographic data	**Q2:** Please indicate your gender.	o Female o Male o Prefer not to say	Developed by the author
	Q3: Please indicate your age.	Single answer	
	Q4: Please indicate your net monthly income level.	o < 600 € o 601 € - 1.000 € o 1.001 € - 1.500 € o 1.501 € - 2.000 € o > 2.001 €	
Screening	**Q5:** Do you use sunglasses?	o Yes o No	Developed by the author
Consumption habits	**Intro Q6:** Please indicate how important the use of sunglasses is for you.	N. A.	Developed by the author
	Q6: Importance of wearing sunglasses	1 = Not Important to 7 = Extremely Important)	
	Q7: Please indicate where you usually buy sunglasses.	o Optical Stores o Official brand stores o Online Stores o Others	

Purchase intention		**Intro Q8:** Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
		I intend to buy some sunglasses through this online store (**PI1**).	1 = Totally disagree to 7 = Totally agree)	(Lian and Yen, 2014) (Hilken et al., 2017)
		In the future, I would buy sunglasses through this online store (**PI2**).		
		I would consider this online store as one of my first choices for buying sunglasses (**PI3**).		
Return intentions		**Intro Q9:** Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
		I think I will be satisfied with the purchase of these sunglasses in this online store (**RI1**).	1 = Totally disagree to 7 = Totally agree	(Pavlou, P. A., et al., 2007)
		I don't think I will regret having bought these sunglasses in this online store (**RI2**).		
		It would be likely to return the sunglasses bought on this online store (**RI3**).		
Perceptions	Hedonic value	**Intro Q10:** Please state the extent to which you identify with the following statements.	N. A.	Developed by the author
		The experience with the *Virtual Try-on* observed in the video made me feel good (**HV1**).	1 = Totally disagree to 7 = Totally agree	(Childers et al., 2001) (Hilken et al., 2017)
		The *Virtual Try-on* experience observed in the video made me feel bored (**HV2**).		
		The Virtual Try-on experience observed in the video was exciting (**HV3**).		

	Utilitarian value	The experience with the Virtual Try-on observed in the video was crucial for an efficient purchase (**UV1**).		(Childers et al., 2001)
		The Virtual Try-on experience observed in the video would improve my ability to buy sunglasses from online stores (**UV2**).	1 = Totally disagree to 7 = Totally agree	(Hilken et al., 2017)
		The Virtual Try-on experience observed in the video would contribute to a successful purchase (**UV3**).		
	Perceived risk	The experience with the Virtual Try-on observed in the video would help to reduce the risk of the purchased item not meeting my expectations (**PR1**).		
		The experience with the Virtual Try-on observed in the video would contribute to decreasing the probability of paying more money for an article than it is actually worth (**PR2**).	1 = Totally disagree to 7 = Totally agree	
		The experience with the Virtual Try-on observed in the video would contribute to reducing the probability of regret for the purchase made (**PR3**).		
Sensations		**Intro Q11**: Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
	Sense of control	I had the feeling that I could touch the article virtually (**SC1**).		
		I had the feeling that I was using the article really (**SC2**).	1 = Totally disagree to 7 = Totally agree	(Heller et al., 2019)
		I had the feeling that I could move the article with my hands (**SC3**).		

	Attractiveness	The use of the Virtual Try-on makes the product more attractive (**AT1**).	1 = Totally disagree to 7 = Totally agree	(Wirtz, B., et al., 2013)
		The use of the Virtual Try-on could be a criterion of choice when making an online purchase (**AT2**).		
		If you weren't looking for sunglasses, using the Virtual Try-on could make that purchase more attractive (**AT3**).		
	Confidence	The Virtual Try-on application inspires confidence (**CF1**).	1 = Totally disagree to 7 = Totally agree	(Pavlou, P. A., 2003)
		The Virtual Try-on application allows the consumer to get closer to the product to buy (**CF2**).		
		The transmitted information from the Virtual Try-on application seemed honest and sincere (**CF3**).		

Source: Developed by the author based on the scales implemented by (Lian & Yen, 2014), (Hilken et al., 2017), (Pavlou, P. A., et al., 2007), (Childers et al., 2001), (Heller et al., 2019), (Wirtz, B., et al., 2013), (Pavlou, P. A., 2003)

TABLE 3 - Control Group Measurement Scales

Topics	Items	Measurement scales	Support Literature
Language	**Q1**: Please choose a language.	o Portuguese o English	Developed by the author
Socio-demographic data	**Q2:** Please indicate your gender.	o Female o Male o Prefer not to say	Developed by the author
	Q3: Please indicate your age.	Single answer	
	Q4: Please indicate your net monthly income level.	o < 600 € o 601 € - 1.000 € o 1.001 € - 1.500 € o 1.501 € - 2.000 € o > 2.001 €	
Screening	**Q5:** Do you use sunglasses?	o Yes o No	Developed by the author
Consumption habits	**Intro Q6:** Please indicate how important the use of sunglasses is for you.	N. A.	Developed by the author
	Q6: Importance of wearing sunglasses.	1 = Not Important to 7 = Extremely Important)	
	Q7: Please indicate where you usually buy sunglasses.	o Optical Stores o Official brand stores o Online Stores o Others	

Purchase intention		**Intro Q8:** Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
		I intend to buy some sunglasses through this online store (**PI1**).	1 = Totally disagree to 7 = Totally agree)	(Lian and Yen, 2014) (Hilken et al., 2017)
		In the future, I would buy sunglasses through this online store (**PI2**).		
		I would consider this online store as one of my first choices for buying sunglasses (**PI3**).		
Return intentions		**Intro Q9:** Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
		I think I will be satisfied with the purchase of these sunglasses in this online store (**RI1**).	1 = Totally disagree to 7 = Totally agree	(Pavlou, P. A., et al., 2007)
		I don't think I will regret having bought these sunglasses in this online store (**RI2**).		
		It would be likely to return the sunglasses bought on this online store (**RI3**).		
Perceptions	Hedonic value	**Intro Q10:** Please state the extent to which you identify with the following statements.	N. A.	Developed by the author
		The shopping experience on the product page observed in the video made me feel good (**HV1**).	1 = Totally disagree to 7 = Totally agree	(Childers et al., 2001) (Hilken et al., 2017)
		The shopping experience on the product page observed in the video made me feel bored (**HV2**).		
		The shopping experience on the product page observed in the video was exciting (**HV3**).		

	Utilitarian value	The shopping experience on the product page observed in the video was crucial for an efficient purchase (**UV1**).	1 = Totally disagree to 7 = Totally agree	(Childers et al., 2001)

(Hilken et al., 2017) |
		The shopping experience on the product page observed in the video would improve my ability to buy sunglasses from online stores (**UV2**).		
		The shopping experience on the product page observed in the video would contribute to a successful purchase (**UV3**).		
	Perceived risk	The shopping experience on the product page observed in the video would contribute to reducing the risk of the purchased item not meeting my expectations (**PR1**).	1 = Totally disagree to 7 = Totally agree	
		The shopping experience on the product page observed in the video would contribute to reducing the likelihood of paying more money for an item than it is actually worth (**PR2**).		
		The shopping experience on the product page observed in the video would contribute to reducing the likelihood of regret for the purchase made (**PR3**).		

	Sense of control	**Intro Q11**: Please indicate your level of agreement with the following statements.	N. A.	Developed by the author
		I had the feeling that I could touch the article virtually (**SC1**).	1 = Totally disagree to 7 = Totally agree	(Heller et al., 2019)
		I had the feeling that I was using the article really (**SC2**).		
		I had the feeling that I could move the article with my hands (**SC3**).		
Sensations	Attractiveness	The use of the product page observed in the video makes the product more attractive (**AT1**).	1 = Totally disagree to 7 = Totally agree	(Wirtz, B., et al., 2013)
		The use of the product page observed in the video could be a choice criterion when making an online purchase (**AT2**).		
		If you weren't looking for sunglasses, using the product page observed in the video could make that purchase more attractive (**AT3**).		
	Confidence	The product page observed in the video inspires confidence (**CF1**).	1 = Totally disagree to 7 = Totally agree	(Pavlou, P. A., 2003)
		The product page observed in the video allows the consumer to be closer to the item to buy (**CF2**).		
		The information conveyed by the product page observed in the video seemed sincere and honest (CF3).		

Source: Developed by the author based on the scales implemented by (Lian & Yen, 2014), (Hilken et al., 2017), (Pavlou, P. A., et al., 2007), (Childers et al., 2001), (Heller et al., 2019), (Wirtz, B., et al., 2013), (Pavlou, P. A., 2003)

APPENDIX E - RESULTS ANALYSIS
TABLE 4 - Sample Characterization

		Experimental Group			Control Group		
		n	Valid Percent (%)	Cumulative Percent (%)	n	Valid Percent (%)	Cumulative Percent (%)
Gender	Female	64	48,48	48,48	76	53,52	53,52
	Male	67	50,76	99,24	65	45,77	99,29
	Prefer not to say	1	0,76	100,00	1	0,70	100,00
Age	< 25 years old	66	50,00	50,00	60	42,25	42,25
	26-35 years old	6	4,55	54,55	15	10,56	52,81
	36-45 years old	8	6,06	60,61	10	7,04	59,85
	46-55 years old	22	16,67	77,28	25	17,61	77,46
	> 56 years old	30	22,72	100,00	32	22,54	100,00
Net monthly income	< 600 €	50	37,88	37,88	39	27,46	27,46
	601 € - 1000 €	12	9,09	46,97	23	16,20	43,66
	1001 € - 1500 €	22	16,67	63,64	28	19,72	63,38
	1501 € - 2000 €	16	12,12	75,76	13	9,15	72,53
	> 2001 €	32	24,24	100,00	39	27,47	100,00
Use of Sunglasses	Yes	102	77,27	77,27	116	81,69	81,69
	No	30	22,73	100,00	26	18,31	100,00
Importance of wearing sunglasses	Low importance	62	46,97	46,97	54	38,03	38,03
	High importance	70	53,03	100,00	88	61,97	100,00
Favorite place to buy	Optical stores	74	45,68	N/A (*)	92	55,09	N/A (*)
	Official brand stores	27	16,67		26	15,57	
	Online stores	22	13,58		17	10,18	
	Others	39	24,07		32	19,16	

(*) Not applied because it was a multiple-choice answer.

Source: Developed by the author based on the results obtained in the online survey (2022)

TABLE 5 - Importance of Wearing Sunglasses (General Analysis)

	n	Minimum	Maximum	Mean	Std. Dev.
Importance of wearing sunglasses	274	1	7	4,64	1,78

Source: Developed by the author based on the results obtained in the online survey (2022)

TABLE 6 - Importance of Wearing Sunglasses (Comparison Analysis)

		n	Valid Percent (%)	Cumulative Percent (%)
Importance of wearing sunglasses	Low Importance	116	42,34	42,34
	High Importance	158	57,66	100,00

Source: Developed by the author based on the results obtained in the online survey (2022)

TABLE 7 - Cronbach's Alpha Test

Constructs	Initial Number of Items	Initial Cronbach's Alpha Test	Items deleted	Final Number of Items	Final Cronbach's Alpha Test
Purchase intention	3	,916	-	3	,916
Return intention	3	,450	1	2	,892
Hedonic value	3	,665	1	2	,831
Utilitarian value	3	,942	-	3	,942
Perceived risk	3	,889	-	3	,889
Sense of control	3	,926	-	3	,926
Attractiveness	3	,912	-	3	,912
Confidence	3	,928	-	3	,928

Source: Developed by the author based on the results obtained in the online survey (2022)

TABLE 8 - Multiple Linear Regression Results (Experimental Group)

Independent variable	Dependent variable	Model Summary & ANOVA				Coefficient		
		R Square	F	df	Sig.	β*	t	Sig.
Hedonic value	Purchase intentions	,564	26,944	6	,000	,279	2,241	,027
Utilitarian value						,269	1,886	,062
Perceived risk						,017	,133	,894
Sense of control						,215	2,315	,022
Attractiveness						-,008	-,054	,957
Confidence						,051	,346	,730
Hedonic value	Return intentions	,690	46,395	6	,000	-,138	-1,317	,190
Utilitarian value						-,294	-2,445	,016
Perceived risk						-,171	-1,549	,124
Sense of control						-,025	-,323	,747
Attractiveness						-,237	-1,893	,061
Confidence						-,030	-,244	,808

β* - Standardized coefficients Beta

Source: Developed by the author based on the results obtained in the online survey (2022)

TABLE 9 - Multiple Linear Regression Results (Control Group)

Independent variable	Dependent variable	Model Summary & ANOVA				Coefficient		
		R Square	F	df	Sig.	β*	t	Sig.
Hedonic value	Purchase intentions	,572	30,074	6	,000	,432	4,188	,000
Utilitarian value						,247	2,029	,044
Perceived risk						,214	2,454	,015
Sense of control						-,070	-,834	,406
Attractiveness						,131	1,109	,269
Confidence						-,146	-1,316	,192
Hedonic value	Return intentions	,608	34,862	6	,000	-,250	-2,527	,013
Utilitarian value						-,349	-2,988	,000
Perceived risk						-,296	-3,541	,000
Sense of control						,128	1,591	,114
Attractiveness						-,082	-,724	,470
Confidence						,012	,112	,911

β* - Standardized coefficients Beta

Source: Developed by the author based on the results obtained in the online survey (2022)