From static images to immersive experiences: Does AR influence purchase intention and brand attitude in online shopping?

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Abstract

Over the years, with the growth of e-commerce, retailers have been adopting technologies that help consumers reduce uncertainty at the point of purchase, whether through artificial intelligence and personalized recommendations or through augmented reality, allowing consumers to view products in real environments. Among various technologies, augmented reality stands out for its ability to provide a more interactive viewing experience. This study analyzes the impact of various types of product visualization commonly found on online shopping sites and examines differences in purchase intention and brand attitude across viewing contexts. The study also examines the mediating role of perceived usefulness and perceived ease of use, as well as the moderating effect of individual and contextual factors. The results show that AR presentation leads to higher levels of purchase intention and brand attitude when compared to white background images, but not when compared to contextualized images. It was also found that perceived usefulness and perceived ease of use fully mediate the effect of AR on purchase intention, and only perceived ease of use has a mediating effect on brand attitude. Among the moderators analysed, only tradition barriers significantly weaken the effect of AR on brand attitude.

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Resumo

Ao longo dos anos, com o crescimento do comércio eletrónico, os retalhistas têm vindo a adotar tecnologias que ajudem os consumidores a reduzir a incerteza no momento da compra, seja por meio de inteligência artificial com recomendações personalizadas ou de realidade aumentada, com a visualização dos produtos num ambiente real. Entre várias tecnologias, a realidade aumentada destaca-se pela capacidade de proporcionar uma experiência de visualização interativa. Este estudo analisa o impacto de vários tipos de visualização de produto, encontrados em sites de compras online, analisando as diferenças na intenção de compra e na atitude face à marca nos diferentes contextos. O estudo examina o papel mediador da utilidade e da facilidade de uso percebidas, bem como o efeito moderador de fatores individuais e contextuais. Os resultados demonstram que a apresentação de RA aumenta a intenção de compra e a atitude face à marca apenas quando comparada com imagens de fundo branco. Verificou-se ainda que a utilidade e facilidade de uso percebidas medeiam o efeito total da AR na intenção de compra e que apenas a facilidade de uso percebida medeia a atitude face à marca. Entre os moderadores analisados, apenas as barreiras à tradição enfraquecem o efeito da AR na atitude face à marca.

Título: De imagens estáticas a experiências imersivas: A RA influencia a intenção de compra e a atitude face à marca nas compras online?

Autora: Mafalda Pedreiro Afonso Lopes Amaro

Palavras-Chave: Realidade Aumentada, Intenção de Compra, Atitude face à Marca, Visualização de Produtos Online

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1. Introduction

In 2024, 49% of the Portuguese population made online purchases, representing an increase of 5.0 percentage points compared to the previous year (ANACOM, 2024). This growth suggests that online shopping is becoming increasingly relevant in Portugal, and consumers are becoming more comfortable and familiar with digital purchasing processes. Consequently, retailers' presence in online platforms is no longer optional but essential.

The way retailers present their products in online environments has been shown to influence consumers' purchasing behaviour and their attitudes toward websites (Farooqi, 2025). Prior research suggests that the quality of product information provided in online shopping environments positively affects consumer behaviour, contributing to website success and increased consumer satisfaction(Kwaku & Antwi, 2021). Nevertheless, despite detailed descriptions and images, consumers often continue to experience uncertainty when evaluating products online (Dimoka et al., 2012).

As online shopping grows and consumer expectations evolve, there is an increasing need for technologies that reduce this uncertainty and enhance the evaluation experience. It is in this context that augmented reality becomes highly relevant. By allowing consumers to digitally place, manipulate, and experience products within their own physical environment, augmented reality provides a more accurate and interactive experience that conventional images can't deliver.

Although AR has received increasing academic attention in recent years, existing research has primarily focused on AR's main mechanisms on purchase intention or user experience. However, limited attention has been given to examining the direct impact of viewing an AR-based static product presentation compared to traditional formats, such as contextual cues or white-background product images commonly used by online retailers. In this study, AR will be used as a static visual representation rather than a fully interactive AR experience, analysing the visual cues associated with AR product presentations. Moreover, the mechanisms through which AR influences consumer outcomes, particularly perceived usefulness and perceived ease of use, remain insufficiently explored, especially in shaping brand attitude. Consequently, little is known about how individual and contextual factors shape consumers' responses to AR-based product presentations, a gap that this study addresses by examining key individual and product-related moderators of ARs impact on purchase intention and brand attitude.

Given the increasing adoption of augmented reality in online retail and the remaining uncertainty regarding its effectiveness compared to traditional product presentation formats, an understanding of its impact is needed. Specifically, it is important to assess how AR-based product presentations influence key consumer outcomes and whether they vary across consumers and product contexts. Accordingly, this study addresses these issues through the following research questions:

RQ1: How does experiencing an AR static image scenario, compared to viewing traditional product formats, affect consumers' Purchase Intention and Brand Attitude?

RQ2: Does perceived usefulness and perceived ease of use mediate the effect of an AR static image scenario on consumers' Purchase Intention and Brand Attitude?

RQ3: Do individual and contextual factors moderate the effect of an AR static image scenario on Purchase Intention and Brand Attitude?

This study is relevant as it responds to the growing use of augmented reality in online retail by helping clarify its actual value in digital product presentations. It contributes to a more informed understanding of AR in online shopping contexts and supports more evidence-based decisions regarding the implementation of digital retail technologies. In doing so, it offers insights that are valuable for both academic research and managerial decision-making in increasingly competitive online markets.

This thesis is organized into five main chapters, followed by references and appendices. Chapter 1 introduces the research context, outlines the relevance of the study, and presents the research objectives and questions. Chapter 2 reviews the relevant literature, providing the theoretical background on augmented reality in online retail, traditional product visualization, and key consumer behaviour constructs, as well as the individual and contextual factors considered in this research. Chapter 3 presents the conceptual model and develops the research hypotheses. Chapter 4 describes the research methodology and data collection procedures, detailing the research design and quantitative approach adopted. Chapter 5 presents and discusses the empirical results of the study. This thesis concludes with a summary of the main findings, discussing academic and managerial implications, acknowledging limitations, and suggesting directions for future research.

2. Literature review

2.1 AR in E-commerce

The retail industry is undergoing rapid change due to digital innovations. Technologies such as artificial intelligence, virtual reality, and augmented reality are increasingly integrated into retail environments, reshaping how consumers interact with products and brands (Sharma et al., 2023). Among these technologies, AR has gained particular relevance, as it moves beyond novelty and becomes a functional tool embedded in consumers' decision-making processes (Jayaswal & Parida, 2023). Projections indicate that in the year of 2025, almost 75% of the world´s population and every smartphone user will regularly engage with AR (Deloitte Digital & Snap Inc, 2021). Regarding consumer behaviour, in 2021, over 100 million consumers used AR both online and in physical stores to support their purchasing decisions, and 94% intended to maintain or increase their usage in the next year (Deloitte Digital & Snap Inc, 2021). These adoption trends highlight that AR is a critical tool influencing consumer brand interactions and decision-making in digital commerce.

The strategic value of AR in e-commerce lies in its ability to address one of the core limitations of online shopping, the lack of direct interaction with products By overlaying virtual objects onto the real world, AR allows consumers to visualize products in a real context, try them on virtually, or experience how they would fit within their own environment (Jayaswal & Parida, 2023; Sharma et al., 2023). This capability brings up a sense of spatial presence, where virtual objects are perceived as physically existing in the real environment, which allows a more realistic and immersive visualization experience (Hilken et al., 2017).

Compared with traditional product images, AR offers a richer interaction, allowing consumers to rotate, position, and manipulate the products virtually. These interactions enhance product evaluations, reduce purchase uncertainty, and strengthen consumers' confidence in their buying decisions (Smink et al., 2020; Hilken et al., 2017)

Beyond experiential benefits, AR provides utilitarian value by facilitating more convenient product examination and faster access to information (J. Yang & Lin, 2024). Through the integration of virtual content into the real world (*environmental embedding*), which delivers specific information and insights, AR alleviates the cognitive effort required to imagine a product in real use (Hilken et al., 2017).

Furthermore, research highlights interactivity as a key feature of AR, which enhances user engagement and hedonic value (Ngo et al., 2025; Zare Ebrahimabad et al., 2024). By

manipulating the products virtually in real time, consumers experience greater enjoyment, contributing to a more pleasurable online shopping (Ngo et al., 2025), making AR an appealing technology. Overall, AR features seemed to influence consumer perceptions and psychological states by enhancing consumers' visualization of products through online shopping websites (J. Yang & Lin, 2024). Therefore, AR immersive and interactive features are not merely functional improvements but can also act as a persuasive tool, shaping consumers' attitudes.

However, the effectiveness of AR is not uniform across consumers and contexts. The use of AR often requires personal data, such as access to a real-time camera, that has been shown to negatively affect user experience, purchase intention, and brand attitude (Smink et al., 2020; Zare Ebrahimabad et al., 2024a). Furthermore, consumer responses to AR may vary depending on individual characteristics, including prior knowledge, personality traits, and openness to new technologies. These individual differences can shape the degree to which AR enhances decision processes and add value (Rumokoy & Frank, 2025).

Taken together, existing research suggests that AR potentially influences consumer decision-making in e-commerce through both cognitive and affective mechanisms. However, despite substantial evidence of AR potential, research has not fully clarified whether AR influences consumer responses, especially brand attitude, and how such responses of AR are influenced. Besides that, as mentioned before, there are some negative repercussions when using AR as a consumer, which can negatively affect the same aspects that AR is meant to provide positively, and this dissertation will explore this.

2.2 Traditional product visualization in Online Retail

In online retail, consumers cannot physically interact with products, to mitigate this, retailers use enhanced product visualization to support consumer decision-making. These strategies often involved either human cues or contextualized environments, depending on the product, to help consumers imagine the product in use.

Humanized product displays, such as images featuring human models, are widely used in digital retail settings. These displays introduce social cues that humanize the online shopping environment, thereby enhancing emotional engagement, enjoyment, and a sense of social presence (Dwinanda Putri & Balqiah, 2017; Hassanein & Head, 2007). Increased social presence fosters feelings of warmth, which in turn positively influence perceived usefulness, trust, and enjoyment, ultimately leading to more favorable attitudes toward the online store

(Hassanein & Head, 2007).From a psychological perspective, human cues function as persuasive signals that reduce psychological distance and increase affective responses.

Beyond human presence, another strategy is to place products within realistic usage environments, such as furniture displayed in a living room, retailers increase imagery fluency (*how easily someone can picture something in their mind*), which in turn increases mental imagery (*the process through which people mentally simulate sensory experiences without a direct physical perception*), and purchase intention relative to products displayed on neutral white backgrounds (Maier & Dost, 2018a, 2018b). In this sense, contextual backgrounds reduce cognitive effort and enhance visualization quality.

Building on this perspective, this study will also investigate whether AR can have a greater impact on purchase intention and brand attitude than traditional humanized product presentations and contextual backgrounds. This comparison helps to analyse whether AR provides stronger effects than humanization and environmental cues.

2.3 Purchase Intention

Purchase intention refers to the consumer's motivation and desire to buy a specific product or service, often shaped by evaluating and comparing different choices and alternatives (Zare Ebrahimabad et al., 2024a). In the online context, purchase intention is mainly shaped by consumers' evaluation of risk, trust, enjoyment, and access to relevant information. Trust has emerged as a key determinant, while hedonic enjoyment and informative product content help reduce uncertainty and facilitate decision making. (Santo & Marques, 2022).

AR technology has been shown to influence purchase intention by enhancing both cognitive and affective aspects of the shopping experience. From a cognitive perspective, AR improves product understanding by providing detailed, contextually embedded information that reduces ambiguity regarding product attributes, fit, and quality (Smink et al., 2019). This reduction in uncertainty strengthens consumers' confidence in their evaluations, thereby increasing purchase intention.

From an affective perspective, AR generates hedonic value through interactivity, enjoyment, vividness, and novelty. Interactive AR experiences increase engagement and perceived control, while novelty and vivid visualizations evoke positive emotional responses that enhance enjoyment (Du et al., 2022; J. Yang & Lin, 2024). These positive emotional states have been

shown to directly contribute to higher purchase intention by making the shopping experience more pleasurable and memorable (Du et al., 2022; J. Yang & Lin, 2024).

At the same time, AR may also evoke negative responses, particularly when it is perceived as intrusive. Although some studies suggest that perceived intrusiveness does not necessarily reduce purchase intention when the overall value of AR remains high (Smink et al., 2019), others report significant negative effects (Zare Ebrahimabad et al., 2024). These mixed findings indicate that the impact of AR on purchase intention is context-dependent and may vary according to product category, AR design, and consumers' characteristics.

Despite extensive research on AR features and purchase intention, relatively little attention has been paid to the direct comparison of different AR presentation scenarios, particularly static AR images, relative to traditional product visualization formats. This dissertation aims to bridge this gap.

2.4 Brand Attitude

Brand attitude refers to the overall evaluation that consumers hold about a brand, shaping their behavioral responses and influencing brand choices (Keller, 1993). Keller explains that these evaluations are formed based on consumers' beliefs about a brand's functional, experiential, and symbolic attributes, as well as the perceived benefits associated with the brand (Keller, 1993).

In the context of AR, interactions with branded AR content can influence brand attitude through experiential spillover effects. When consumers perceive AR experience as engaging, useful, and well-designed, these positive evaluations may transfer to the brand, strengthening brand associations and overall brand attitude (Rauschnabel et al., 2019).Conversely, poorly designed or frustrating AR experiences may generate negative affect, which can spill over and decrease brand evaluations.

Empirical findings regarding AR's impact on brand attitude remain inconsistent. Some studies demonstrate that high-quality AR experiences enhance brand attitude by triggering inspiration and positive emotional experiences (Rauschnabel et al., 2019). Other research, however, suggests that AR improves app-related evaluations without significantly affecting brand attitude, particularly for a well-established brand with strong pre-existing associations (Smink et al., 2020). Similarly, (Javornik, 2016) found that although AR enhances flow (a state of deep

immersion during an activity/experience) and app engagement, these positive experiences do not necessarily translate into improved brand evaluations.

These mixed findings suggest that brand attitude may be more resistant to change than immediate behavioral intentions. In conclusion, while AR can enhance user experience and app-related evaluations, its impact on brand attitude appears less consistent and may depend on contextual or consumer-related moderators. By examining the AR presentation scenario and consumer-specific factors, the present study aims to clarify whether AR can directly contribute to a higher brand attitude.

2.5 Perceived Usefulness

Perceived usefulness refers to the extent to which individuals believe that using a certain technology will improve their performance or experience (Fred D. Davis, 1989). Within the context of online shopping, perceived usefulness captures consumers' perceptions of whether a technology facilitates better product evaluation, reduces uncertainty, and improves shopping efficiency.

In AR shopping environments, perceived usefulness has emerged as a central driver of technology adoption and behavioral intention (Oyman et al., 2022). AR features such as augmentation quality, informativeness, and environmental embedding enhance consumers' understanding of products, thereby increasing perceptions of usefulness (Guo & Zhang, 2024; Söderström et al., 2024). When consumers perceive AR as useful, they are more likely to rely on it during decision-making, which directly strengthens purchase intention.

Importantly, research suggests that perceived usefulness often functions as a mediating mechanism in AR contexts. Rather than influencing outcomes directly, AR features shape consumer responses by enhancing perceived usefulness, which subsequently drives purchase intention. This mediating role appears to be stronger in AR environments than in general e-commerce studies, where perceived usefulness often influences attitudes toward platforms without necessarily translating into purchase intention (Agung Ayu Puty Andrina et al., 2022).

Although direct evidence linking perceived usefulness to brand attitude in AR contexts remains limited, findings from related domains suggest a possible relationship. Studies in gamification and mobile advertising indicate that perceived usefulness can positively influence brand attitude by enhancing consumers' evaluations of brand-related interactions (Parreño et al., 2013; Sari,

2022). These findings imply that the usefulness evaluations may extend beyond immediate purchase decisions and shape broader brand evaluations

Overall, while perceived usefulness is well established as a key mechanism of AR use and purchase intention, its role in shaping brand attitude remains underexplored. Existing findings are split into different domains, offering no clear evidence of whether perceived usefulness generated by AR can enhance brand evaluations. This study addresses this gap by investigating whether perceived usefulness derived from AR presentation contributes to more favorable brand attitudes.

2.6 Perceived Ease of Use

Perceived Ease of Use (PEOU) refers to the extent to which an individual believes that a given technology requires minimal effort to use (Fred D. Davis, 1989). In e-commerce contexts, technologies perceived as easy to use are evaluated more favorably, as lower effort reduces the frustration and increases users´ willingness to engage with the platform (Agung Ayu Puty Andrina et al., 2022).

In AR environments, perceptions of ease of use depend heavily on the design and complexity of the AR application. When AR apps are intuitive and require little effort, users are more likely to perceive the technology as easy to use, increasing their adoption (Guo & Zhang, 2024). AR features that enhance engagement and interactivity can reduce perceived difficulty, making the experience more engaging and natural. However, very complex or high-demand cognitive AR interactions may have the opposite effect, diminishing perceived ease of use (Guo & Zhang, 2024). Empirical research indicates that perceived ease of use positively influences purchase intention in AR contexts, as users are more willing to use technologies that do not require lot of effort during decision-making (Guo & Zhang, 2024). Similar patterns have been observed in broader e-commerce platforms, reinforcing the importance of ease of use as a determinant of purchase intention (Agung Ayu Puty Andrina et al., 2022).

The relationship between perceived ease of use and brand attitude remains less clear. While studies on gamification suggest that ease of use does not significantly influence brand evaluations (Sari, 2022,Y. Yang et al., 2017) and may shape initial user attitudes toward using a certain technology, but such influence may not persist over time, others report positive effects in mobile service contexts (Musavi & Mammadli, 2025). These mixed findings indicate that

PEOU may play a stronger role in shaping immediate purchase decisions than more stable brand attitudes

Overall, perceived ease of use is conceptualized in this study as a psychological mechanism through which AR presentation scenarios influence consumer responses, particularly purchase intention. Its potential mediating role in shaping brand attitude remains an open question that this dissertation seeks to explore.

2.7 Psychological Tradition Barriers

Tradition barriers are psychological resistance factors that arise when innovations conflict with consumers' established habits, routines, values, and past experiences (Ram & Sheth, 1989). These barriers reflect consumers' resistance to deviating from familiar behavioral patterns and social norms (Ram & Sheth, 1989).

In online shopping contexts, the integration of AR may require consumers to change well-established purchasing routines. Although AR offers functional and experiential benefits, the need to engage with unfamiliar technologies or interaction modes may generate discomfort and resistance, particularly among consumers who value traditional shopping practices (Jayaswal & Parida, 2023).

Evidence on the role of tradition barriers in AR adoption remains limited and mixed. While some studies suggest that tradition barriers do not significantly inhibit AR adoption for high involvement products (Ngobeni, 2025), the direction of the effect indicates potential resistance. Evidence from related digital innovations further suggests that tradition barriers can impede the adoption in some contexts, such as internet banking, while being less relevant in others, such as mobile payments contexts(Khanra et al., 2021; Laukkanen, 2016).

Given these inconsistencies, traditional barriers may function as a moderating factor that weakens the effects of AR presentation scenarios on consumer responses. This lack indicates a gap in current research, making it relevant to examine whether traditional barriers can influence and moderate how consumers respond to AR in the online shopping context.

2.8 AR Familiarity

AR familiarity refers to the user's knowledge of AR technology based on previous experience (Gong & Park, 2023). Familiarity shapes how users interpret and evaluate technological stimuli by influencing perceived risk, confidence, and cognitive processing (Söderström et al., 2024).

Consumers who are familiar with AR tend to perceive lower risk and greater enjoyment when using the technology, which increases purchase intention (Bonnin, 2020; Söderström et al., 2024). Familiarity also reduces the novelty effect associated with AR. While novelty can initially generate excitement and positive affect, repeated exposure diminishes this effect over time (Yim et al., 2017). At the same time, increased familiarity reduces perceived difficulty and frustration, making AR experiences smoother and more efficient (Gong & Park, 2023). Together, these findings suggest that initial excitement about AR may fade, but familiarity helps users feel more comfortable with AR, which may lead to more positive evaluations over time.

Accordingly, AR familiarity is expected to moderate the relationship between AR presentation scenarios and consumer outcomes.

2.9 Privacy Concerns

Privacy concerns in the AR context arise from the technology's inherent need to access sensitive personal data and real-time environments to deliver personalized experiences(Smink et al., 2019). In this case, privacy concerns refer to a consumer's apprehension about the potential misuse, unauthorized access, or vulnerability related to the personal data collected and used by AR technology during the online shopping interaction (Hilken et al., 2017; Jayaswal & Parida, 2023)

Research suggests that perceived intrusiveness negatively influences purchase intention and brand attitude in AR environments, as consumers react unfavorably when they feel their privacy is compromised (Smink et al., 2020; Zare Ebrahimabad et al., 2024). However, some studies indicate that the overall value provided by AR may outweigh privacy concerns, resulting in positive consumer responses despite perceived intrusiveness (Smink et al., 2019).

Despite growing attention to perceived intrusiveness, privacy concerns related to AR data practices remain underexplored. It remains unclear whether privacy concerns merely reduce the effectiveness of AR or affect its positive effect on consumer outcomes. This dissertation

addresses this gap by examining privacy concerns as a moderating variable that may weaken the influence of AR presentation scenarios on the main outcomes.

2.10 Category Type

Consumers do not perceive and evaluate products uniformly, their evaluations are influenced by the product category to which an item belongs (Verhagen et al., 2010). The findings of (Verhagen et al., 2010) demonstrate that product-type (both form and function) is a critical driver of which website content elements consumers value and perceive as most useful when shopping online. These patterns can lead to variations in how consumers interact with digital product presentation and information across different product categories.

In AR contexts, hedonic products such as fashion accessories and cosmetics, AR primarily works through affective mechanisms, such as interactivity, vividness, personalization, and novelty, which can trigger impulsive purchases and improve brand attitude (Hsu et al., 2024; Smink et al., 2019, 2020). This suggests that AR effects on purchase intention and brand attitude are driven mainly by enjoyment and hedonic experiences for these types of products. In contrast, utilitarian products such as furniture and appliances, AR has a more cognitive and risk-focused impact, enabling consumers to visualize products in their own context, increasing perceived usefulness, informativeness, and decision confidence, thereby boosting purchase intention and strengthening cognitive brand associations (Taub et al., 2025; Zare Ebrahimabad et al., 2024). Here, AR impact seems to be moderated by involvement, as its benefits rely on providing diagnostic information and reducing perceived risk for complex or high-cost purchases.

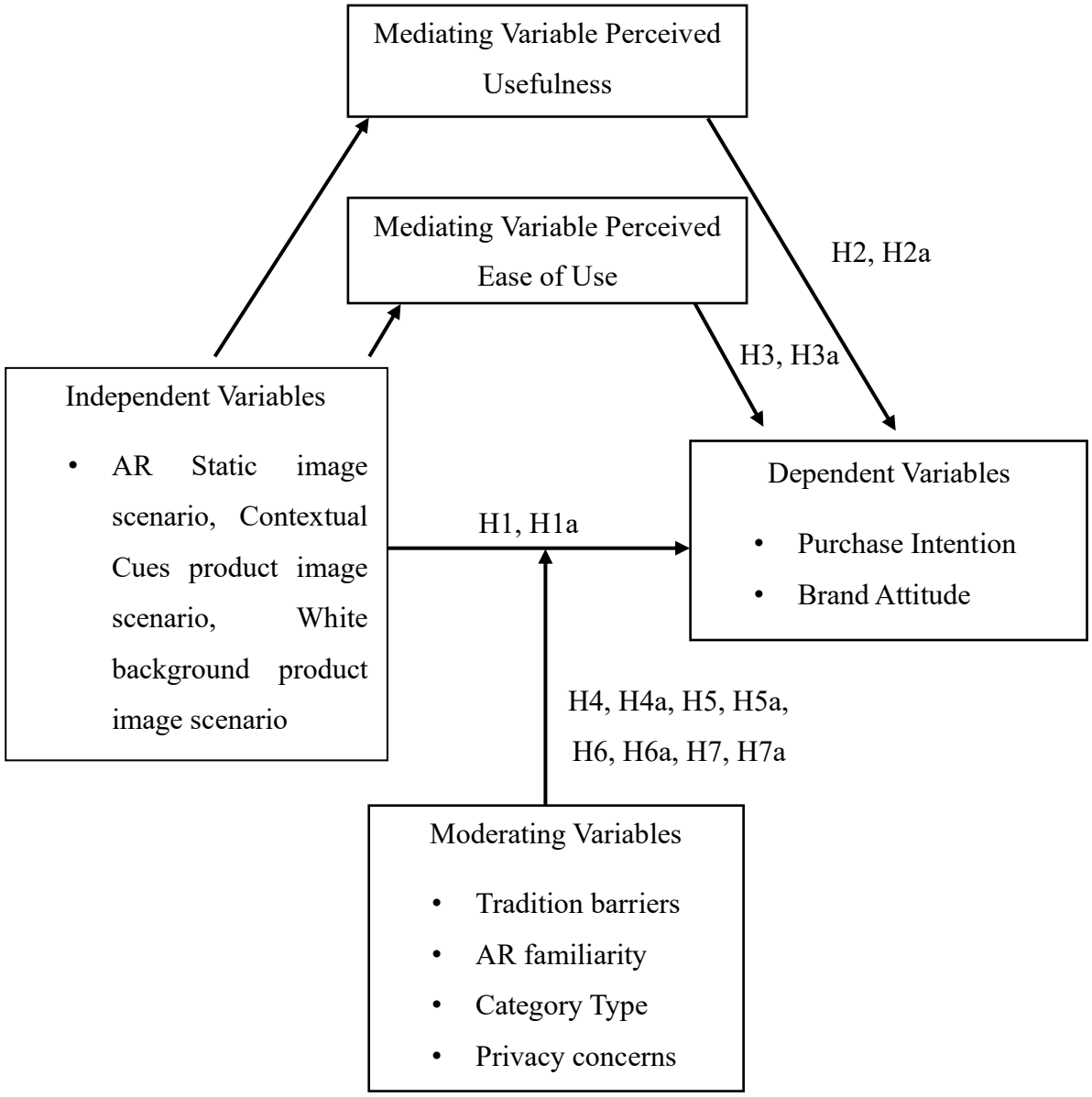
Despite evidence suggesting differential mechanisms across product categories, few studies have explicitly examined product category as a moderating factor in AR effects, highlighting an opportunity to examine how product category shapes AR effects and if there is a greater benefit for one than for another.

3 Conceptual Model and Hypotheses

3.1 Conceptual Model

Figure 1 represents the conceptual model guiding this study. This research will examine the impact of viewing a product online through augmented reality vs traditional product images, namely contextual cues scenarios and white background scenarios, on consumers' purchase intention and brand attitude. It will also explore the impact of mediating variables, namely perceived usefulness and perceived ease of use, on this relationship. Finally, Tradition Barriers, AR familiarity, Privacy Concerns, and Category Type will also be analyzed as moderators of this relationship.

Figure 1. *Conceptual Model*



3.2 Hypotheses

As mentioned before, AR can enhance purchase intention by increasing engagement, product knowledge, and reducing uncertainty through interactivity, novelty, and informativeness. (Zare Ebrahimabad et al., 2024a ; Smink et al., 2019). In addition, evidence suggests that the mere presence of AR, whether static or dynamic, appears to be sufficient to increase purchase intention compared to traditional product displays (Taub et al., 2025). Therefore, the following hypothesis is proposed:

H1: AR product presentation will lead to higher purchase intention compared to contextual cues scenarios and the white background scenario.

As stated in the literature, brand attitude has produced inconsistent results in the context of AR, suggesting that AR may or may not lead to more favorable brand evaluations. Thus, it was hypothesized:

H1a: AR product presentation will lead to a higher brand attitude compared to contextual cues scenarios and the white background scenario.

Evidence suggests that the perceived augmented reality of AR influences perceived usefulness (Oyman et al., 2022)and that higher perceived usefulness of AR increases purchase intention (Söderström et al., 2024). Although there is no evidence on perceived usefulness and brand attitude in the context of AR, as seen in the literature, studies from related fields point to a relationship between the two variables (Parreño et al., 2013; Sari, 2022). Therefore, the following hypotheses are proposed:

H2: Perceived usefulness will mediate the relationship between the AR presentation scenario and purchase intention

H2a: Perceived usefulness will mediate the relationship between the AR presentation scenario and brand attitude

Perceived ease of use is expected to mediate the effect of AR presentation scenarios on purchase intention, as easier interactions reduce effort (Agung Ayu Puty Andrina et al., 2022; Guo & Zhang, 2024). While evidence on brand attitude remains mixed, PEOU may also transmit the

effects of AR on brand evaluations through more intuitive experiences (Musavi & Mammadli, 2025). Therefore, the following hypotheses are proposed:

H3: Perceived Ease of Use will mediate the relationship between the AR presentation scenario and purchase intention

H3a: Perceived Ease of Use will mediate the relationship between the AR presentation scenario and brand attitude

As tradition barriers arise from resistance to changing established habits (Ram & Sheth, 1989), when they are stronger, consumers are more likely to experience friction with AR technology (Jayaswal & Parida, 2023), potentially moderating its impact on behavioral outcomes. Therefore, the following hypotheses are proposed:

H4: Tradition Barriers moderate the relationship between the AR presentation scenario and purchase intention

H4a: Tradition Barriers moderate the relationship between the AR presentation scenario and brand attitude.

As seen before, AR familiarity may moderate the effects of AR presentation scenarios on purchase intention and brand attitude, as prior experience shapes how users interpret and respond to AR stimuli (Gong & Park, 2023). Thus, the following hypotheses are proposed:

H5: AR familiarity moderates the relationship between the AR presentation scenario and purchase intention

H5a: AR familiarity moderates the relationship between the AR presentation scenario and brand attitude.

As stated in the literature, privacy concerns may moderate the effects of AR presentation scenarios on purchase intention and brand attitude, as apprehensions about data collection and perceived intrusiveness can weaken consumer trust and reduce favourable behavioural outcomes toward AR (Smink et al., 2020; Zare Ebrahimabad et al., 2024). Thus, the following hypotheses are proposed:

H6: Privacy Concerns moderate the relationship between the AR presentation scenario and purchase intention

H6a: Privacy Concerns moderate the relationship between the AR presentation scenario and brand attitude.

As mentioned before, the effects of AR are not uniform across product categories, as consumers rely on different evaluation processes depending on the type of product. Therefore, product category is expected to moderate the effects of AR presentation on purchase intention and brand attitude:

H7: Category type moderates the relationship between the AR presentation scenario and purchase intention

H7a: Category type moderates the relationship between the AR presentation scenario and brand attitude.

4 Methodology and Data Collection

4.1 Research Design

This study adopts a quantitative experimental research approach to explore and test the relationships between different product presentation formats and consumers' purchase intention and brand attitude. To test the differences in product presentation formats, participants were randomly assigned to one of the three presentation formats. According to (John W. Creswell, 2014), quantitative research is appropriate to this study because it allows for testing hypotheses by examining relationships among variables. Furthermore, this approach enables comparisons between experimental conditions and supports the use of statistical techniques, such as mediation and moderation analyses, which are central to the objective of this study. Given that this research aims to assess both main effects and underlying mechanisms of AR on consumer responses, a quantitative methodology provides the necessary rigor and accuracy.

Data for this study were collected using two non-experimental research designs, both structured surveys. The first survey was conducted as an exploratory pre-study and aimed to identify the most relevant and appropriate product categories for the main survey. This preliminary study ensured that the products used in the main study were relevant and meaningful to participants when viewing them with an AR stimulus.

Based on the results of the first survey, a second and explanatory main survey was developed. The main survey was designed to measure the study's key variables and their relationship. The data collected through this second survey were subsequently used to test the research hypotheses.

4.2 Quantitative Research

4.2.1 Pre-Survey

To determine the most suitable product for the application of AR stimulus in the main study, an exploratory pre-test was conducted. This preliminary survey took place between November 2nd and November 4th and resulted in 16 responses. The questionnaire was designed using Qualtrics and distributed via WhatsApp (Appendix 8.1)

The pre-survey consisted of an online questionnaire in which participants were first asked to select two product categories among these: Fashion, Beauty, Accessories, Home Furniture, and Home Appliances, in which they considered AR to be most useful. Subsequently, within the

selected categories, participants were asked to choose specific products, such as clothes, shoes, watches, bags, glasses, home décor, furniture, televisions, and coffee machines. Each selected product was then evaluated based on AR visual stimuli, using a five-point Likert scale (1= Completely disagree; 5= Totally agree), measuring participants' perceptions of the usefulness and suitability of AR for each product.

The means and standard deviations showed the products with the most favourable evaluations. The highest ratings were observed for furniture (M= 4,25 / SD= 0,390 / N=6) and sunglasses (M= 4,19 / SD= 0,371 / N=6) (Table 16). In addition to these results, secondary data from (Eurostat, 2024) were considered to ensure market relevance. According to (Eurostat, 2024) 40,23% of internet users in Portugal made online purchases in the category clothes, shoes, or accessories in 2024, while 15.39% purchased items in the category furniture, home accessories, or gardening products. Taken together, the results of the exploratory pre-test and the market data justify the inclusion of both sunglasses and furniture in the main study.

4.2.2 Pilot-test

Before the main data collection, a pilot test was conducted between December 11th and December 14th, with a total of 20 responses, to assess the clarity and structure of the questionnaire. The pilot study aimed to ensure that the survey items were clearly understood and that the flow was coherent.

Based on the feedback obtained, minor adjustments were made to improve question wording. Following these refinements, the survey was considered suitable for the main study and was subsequently published.

4.2.3 Main Survey

4.2.3.1 Method

Based on the exploratory survey, secondary data, and existing literature, the main survey was developed and distributed via Qualtrics (Appendix 8.2). Data were collected between the 20th of January and the 30th of January through social media platforms, namely Instagram, WhatsApp, and LinkedIn, resulting in a non-probability convenience sample (Mark N.K Sauders, 2019). Participation in the study was entirely voluntary and anonymous, and respondents were informed about the purpose of the study before participation. To ensure an

adequate sample size for analysis, participants were strongly encouraged to share the survey within their personal network.

Following data collection, a total of 564 responses were obtained, of which only 327 valid responses remained for analysis. The data were analyzed using the statistical software R, which enabled the application of both descriptive statistics and inferential analyses to test the proposed hypotheses and address the research questions.

4.2.3.2 Procedure

Participants were first presented with an introductory section explaining the purpose of the study. Participants assigned to the augmented reality condition were then shown an additional introductory block explaining the concept of AR and its use in online shopping contexts, ensuring that they understood the technology before being exposed to the stimuli. Participants in the non-AR conditions didn't see this explanatory block.

Each participant was randomly assigned to one of the three presentation conditions: viewing products through an augmented reality stimulus, a white-background presentation, or a contextual/model-based presentation. This random assignment allowed for comparisons between the different presentation formats.

All participants were exposed to both product categories, sunglasses and furniture. To minimize the risk of order effects, the sequence in which the two product categories were presented was randomized, with some participants viewing sunglasses first and others viewing furniture first. By doing this, we aim to prevent any of the products from being systematically advantaged or disadvantaged.

After viewing each product category, participants answered the items for perceived usefulness, perceived ease of use, purchase intention, and brand attitude. All variables were measured using a seven-point Likert scale. Participants in the augmented reality condition also answered an additional manipulation check to confirm and ensure their perception of the AR stimulus as actually AR. Following the mediators and dependent variables questions, participants responded to the moderators block, measuring AR familiarity, traditional barriers, category type, and privacy concerns. The questionnaire concluded with a demographic section.

4.2.3.3 Stimuli development

The stimuli used in this study were developed to replicate in the best possible way a realistic online shopping environment, representing common product presentation formats that we find in online shopping. Three different product presentation scenarios were created to represent different ways in which consumers usually see products online.

The first scenario consisted of an augmented reality product presentation. To simulate an AR experience within the context of an online survey, static images were used to illustrate an AR visualization, rather than a fully interactive AR experience. Therefore, the study examines the visual representation and cues of AR rather than the interactive AR experience. Previous research suggests that fully interactive AR applications may result in a negative user experience due to technical limitations, such as inaccurate product positioning, bad alignment with the physical environment, or difficulties in using AR features (Javornik, 2016). To enhance realism, the AR stimuli were developed on existing brand applications, namely the Ray-Ban virtual try-on for sunglasses and the Portuguese brand Antarte AR feature for furniture.

The second scenario illustrated products in a contextual use. In this condition, sunglasses were presented on a model, while furniture was shown within a realistic living room environment, allowing participants to visualize the products in a real-life context. The inclusion of this scenario was designed to help distinguish whether the effects observed in the augmented reality scenario were driven by the AR technology itself or merely by the presence of contextual cues, such as a model or environment background. By comparing the AR condition with contextual presentations, the study allows to study if any differences in consumer responses can be attributed to AR itself or enhanced visual context alone.

The third scenario represented a traditional online product presentation, in which products were displayed against a plain white background, a format commonly used in online retail and serving as a reference for comparison.

Across all scenarios, the visual stimuli were designed to be as comparable as possible in terms of product type, image quality, and presentation structure, ensuring that differences in consumer responses could be attributed to the presentation format rather than visual factors.

4.2.3.4 Variables Description

Variables	Measurement items	Reference
AR Image Manipulation Check (7-Point Scale)	**Please indicate how much you agree or disagree with the following statements about the images you viewed (1 = Strongly disagree, 7 = Strongly agree):** • Two of the images used augmented reality to present the product • Two of the images suggested that, in a real situation, it would be possible to interact with or try the product • Two of the images showed the product in a dynamic way, despite being static images	(Poushneh & Vasquez-Parraga, 2017)
Perceived Usefulness (7-Point Likert Scale)	**Please indicate how much you agree or disagree with the following statements about the images you viewed (1 = Strongly disagree, 7 = Strongly agree):** • The product presentation is useful for my purchase decision • The presentation provides useful information about the product • The presentation would improve my shopping experience • The presentation would make the shopping experience more efficient	Adapted from (Ngo et al., 2025)
Perceived Ease of Use (7-Point Likert Scale)	**Please indicate how much you agree or disagree with the following statements about the images you viewed (1 = Strongly disagree, 7 = Strongly agree):**	Adapted from (Rese et al., 2017)

	• The way the product was presented was intuitive • The product presentation was easy and clear to understand • It would be easy for me to use this product presentation format	
Brand Attitude (7-Point Likert Scale)	**If a brand presented the product as shown above, how would you evaluate the brand? (1 = Strongly disagree, 7 = Strongly agree)** • Bad/Good • Unappealing/Appealing • Unpleasant/Pleasant • Unattractive/Attractive • Boring/Interesting • Dislike the brand/Like the brand	(Li et al., 2002; Spears & Singh, 2004)
Purchase Intention (7-Point Likert Scale)	**Please indicate how much you agree or disagree with the following statements about the images you viewed. Consider only the images, without considering the quality of the product. (1 = Strongly disagree, 7 = Strongly agree)** • I would consider buying this product in the near future • I intend to visit the brand´s website when I need a similar product • I would choose this product if I need something similar	(Chen & Chang, 2018; J. Yang & Lin, 2024)
Tradition Barriers	**Please indicate how much you agree or disagree with the following statements. (1 = Strongly disagree, 7 = Strongly agree)**	Adapted from (Khanra et al., 2021)

(7-Point Likert Scale)	• I feel more comfortable shopping online without using augmented reality • AR features seem complicated to me • I prefer seeing products physically in a store rather than use augmented reality during online shopping	
Privacy Concerns (7-Point Likert Scale)	**Please indicate how much you agree or disagree with the following statements. (1 = Strongly disagree, 7 = Strongly agree)** • I feel uncomfortable with the possibility that AR may collect excessive personal information about me • I am concerned about the privacy of my personal data when using AR for online shopping • I feel that the e-commerce platforms may use my personal information for unintended purposes without my approval	(Mahajan et al., 2025)
AR Familiarity (7-Point Likert Scale)	**Please indicate how much you agree or disagree with the following statements. (1 = Strongly disagree, 7 = Strongly agree)** • I am familiar with AR applications • I have experience using AR tools • I have the technical skills to use AR tools • I know how to use AR to evaluate products online	(Rumokoy & Frank, 2025)
Sample		

Gender **Age** **Education**	• 1] Male; [2] Female; [3] Non-binary ; [4] Prefer not to say • [1] <18; [2] 18-24; [3] 25-34; [4] 35-44; [5] 45-54; [6] 55-64; [7] 65-74; [8] 65-84; [9] >85 • [1] Primary School; [2] High School; [3] Bachelor; [4] Master; [5] Doctorate	

5 Analysis and Results

5.1 Sample Characterization

This section presents the characterization of the sample used in the main study, providing an overview of the participants' main demographic characteristics.

The final sample consists of 327 respondents. As shown in Table 18, the majority of participants are female (66.1%), followed by male respondents (33.3%), while a very small proportion of participants (0.6%) preferred not to disclose their gender.

Regarding age, the sample includes respondents from a wide range of age groups. The largest age group is 18-24 years, representing 36.7% of the sample, followed by participants aged 45-54 years (31.5%). A smaller percentage of respondents fall within the 25-34 (11%) and 35-44 (9.5%) age groups. Older groups are less represented, with 8.3% of respondents aged 55-64, and fewer than 3% aged 65 years or older. Participants under the age of 18 represent 0.6% of the sample.

In terms of educational level, the sample is relatively well educated. Nearly half of the respondents hold a Bachelor's degree (49.8%), while 31.8% have completed a Master's degree. A smaller percentage of participants reported having a high school education (15.9%), and only a limited number hold a Doctorate (2.1%) or have completed primary school (0.3%).

Nationality was not explicitly measured in the survey. However, all respondents were Portuguese, since the survey was available only in Portuguese and distributed within a Portuguese context.

5.2 Data Cleaning and Preparation

Before the statistical analyses, the survey data were checked and prepared to make sure they were complete and suitable for analysis. The initial sample consisted of 564 responses. During the data preparation process, 224 responses were removed because they were not fully completed, as well as 13 responses that failed the manipulation check related to the perception of the AR scenario in both categories. After these exclusions, the final dataset included 327 valid responses (see details in Table 17)

In the AR condition, responses with manipulation check scores below 4, which corresponds to the midpoint of the 7-point Likert scale, were excluded, as such scores indicate that the stimuli

were not perceived as AR. It is also important to mention that manipulation checks were evaluated separately for each category (sunglasses and furniture). In the sunglasses scenario, 20 responses were excluded for failing the manipulation check, while 7 responses were excluded in the furniture scenario (see details in Table 20). When participants passed the manipulation check in one category but not in the other, they were included only in the analysis of the category they passed. Removing these participants from both scenarios would have substantially reduced the sample size. This approach allowed for the use of a larger sample while ensuring that the augmented reality was correctly perceived in each category. In addition, a one-sample t-test was made, comparing the mean of the manipulation check score with the midpoint of the scale (4). For eyewear, the manipulation check score was significantly higher than the midpoint ($M = 6.14$, $p < 0.001$) (Table 21). For furniture, the manipulation check was also significantly higher than the midpoint ($M = 6.13$, $p < 0.001$) (Table 21). These results indicate that participants clearly perceived the AR presentation.

The reliability of the measurement scales was assessed to evaluate the internal consistency of the items used in the survey. Scale reliability was examined using Cronbach`s alpha separately for each scenario (AR, Contextual Cues, and White Background) and product category (sunglasses and furniture). This approach was adopted because both presentation format and product type represent distinct evaluation contexts, which may influence how respondents interpret and respond to the scale items. Most scales show Cronbach's alpha values above the commonly accepted threshold of 0.70. In one case, the ease-of-use scale in the AR furniture condition showed a lower initial alpha (0.674). Removing one item resulted in an improved reliability level (0.766) for this scale. After this adjustment, all scales demonstrated acceptable reliability for analysis (See details in Table 22).

5.3 Descriptive Statistics and Correlation Analysis

Before conducting the hypothesis tests, descriptive statistics and correlations between the main variables were examined. Means, standard deviations, and Pearson correlation coefficients were calculated for each variable. The results were also calculated separately for each experimental format (Tables 23, 24, and 25).

Overall, the results show positive correlations between perceived usefulness and ease of use and purchase intention and brand attitude across the three conditions. For example, in the AR condition, perceived usefulness is positively correlated with perceived ease of use ($r = 0.57$)

and purchase intention (r = 0.41), while perceived ease of use shows a strong correlation with purchase intention (r = 0.61) (Table 23). These patterns also occur in the other formats. Tradition barriers tend to show negative correlations with several variables, particularly with perceived usefulness (r = -0.51 in the AR condition) (Table 23). Privacy concerns show generally weak correlations with the variables across conditions.

In general, the correlation patterns are consistent with the expected relationships proposed in the conceptual model and provide support for the subsequent analyses.

5.4 Main Survey Results

To test hypotheses H1 and H1a, a one-way ANOVA was conducted to examine whether purchase intention and brand attitude differ across the three presentation scenarios. Because the ANOVA only indicates whether overall differences exist, Tukey's HSD post-hoc test was used to identify which specific presentation scenarios differ from each other.

Before conducting the ANOVA analyses, the homogeneity of variances was tested using Levene´s test. The results indicated that this requirement was not violated for purchase intention ($p = 0.616$) (Table 26) and for brand attitude ($p = 0.835$) (Table 27). The results indicate that the variances across the presentation scenarios were homogeneous and given the relatively large sample size (N = 327), the Central Limit Theorem supports the robustness to moderate deviations from normality.

H1: AR product presentation will lead to higher purchase intention compared to contextual cues scenarios and the white background scenario.

Hypothesis H1 proposed that AR product presentation leads to higher purchase intention compared to other presentation formats. The ANOVA results reveal a statistically significant effect of presentation scenario on purchase intention ($F(2, 324) = 14.23$, $p < 0.001$) (Table 28), indicating that purchase intention differs across at least one of the presentation formats. The results of Tukey's HSD post-hoc test show that purchase intention is significantly higher in the AR condition compared to the white background condition ($p < 0.001$) (Table 1). However, no significant difference was found between the AR and contextual cues condition ($p = 0.614$) (Table 1). Therefore, hypothesis H1 is partially supported.

Table 1. *Tukey HSD Post-Hoc Test Results for Purchase Intention*

Comparison	diff	lwr	upr	p adj
White_Background-AR	-0.7261	-1.0847	-0.3675	0.0000083
Contextual Cues-AR	-0.1421	-0.4978	0.2135	0.6148100

H1a: AR product presentation will lead to a higher brand attitude compared to contextual cues scenarios and the white background scenario.

Hypothesis H1a proposed that AR product presentation leads to a higher brand attitude compared to contextual cues and white background scenarios. The ANOVA results reveal a statistically significant effect of the presentation scenario on brand attitude ($F(2, 324) = 3.71$, $p = 0.026$) (Table 29). The results of Tukey's HSD post-hoc test showed that brand attitude is significantly higher in the AR condition compared to the white background condition ($p = 0.028$) (Table 2). In contrast, there is no significant difference between the AR and contextual cues conditions ($p = 0.681$) (Table 2). Overall, the findings indicate that H1a is partially supported.

Table 2. *Tukey HSD Post-Hoc Test Results for Brand Attitude*

Comparison	diff	lwr	upr	p adj
White_Background-AR	-0.5396	-1.0328	-0.0464	0.02804
Contextual Cues-AR	-0.1736	-0.6627	0.3155	0.6811

To test H2, H2a, H3, and H3a, a parallel mediation analysis using Process Model 4 was conducted to examine whether perceived usefulness and perceived ease of use mediate the relationship between the AR presentation scenario, purchase intention, and brand attitude. In this model, both mediators were included at the same time, allowing the analysis to assess the indirect effect of each mediator while controlling the other. The AR presentation scenario was

coded as a dummy variable (AR=1, non-AR=0), and separate models were estimated for purchase intention and brand attitude.

***H2: Perceived usefulness will mediate the relationship between the AR presentation scenario* and purchase intention**

H3: Perceived Ease of Use will mediate the relationship between the AR presentation scenario and purchase intention

The mediation analysis shows that AR presentation significantly increased both perceived usefulness ($a1 = 0.531$, $p < 0.001$) (Table 3) and perceived ease of use ($a2 = 0.498$, $p < 0.001$) (Table 3). In addition, both mediators influence purchase intention, but perceived ease of use shows a stronger effect ($b2 = 0.557$, $p < 0.001$) (Table 3) when compared to perceived usefulness ($b1 = 0.220$, $p = 0.001$) (Table 3).

The indirect effects via perceived usefulness (0.117) (Table 4) and perceived ease of use (0.277) (Table 4) are both positive and statistically significant, given that the confidence interval does not include 0. Although the direct effect shows a positive coefficient, it was not statistically significant ($c' = 0.034$, $p = 0.747$) (Tables 3 and 4)

These results indicate that the effect of AR presentation on purchase intention is fully mediated by perceived usefulness and perceived ease of use, therefore H2 and H3 are supported.

Table 3. *Path Coefficients for the Parallel Mediation Model (Purchase Intention)*

Comparison	Path	Estimate	SE	t	p_value
AR vs Non-AR	AR -> Usefulness (a1)	0.531	0.122	4.364	0.000
AR vs Non-AR	AR -> Ease of Use (a2)	0.498	0.135	3.683	0.000
AR vs Non-AR	Usefulness -> Outcome (b1)	0.220	0.064	3.452	0.001
AR vs Non-AR	Ease of use -> Outcome (b2)	0.557	0.057	9.689	0.000

Comparison	Path	Estimate	SE	t	p_value
AR vs Non-AR	Direct effect (c')	0.034	0.104	0.324	0.747
AR vs Non-AR	Total effect (c)	0.428	0.139	3.076	0.002

Table 4. *Indirect Effects of the Parallel Mediation Model (Purchase Intention)*

Comparison	Effect	Estimate	CI_low	CI_high	p_value
AR vs Non-AR	Indirect via Usefulness	0.117	0.017	0.227	
AR vs Non-AR	Indirect via Ease of Use	0.277	0.129	0.453	
AR vs Non-AR	Total indirect	0.394	0.219	0.571	
AR vs Non-AR	Direct	0.034	-0.172	0.239	0.747
AR vs Non-AR	Total	0.428	0.154	0.702	0.002

H2a: Perceived usefulness will mediate the relationship between the AR presentation scenario and brand attitude

H3a: Perceived Ease of Use will mediate the relationship between the AR presentation scenario and brand attitude

The results for H2a and H3a show that perceived ease of use influences brand attitude (b2 = 0.416, $p < 0.001$) (Table 5), but the same does not occur for the influence of perceived usefulness on brand attitude, given the lack of statistical significance (b1 = 0.113, p = 0.307) (Table 5). In addition, the indirect effect through perceived usefulness is not statistically significant (0.060, CI [-0.070, 0.186]) (Table 5), as the confidence of interval includes zero. In contrast, the indirect effect through perceived ease of use is positive and statistically significant (0.207, CI [0.083, 0.347]) (Table 6). The direct effect of the AR presentation scenario on brand

attitude is positive, but it was not statistically significant (c' = 0.086, p = 0.636) (Tables 5 and 6).

Given these results, H2a is not supported, but H3a is.

Table 5. *Path Coefficients for the Parallel Mediation Model (Brand Attitude)*

Comparison	Path	Estimate	SE	t	p_value
AR vs Non-AR	AR -> Usefulness (a1)	0.531	0.122	4.364	0.000
AR vs Non-AR	AR -> Ease of Use (a2)	0.498	0.135	3.683	0.000
AR vs Non-AR	Usefulness -> Outcome (b1)	0.113	0.111	1.023	0.307
AR vs Non-AR	Ease of Use -> Outcome (b2)	0.416	0.100	4.172	0.000
AR vs Non-AR	Direct effect (c')	0.086	0.181	0.473	0.636
AR vs Non-AR	Total effect (c)	0.353	0.187	1.884	0.060

Table 6. *Indirect Effects of the Parallel Mediation Model (Brand Attitude)*

Comparison	Effect	Estimate	CI_low	CI_high	p_value
AR vs Non-AR	Indirect via Usefulness	0.060	-0.070	0.186	
AR vs Non-AR	Indirect via Ease of Use	0.207	0.083	0.347	
AR vs Non-AR	Total indirect	0.267	0.125	0.407	
AR vs Non-AR	Direct	0.086	-0.270	0.442	0.636

Comparison	Effect	Estimate	CI_low	CI_high	p_value
AR vs Non-AR	Total	0.353	-0.016	0.721	0.06

To test hypotheses H4 to H6a, moderation analyses were conducted using linear regression models with interaction terms. The AR presentation was coded as a dummy variable (AR =1, non-AR = 0), and purchase intention and brand attitude were used as dependent variables. Each model included the main effects of the AR scenario and the proposed moderators, along with their interaction term.

H4: Tradition Barriers moderate the relationship between the AR presentation scenario and purchase intention

Hypothesis H4 proposed that tradition barriers moderate the relationship between the AR presentation scenario and purchase intention. The interaction term between the AR presentation scenario and tradition barriers is negative but not statistically significant (b = -0.19, p = 0.092) (Table 7). Although the effect of AR on purchase intention appears to weaken as tradition barriers increase, this moderating effect is not statistically significant. Therefore, H4 is not supported

Table 7. *Moderating Effect of Tradition Barriers on the relationship between AR scenario and purchase intention*

	Purchase Intention	
Predictors	*Estimates*	*p*
(Intercept)	4.80	<0.001
AR dummy	1.19	0.012
Traditional	0.05	0.439

AR dummy × Traditional	-0.19	0.092
Participants (N)	327	
R^2 / R^2 adjusted	0.037 / 0.028	

H4a: Tradition Barriers moderate the relationship between the AR presentation scenario and brand attitude.

Hypothesis H4a tests whether tradition barriers moderate the relationship between the AR presentation scenario and brand attitude. Crucially, the interaction term is negative and statistically significant (b = -0.38, p = 0.015) (Table 8), meaning that the positive effect of AR on brand attitude becomes weaker as tradition barriers increase. The results provide statistical support for H4a, validating the hypothesis.

Table 8. *Moderating Effect of Tradition Barriers on the relationship between AR scenario and brand attitude*

	Brand Attitude	
Predictors	*Estimates*	*p*
(Intercept)	4.47	<0.001
AR dummy	1.82	0.004
Traditional	0.07	0.378
AR dummy × Traditional	-0.38	0.015
Participants (N)	327	
R^2 / R^2 adjusted	0.029 / 0.020	

H5: AR familiarity moderates the relationship between the AR presentation scenario and purchase intention

H5 proposed that AR familiarity moderates the relationship between the AR presentation scenario and purchase intention. Findings indicate that the interaction between the AR presentation scenario and AR familiarity is negative but not statistically significant (b = -0.04, p = 0.636) (Table 9), revealing that the effect of the AR presentation scenario on purchase intention does not differ significantly across levels of AR familiarity. Consequently, H5 is rejected.

Table 9. *Moderating Effect of AR familiarity on the relationship between AR scenario and purchase intention*

	Purchase Intention	
Predictors	*Estimates*	*p*
(Intercept)	4.77	<0.001
AR dummy	0.60	0.106
AR familiarity	0.06	0.160
AR dummy × AR familiarity	-0.04	0.636
Participants (N)	327	
R^2 / R^2 adjusted	0.034 / 0.025	

H5a: AR familiarity moderates the relationship between the AR presentation scenario and brand attitude.

Hypothesis H5a suggests that AR familiarity moderates the relationship between the AR presentation scenario and brand attitude. The interaction term is positive but not statistically significant (b = 0.09, p = 0.453) (Table 10). Overall, the findings show no evidence that AR

familiarity moderates the relationship between the AR presentation scenario and brand attitude, as the interaction term is not statistically significant. Therefore, H5a is rejected.

Table 10. *Moderating Effect of AR familiarity on the relationship between AR scenario and brand attitude*

	Brand Attitude	
Predictors	*Estimates*	*p*
(Intercept)	4.40	<0.001
AR dummy	0.03	0.956
AR familiarity	0.09	0.089
AR dummy × AR familiarity	0.09	0.453
Participants (N)	327	
R^2 / R^2 adjusted	0.029 / 0.020	

H6: Privacy Concerns moderate the relationship between the AR presentation scenario and purchase intention

Hypothesis H6 proposed that privacy concerns moderate the relationship between the AR presentation scenario and purchase intention. The interaction term is positive but not statistically significant (b = 0.09, p = 0.337) (Table 11). This means that the impact of AR on purchase intention appears to be stable, regardless of how concerned consumers are about privacy. Overall, the results do not support Hypothesis H6.

Table 11. *Moderating Effect of Privacy Concerns on the relationship between AR scenario and purchase intention*

	Purchase Intention	
Predictors	*Estimates*	*p*
(Intercept)	5.46	<0.001
AR dummy	-0.02	0.969
Privacy	-0.09	0.041
AR dummy × Privacy	0.09	0.337
Participants (N)	327	
R^2 / R^2 adjusted	0.041 / 0.032	

H6a: Privacy Concerns moderate the relationship between the AR presentation scenario and brand attitude.

Hypothesis H6a examined whether privacy concerns influence how consumers form brand attitudes when exposed to an AR presentation scenario. The results show that the interaction term between the AR presentation scenario and privacy concerns is positive but not statistically significant (b = 0.10, p = 0.424) (Table 12). This suggests that privacy concerns of AR do not change how consumers evaluate brands when exposed to AR. As a result, H6a is not supported.

Table 12. *Moderating Effect of Privacy Concerns on the relationship between AR scenario and brand attitude*

	Brand Attitude	
Predictors	*Estimates*	*p*
(Intercept)	5.32	<0.001
AR dummy	-0.15	0.825
Privacy	-0.11	0.066
AR dummy × Privacy	0.10	0.424
Participants (N)	327	
R^2 / R^2 adjusted	0.021 / 0.012	

To test H7 and H7a, a linear mixed-effect regression model with a random intercept for respondents was estimated to account for the fact that each participant evaluated more than one product. The AR presentation scenario was coded as a dummy (AR = 1, non-AR = 0), and the product category was also coded as a dummy (sunglasses = 1, furniture = 0). The interaction term between these two dummy variables was included to examine whether product category moderates the effect of AR on purchase intention and brand attitude. Because each participant evaluated two product categories, each respondent's result included more than one observation, resulting in 627 observations from 327 participants.

H7: Category type moderates the relationship between the AR presentation scenario and purchase intention

Hypothesis H7 proposed that product category (sunglasses vs furniture) moderates the relationship between the AR presentation scenario and purchase intention. The interaction term between the AR presentation scenario and product category is negative but not statistically significant (b = -0.10, p = 0.613) (Table 13). This indicates that the effect of AR on purchase

intention does not differ meaningfully between sunglasses and furniture. Therefore, H7 is not supported.

Table 13. *Moderating Effect of Category Type on the relationship between AR scenario and purchase intention*

	Value	
Predictors	*Estimates*	*p*
(Intercept)	4.93	<0.001
AR dummy	0.54	0.001
Category dummy	0.12	0.147
AR dummy × Category dummy	-0.10	0.613
Random Effects		
σ^2	0.89	
$\tau_{00\ ResponseId}$	0.68	
ICC	0.43	
$N_{\ ResponseId}$	327	
Observations	627	
Marginal R^2 / Conditional R^2	0.027 / 0.447	

H7a: Category type moderates the relationship between the AR presentation scenario and brand attitude.

Hypothesis H7a proposed that product category type (sunglasses vs furniture) moderates the relationship between the AR presentation scenario and brand attitude. The interaction term

showed a positive coefficient, but was statistically insignificant (b = 0.05, p = 0.766) (Table 14). This indicates that product category type does not act as a boundary condition that changes how AR-based presentation influences consumers' brand attitudes. Therefore, H7a is rejected.

Table 14. *Moderating Effect of Category Type on the relationship between AR scenario and brand attitude*

	Value	
Predictors	*Estimates*	*p*
(Intercept)	4.87	<0.001
AR dummy	0.29	0.146
Category dummy	0.02	0.755
AR dummy × Category dummy	0.05	0.766
Random Effects		
σ^2	0.59	
$\tau_{00\ ResponseId}$	1.73	
ICC	0.74	
$N_{\ ResponseId}$	327	
Observations	627	
Marginal R^2 / Conditional R^2	0.07 0.746	
	0.08	

5.5 Summary of hypothesis testing

Table 15. *Summary of Hypothesis*

Hypothesis	Result
H1	Partially Supported
H1a	Partially Supported
H2	Supported
H2a	Not Supported
H3	Supported
H3a	Supported
H4	Not Supported
H4a	Supported
H5	Not Supported
H5a	Not Supported
H6	Not Supported
H6a	Not Supported
H7	Not Supported
H7a	Not Supported

6. Discussion and Conclusions

6.1 Main Findings and Conclusion

Augmented reality has gained "voice" in online retail as a tool capable of enhancing product visualization. Despite increasing academic attention, existing research reports mixed findings regarding AR's impact on consumer outcomes and the mechanisms through which these effects occur. This study moves beyond whether AR is effective and instead examines how and under which conditions an AR static image presentation influences consumer responses in e-commerce.

Regarding RQ1: "How does experiencing an AR static image scenario, compared to viewing traditional product formats, affect consumers' Purchase intention and Brand Attitude?", the findings indicate that AR static image presentations lead to significantly higher purchase intention and brand attitude when compared to a white background format, but not when compared to contextualized product images. These results align with prior research suggesting that AR enhances consumer evaluations by improving visualization quality and reducing cognitive effort (Hilken et al., 2017; Smink et al., 2019). However, the lack of significant differences between AR and contextual cues supports the argument by (Maier & Dost, 2018a) that contextual imagery already facilitates mental visualization and imagery fluency. Although the AR static-image condition performed better than the white-background scenario, we can't conclude whether this effect is driven by the AR technology itself or by the visual contextualized cues embedded in the AR stimuli, such as human models and contextualized environments. Consequently, part of the observed effect may be attributed to enhanced visual contextualization rather than AR itself. However, the absence of significant differences between the AR and contextual cues conditions suggests that AR static images deliver benefits comparable to traditional techniques, while additionally offering features that can enhance the online shopping experience. This finding does not reduce the value of AR but suggests that AR should be used as a complementary tool in online product presentations, rather than a visualization solution alone. In addition, retailers may achieve better outcomes in consumer responses by investing in high-quality contextual product imagery, which typically requires a lower investment than AR.

Addressing RQ2: "Does perceived usefulness and perceived ease of use mediate the effect of an AR static image scenario on consumers' Purchase Intention and Brand Attitude?", the mediation analyses provide strong support for the technology acceptance model (Fred D. Davis,

1989) in the context of AR static image presentations. Both perceived usefulness and perceived ease of use fully mediated the relationship between AR exposure and purchase intention, indicating that AR influences behavioural intentions primarily by enhancing consumers' cognitive evaluations of its usability. These findings are consistent with prior AR research highlighting the central role of usefulness and ease of use in technology adoption and purchase intention (Guo & Zhang, 2024; Oyman et al., 2022). Regarding the mediation effect of perceived usefulness and perceived ease of use on brand attitude, results only provide support for the mediation effect of perceived ease of use on brand attitude. Although exposure to the AR scenario increases perceptions of usefulness, this evaluation does not significantly lead to more favorable brand attitudes. This finding contrasts with evidence from other related domains suggesting that usefulness may impact brand attitude (Parreño et al., 2013; Sari, 2022). Previous studies suggest that perceived usefulness is more strongly associated with purchase intention rather than brand evaluations (Guo & Zhang, 2024; Oyman et al., 2022). This finding suggests that consumers' brand attitude may be shaped more by the ease and intuitiveness of the AR experience rather than the usefulness value. In contrast, perceived ease of use indicates that intuitive and easy AR experiences contribute to more favorable brand attitudes. While previous research in other domains reports mixed findings (Sari, 2022; Y. Yang et al., 2017), the present results are in line with a study that identifies positive effects in digital and mobile service settings (Musavi & Mammadli, 2025).

Regarding RQ3: "Do individual and contextual factors moderate the effect of an AR image scenario on Purchase Intention and Brand Attitude?". The results indicate that most proposed moderators do not significantly alter the effects of AR static image presentations on purchase intention or brand attitude. Contrary to expectations from prior research emphasizing the novelty effects and experiential learning (Yim et al., 2017), AR familiarity did not moderate the impact of AR on either purchase intention or brand attitude. This result implies that, in the case of static AR images, consumers do not rely heavily on prior experience to evaluate the technology. Instead, perceptions of usefulness and ease of use appear to dominate, reducing the relevance of familiarity differences. Similarly, privacy concerns did not significantly weaken the effects of AR on consumer responses. While previous studies have shown that perceived intrusiveness can negatively influence evaluations in highly interactive AR applications (Smink et al., 2020), the absence of moderation in the present study may be explained by the lower level of privacy concerns associated with static rather than interactive AR experiences. As these presentations do not require extensive real-time data access, privacy concerns may play a less

significant role in shaping consumer responses. Product category type also failed to moderate the effects of AR exposure. Despite theoretical arguments suggesting that AR may be perceived and evaluated in a different way for hedonic and utilitarian products, the findings indicate that AR static images provide similar value across both categories examined. This suggests that the cognitive benefits associated with AR, such as improved visualization and reduced evaluation effort, appear not to be category-specific in this context.

An exception emerges for psychological tradition barriers, which significantly moderate the relationship between AR exposure and brand attitude, but not purchase intention. As tradition barriers increase, the positive effect of AR on brand evaluations decreases. This finding is consistent with innovation resistance theory (Ram & Sheth, 1989) and suggests that consumers who are more resistant to changing established habits are less likely to translate positive AR experiences into favorable brand attitudes. Notably, the absence of a moderating effect on purchase intention indicates that purchase decisions may be less sensitive to psychological resistance than brand evaluations.

It is also important to mention that the moderation results should be interpreted with some caution due to the relatively small explanatory power of the regression models. Although the moderation effect of tradition barriers on brand attitude is statistically significant, the small adjusted R^2 (0.02) indicates only 2% of the variance in brand attitude. This means that tradition barrier cannot be considered as the main negative driver of brand attitude, but as a secondary factor instead, suggesting that brand attitude in AR context may depend less on resistance factors and more on consumers' evaluations of the AR experience itself.

6.2 Managerial and Academic Implications

From a managerial perspective, the findings suggest three main implications for retailers. First, simple white-background product images may still be relevant when the objective is to present basic product information in a clear and functional way. Although this format is commonly used in retail, the results indicate that this format should be used together with rich product images, with the purpose of increasing purchase intention and brand attitude. Second, the results reveal the importance of contextualized and rich product images. Images that place products in real environments can enhance the ability to visualize products in real use. As AR static images did not perform better than contextualized product images, this implies that retailers with low investment may still achieve comparable outcomes if they invest in high-quality contextual

images that simulate AR cues. Third, retailers should adopt AR as a complementary visualization tool rather than as a replacement for detailed product images. While AR static images enhance consumer responses compared to minimalistic presentations, they do not perform better than high-quality contextual imagery. This indicates that AR may be more effective when integrated into detailed and context-rich product image strategies. Additionally, given that perceived usefulness and perceived ease of use fully explain the effect of AR on purchase intention and perceived ease of use shapes brand attitude, retailers should prioritize the design of AR experiences that are intuitive, easy to navigate, and visually clear. AR implementations that are difficult to use or cognitively demanding are unlikely to generate value. Nevertheless, AR content should be visually consistent with existing product images and brand aesthetics to avoid confusion and ensure a coherent shopping experience. Moreover, given that traditional barriers negatively affect brand attitude, to attenuate this resistance, retailers can clearly communicate and familiarize consumers with AR. This can be done by highlighting AR attributes, demonstrating how it can help the purchase moment, and providing clear guidance on how to use the technology step by step.

From an academic perspective, this study contributes to the literature on AR in online shopping by clarifying how AR influences consumer responses and through which mechanisms these effects occur. The findings highlight the importance of the technology acceptance model, through perceived usefulness and perceived ease of use, which explain the effect of AR on purchase intention and perceived ease of use on brand attitude. This confirms that users respond to AR mainly based on how useful and easy it is to use. The study also contributes to research on the boundary conditions of AR effectiveness. Most moderating variables did not significantly change the impact of AR. However, psychological tradition barriers weakened the positive effect of AR on brand attitude. This finding highlights the importance of the innovation resistance theory and suggests that resistance to new technologies can limit the positive impact of AR on brand evaluations.

6.3 Limitations

Despite the contributions, this study is subject to several limitations that should be acknowledged. First, participants assigned to the augmented reality condition were exposed to static images designed to replicate AR scenarios, rather than a fully interactive AR experience. As a result, participants did not actively engage with the technology, which may have affected

their perceptions. Second, although the AR and non-AR product presentation scenarios were designed to be as similar as possible, minor differences between stimuli may still exist. Variation in aesthetics could have influenced responses independently of the type of manipulation, limiting the extent to which the observed effects can be attributed only to the type of presentation scenario. In addition, the use of real product brands may have influenced participants' evaluations of brand attitude. Existing perceptions of the used brands may have shaped respondents' brand evaluations beyond the visualization formats. Consequently, the observed results in brand attitude should be interpreted with caution. Third, the study's external validity is restricted by the geographical scope of the sample, which comprises participants exclusively from Portugal. The study results may differ across countries, potentially limiting the generalizability of the findings to other cultural contexts. In addition, the sample was obtained through voluntary participation and distributed via social media, resulting in a non-probability convenience sample, therefore results are not representative of the broader population. Consequently, the findings should be interpreted with caution, as the sample selection may limit their generalizability beyond the study sample. Lastly, the mediation and moderation analyses were conducted using a binary dummy variable in which AR was coded as 1, and both contextual cues and white background were grouped as non-AR. Because the ANOVA results showed that AR only differs from the white background, combining the two formats into a single group may partially mask the differences in the mechanisms between the 2 comparisons.

6.4 Future Research

Building on the limitations of the present study and in the recommendations of other authors, several directions for future research can be identified. First, future studies should aim to use larger, more diverse, and randomly selected samples to enhance representativeness and reduce sample bias. Second, future research should use fully interactive AR experiences. Allowing participants to manipulate, explore, and interact with virtual products in real time would provide a more realistic evaluation of the main constructs. In addition, future research could benefit from combining interactive AR experiments followed by interviews. Post-experience interviews may provide a deeper understanding of consumers' perceptions and interpretations, complementing quantitative findings. Third, and in line with the recommendations of (Guo & Zhang, 2024; Ngo et al., 2025), longitudinal research designs could be adopted to examine how consumer perceptions and responses evolve, distinguishing between short-term and long-term

evaluations. Future research could explore the role of product categories and branding in AR contexts. Examining a broader range of product categories to clarify whether the effects of AR differ across consumption contexts. Additionally, comparing branded and unbranded products could provide insights into how brand cues interact with AR experiences, potentially strengthening or weakening their impact on consumer responses. Lastly, future research should analyze moderation and mediation analyses with the three presentation formats separately. This would allow researchers to understand better whether the effects and mechanisms differ between AR and each format.

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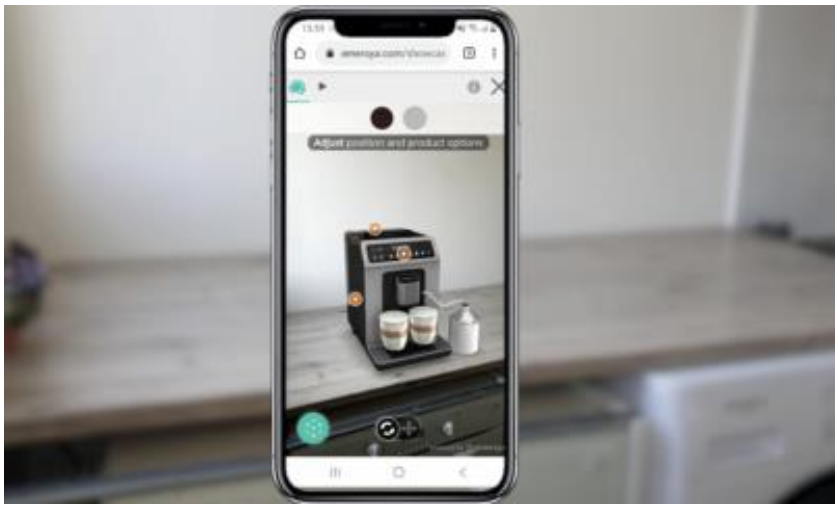
8. Appendix

8.1 Pre-survey

Dear participant,

This study is part of a dissertation project at the Faculty of Economics and Business Sciences of the Catholic University. Your data will help us understand which product consumers prefer to view in augmented reality in the context of online shopping. The survey takes about 5 minutes to complete and your participation is entirely voluntary. The survey is anonymous, and all data will be kept strictly confidential. You may stop participating at any stage of the experiment by closing the browser window. If you wish to participate, click the "->" button to give your consent and enter the experiment.

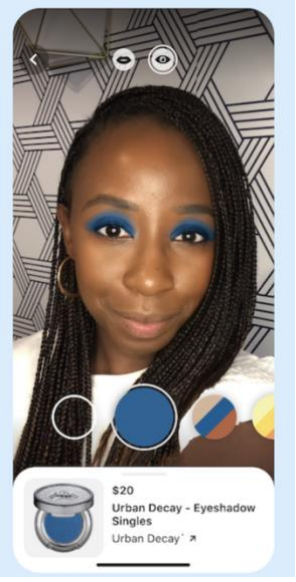
Before starting the questionnaire, it is important to understand what augmented reality is, so we will give you a brief explanation. Augmented Reality (AR) is a technology that allows you to view objects virtually, through a screen, such as that of a cell phone or tablet. For example, when shopping online, some stores allow users to "try on" items by accessing the camera to see how a pair of glasses looks on their face, how a sofa would look in their living room, how a coffee machine would look in their kitchen, or explore a product in 360° to get a more realistic perception of it. Essentially, it is a tool that attempts to mitigate what the online experience cannot offer (touch, detailed viewing, and experimentation), trying to bridge the gap between the in-store and online shopping experiences. To give you a clear understanding, here is an image where you can see how a coffee machine would look in your kitchen through the use of augmented reality.



From the categories below, choose those where you think augmented reality would be most useful for viewing a product before purchasing it. (Select two options.)

- [ ] Fashion (e.g., clothing and footwear) (1)
- [ ] Personal accessories (e.g., eyewear, watches, and bags) (2)
- [ ] Beauty (e.g., makeup) (3)
- [ ] Home and furnishings (e.g., furniture and decor) (4)
- [ ] Appliances (e.g., televisions and coffee machines) (5)

Before answering the following questions, please carefully review the image below for the product you have selected. The image shown uses Augmented Reality to visualize the product.



Please indicate your level of agreement with the statements below, considering the use of augmented reality for the presentation of the product you viewed.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Viewing this product in AR would be useful. (1)	○	○	○	○	○
AR would help me visualize its size and shape. (2)	○	○	○	○	○
It makes sense to use AR for this product. (3)	○	○	○	○	○
It would help me decide whether to buy it. (4)	○	○	○	○	○
I would like to try this product with AR. (5)	○	○	○	○	○
It would increase my intention to buy it. (6)	○	○	○	○	○

From the products below, choose the one you think augmented reality would be most useful for viewing before purchasing.

- ○ Footwear (1)
- ○ Clothing (2)

Before answering the following questions, please carefully review the image below for the product you have selected. The image shown uses Augmented Reality to visualize the product.

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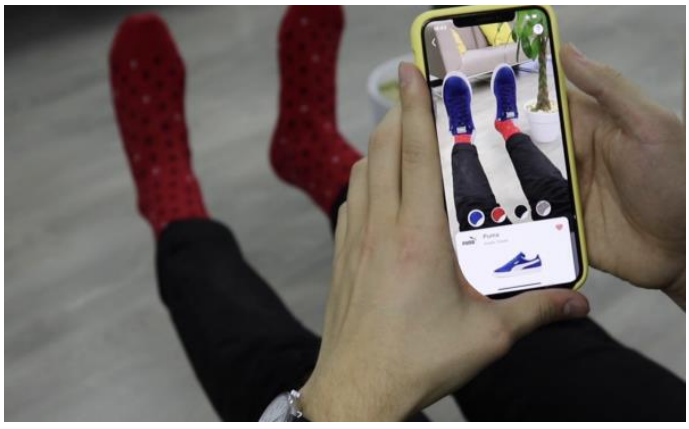
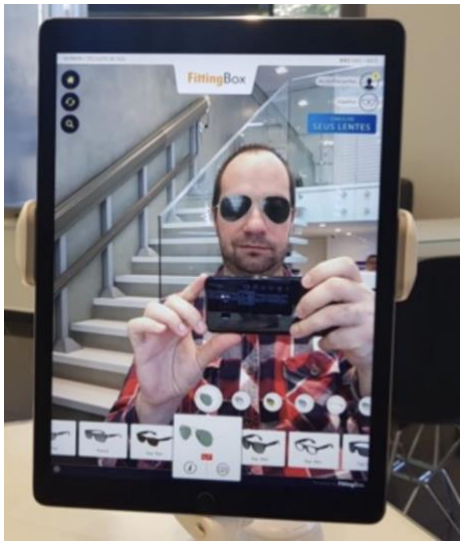


From the products below, choose the one you think augmented reality would be most useful for viewing before purchasing.

- ○ Watches (2)
- ○ Bags (3)
- ○ Sunglasses (4)

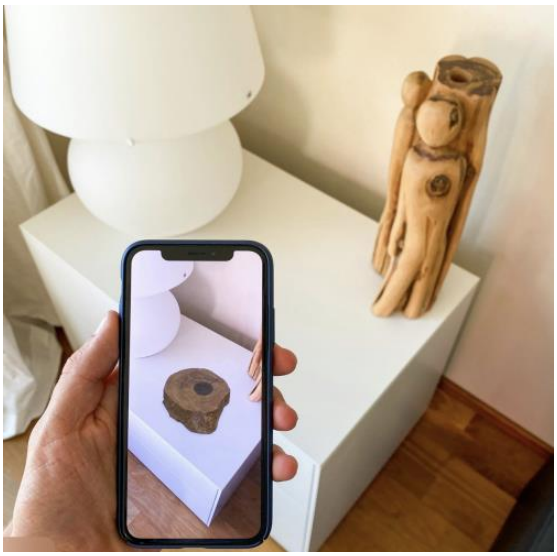
Before answering the following questions, please carefully review the image below for the product you have selected. The image shown uses Augmented Reality to visualize the product.



From the products below, choose the one you think augmented reality would be most useful for viewing before purchasing.

- ○ Furniture (1)
- ○ Home Décor (2)

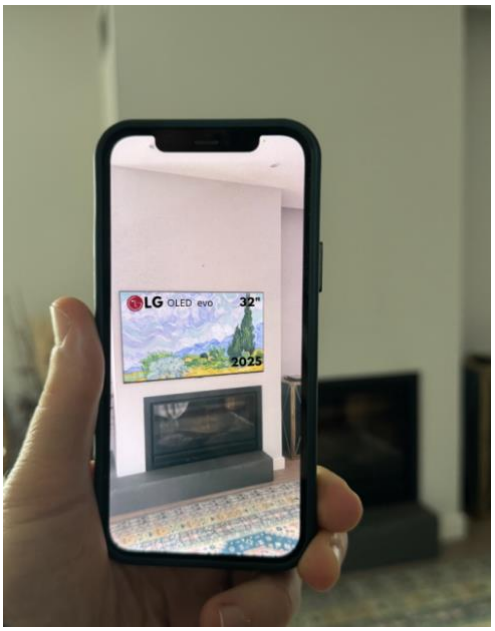
Before answering the following questions, please carefully review the image below for the product you have selected. The image shown uses Augmented Reality to visualize the product.



From the products below, choose the one you think augmented reality would be most useful for viewing before purchasing.

- ○ Television (1)
- ○ Coffee Machine (2)

Before answering the following questions, please carefully review the image below for the product you have selected. The image shown uses Augmented Reality to visualize the product.



What is your gender?

- ○ Female (1)
- ○ Male (2)
- ○ Prefer not to disclose (3)

What is your age?

- ○ < 15 (1)
- ○ 18 – 24 (2)
- ○ 25 – 34 (3)
- ○ 35 – 44 (4)
- ○ 45 – 54 (5)
- ○ 55 – 64 (6)
- ○ > 65 (7)

8.2 Main-Survey

Dear participant, This study is part of a dissertation project from the Faculty of Economics and Business Administration at Universidade Católica. Your data will help us better understand how consumers respond to different product visualizations. The survey takes approximately 10 minutes to complete, and your participation is entirely voluntary. The survey is anonymous, and all data will be treated confidentially. You may stop your participation at any stage of the experience by closing the browser window. If you wish to participate, please click the "->" button to give your consent and enter the experience.

Before starting the questionnaire, you must understand what augmented reality is. Therefore, we will provide you with a brief explanation. Augmented Reality (AR) is a technology that allows users to visualize objects virtually through the screen of a mobile phone or tablet. For example, when shopping online, some stores allow users to "try on" products using camera access, such as seeing how a pair of glasses looks on their face, how a sofa would appear in their living room, or exploring a product in 360° to gain a more realistic perception of it. Essentially, it is a tool that attempts to offer what the online experience cannot (touch, detailed visualization, and product trial), helping to reduce the gap between the in-store and online shopping experience.

In the following images, you will see a real-life scenario of purchasing a piece of hallway furniture available online, where augmented reality is used to view it in two scenarios, and in another scenario, you can view the hallway furniture against a white background. Please analyze the images carefully, as if you were considering purchasing the product in question. Next, you will be asked some questions about your impressions, preferences, and opinion on how the product was presented to you.

In the following images, you will see a real-life scenario of purchasing a piece of sunglasses available online, where augmented reality is used to view it in two scenarios, and in another scenario, you can view the sunglasses against a white background. Please analyze the images carefully, as if you were considering purchasing the product in question. Next, you will be asked some questions about your impressions, preferences, and opinion on how the product was presented to you

Please indicate how much you agree or disagree with the following statements about the images you have viewed.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
Two of the images used augmented reality to present the product. (1)	○	○	○	○	○	○	○
Two of the images suggested that, in a real situation, it would be possible to interact with/try out the product. (2)	○	○	○	○	○	○	○
Two of the images showed the product in a format that appeared dynamic, despite being static images. (3)	○	○	○	○	○	○	○

In the following images, you will see a real-life scenario of purchasing a piece of furniture available online. In two of the images, the furniture is shown in a real environment, and in another image, the furniture is shown against a white background.

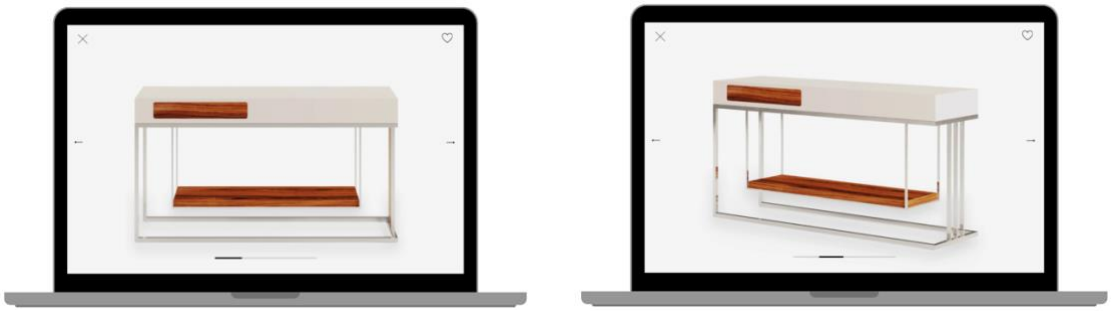
Please analyze the images carefully, as if you were considering purchasing the item. Next, you will be asked some questions about your impressions, preferences, and opinion on how the product was presented to you

In the following images, you will see a real-life scenario of purchasing sunglasses available online. In two of the images, the sunglasses are worn by a model, and in another image, the sunglasses are displayed on a white background.

Please analyze the images carefully, as if you were considering purchasing them. Next, you will be asked some questions about your impressions, preferences, and opinion about the way the product was presented to you.

In the following images, you will see a real-life scenario of purchasing a piece of furniture available online.

Please analyze the images carefully, as if you were considering purchasing the item. Next, you will be asked some questions about your impressions, preferences, and opinions on how the product was presented to you.



In the following images, you will see a real-life scenario of purchasing sunglasses available online.

Please analyze the images carefully, as if you were considering purchasing them. Next, you will be asked some questions about your impressions, preferences, and opinion on how the product was presented to you.

Please indicate how much you agree or disagree with the following statements about the images you have viewed.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
The product presentation is useful for my purchasing decision. (1)	○	○	○	○	○	○	○
The presentation mode provides useful information	○	○	○	○	○	○	○

about the furniture. (2)							
The furniture presentation mode would improve my shopping experience. (3)	○	○	○	○	○	○	○
The product presentation would make the shopping experience more efficient. (4)	○	○	○	○	○	○	○

Please indicate how much you agree or disagree with the following statements about the images you have viewed.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
The way the product was presented was intuitive. (1)	○	○	○	○	○	○	○
The product presentation	○	○	○	○	○	○	○

was easy and clear to understand. (2)							
I would find it easy to use this method of product presentation. (3)	○	○	○	○	○	○	○

Please indicate how much you agree or disagree with the following statements about the images you viewed. Consider only the images, without considering the quality of the product.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
I would consider purchasing this product in the near future. (1)	○	○	○	○	○	○	○
I intend to visit the brand's website when I need to purchase a similar product in	○	○	○	○	○	○	○

the future. (2) I would choose this product if I needed something similar. (3)	○	○	○	○	○	○	○

If a brand presented you with its entry-level furniture as you saw it earlier, how would you rate it, taking into account the following items and their scales:

	1	2	3	4	5	6	7	
Bad	○	○	○	○	○	○	○	Good
Unappealing	○	○	○	○	○	○	○	Appealing
Unpleasant	○	○	○	○	○	○	○	Pleasant
Unattractive	○	○	○	○	○	○	○	Attractive
Boring	○	○	○	○	○	○	○	Interesting
Dislike	○	○	○	○	○	○	○	Like

The following questions are about your familiarity with Augmented Reality. Augmented Reality (AR) is a technology that allows you to view objects virtually through a cell phone or tablet screen. For example, when shopping online, some stores allow users to “try on” items by accessing the camera to see how a pair of glasses looks on their face, how a sofa would look in

their living room, or explore a product in 360° to get a more realistic perception of it. Essentially, it is a tool that attempts to offer what the online experience cannot (touch, detailed visualization, and experimentation), trying to bridge the gap between the in-store and online shopping experiences.

Please indicate how much you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
I know how to use AR to view/evaluate products online. (1)	○	○	○	○	○	○	○
I have experience using AR tools. (2)	○	○	○	○	○	○	○
I am familiar with AR applications. (3)	○	○	○	○	○	○	○

Please indicate how much you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree

I feel more comfortable buying products online without using augmented reality. (1)	○	○	○	○	○	○	○
Augmented reality features for online shopping seem complicated to me. (2)	○	○	○	○	○	○	○
I prefer to see products physically in a store rather than using augmented reality when shopping online. (3)	○	○	○	○	○	○	○

Some online shopping features, such as Augmented Reality (AR), require access to the camera to provide interactive experiences with the product (e.g., trying it on virtually or viewing it in

your home). The following questions concern your opinion on privacy and security in the context of using AR for online shopping.

Please indicate how much you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
I feel uncomfortable with the possibility of AR collecting excessive personal information about me. (1)	○	○	○	○	○	○	○
I am concerned about the privacy of my personal data when using AR features while shopping online. (2)	○	○	○	○	○	○	○
I feel that online	○	○	○	○	○	○	○

shopping sites may use my personal information for unintended purposes without my approval. (3)

What is your gender?

- Female (1)
- Male (2)
- Non-Binary (3)
- Prefer not to disclose (4)

What is your age?

- < 18 (1)
- 18 - 24 (2)
- 25 - 34 (3)
- 35 - 44 (4)
- 45 - 54 (5)
- 55 - 64 (6)
- 65 - 74 (7)
- 75 - 84 (8)
- > 85 (9)

What is your level of education?

- ○ Primary Education (1)
- ○ Secondary Education (2)
- ○ Higher Education - Bachelor's Degree (3)
- ○ Higher Education - Master's Degree (4)
- ○ Higher Education - Doctorate (PhD) (5)

8.3 Product Choice

Table 16. *Descriptive Statistics of Product Choice*

Product	Mean	SD	N
Beauty	3,92	1,060660172	2
Clothes	4,02	0,709907215	7
Shoes	4,04	0,284637521	4
Watch	4,00	-	1
Bag	4,67	0,471404521	2
Sunglasses	4,19	0,371433659	6
Home furniture	4,25	0,39086798	6
Home Decor	4,58	0,589255651	2
TV	3,00	1,414213562	2
Coffee Machine	0	0	0

8.4 Sample Overview

Table 17. *Sample Size*

	Valid		Invalid		Total	
Category	N	%	N	%	N	%
Answers	327	60.3	237	39.7	564	100

Table 18. *Sample Demographic Characteristics*

	Sample (n = 327)	
Characteristic	**N**	**%**
Gender		
Female	216	66.1%
Male	109	33.3%
Prefer not to say	2	0.6%
Age		
<18	2	0.6%
18–24	120	36.7%
25–34	36	11%
35–44	31	9.5%
45–54	103	31.5%
55–64	27	8.3%
65–74	5	1.5%
75–84	3	0.9%

	Sample (n = 327)	
Characteristic	**N**	**%**
Education		
Basic education	1	0.3%
Secondary education	52	15.9%
Bachelor's degree	163	49.8%
Master's degree	104	31.8%
Doctorate	7	2.1%

Table 19. *Scenarios Sample size*

	AR		White Background		Contextual Cues		Total	
	N	%	N	%	N	%	N	%
Answers	82	25.1	120	36.7	125	38.2	327	100

Table 20. *AR Manipulation Check for each category*

Condition	Valid (N)	Invalid (N)
Furniture	20	7
Eyewear	7	20
Furniture and Eyewear	55	13

Table 21. *One-Sample T-Test Manipulation Check*

Category	Mean	SD	t_value	df	p_value
Eyewear	6.137097	0.5738092	29.32598	61	0.0000
Furniture	6.126667	0.5700482	32.30862	74	0.0000

8.5 Reliability Tests

Table 22. *Reliability Test (Cronbach's Alpha)*

Scale	Initial number of items	Cronbach's alpha	Cronbach's alpha if item deleted	Items deleted	Final number of items
Usefulness_AR_Eyewear	4	0.745	0.745	-	4
Ease_of_use_AR_Eyewear	3	0.891	0.891	-	3
Purchase_Intention_AR_Eyewear	3	0.792	0.792	-	3
Brand_Attitude_AR_Eyewear	6	0.967	0.967	-	6
Usefulness_AR_Furniture	4	0.820	0.820	-	4
Ease_of_use_AR_Furniture	3	0.674	0.766	1	2
Purchase_Intention_AR_Furniture	3	0.846	0.846	-	3

Scale	Initial number of items	Cronbach's alpha	Cronbach's alpha if item deleted	Items deleted	Final number of items
Brand_Attitude_AR_Furniture	6	0.969	0.969	-	6
Usefulness_CC_Eyewear	4	0.870	0.870	-	4
Ease_of_use_CC_Eyewear	3	0.843	0.843	-	3
Purchase_Intention_CC_Eyewear	3	0.876	0.876	-	3
Brand_Attitude_CC_Eyewear	6	0.954	0.954	-	6
Usefulness_CC_Furniture	4	0.840	0.840	-	4
Ease_of_use_CC_Furniture	3	0.869	0.869	-	3
Purchase_Intention_CC_Furniture	3	0.870	0.870	-	3
Brand_Attitude_CC_Furniture	6	0.950	0.950	-	6
Usefulness_WB_Eyewear	4	0.804	0.804	-	4
Ease_of_use_WB_Eyewear	3	0.891	0.891	-	3
Purchase_Intention_WB_Eyewear	3	0.807	0.807	-	3

Scale	Initial number of items	Cronbach's alpha	Cronbach's alpha if item deleted	Items deleted	Final number of items
Brand_Attitude_WB_Eyewear	6	0.963	0.963	-	6
Usefulness_WB_Furniture	4	0.874	0.874	-	4
Ease_of_use_WB_Furniture	3	0.942	0.942	-	3
Purchase_Intention_WB_Furniture	3	0.852	0.852	-	3
Brand_Attitude_WB_Furniture	6	0.956	0.956	-	6

8.6 Descriptive Statistics and Pearson Correlations

Table 23. *Descriptive Statistics and Pearson Correlations (AR Condition)*

Variable	M	SD	1	2	3	4	5	6	7
1. PU	6.22	0.65	—						
2. PEOU	5.97	1.05	0.57	—					
3. PI	5.59	1.03	0.41	0.61	—				
4. BA	5.26	1.63	0.28	0.41	0.32	—			
5. TB	3.84	1.24	-0.51	-0.26	-0.14	-0.26	—		
6. AR Familiarity	3.95	1.60	0.27	0.37	0.28	0.34	0.01	—	
7. Privacy	5.24	1.61	-0.15	-0.10	-0.10	-0.10	0.16	-0.20	—

Table 24. *Descriptive Statistics and Pearson Correlations (Contextual- Cues Condition)*

Variable	M	SD	1	2	3	4	5	6	7

1. PU	5.67	1.12	—						
2. PEOU	5.75	1.02	0.71	—					
3. PI	5.26	1.27	0.60	0.69	—				
4. BA	4.92	1.60	0.29	0.21	0.27	—			
5. TB	4.22	1.21	0.05	0.13	0.05	-0.02	—		
6. AR Familiarity	4.22	1.72	0.04	0.01	0.10	0.14	-0.10	—	
7. Privacy	4.99	1.67	-0.19	-0.15	-0.11	-0.16	0.36	-0.04	—

Table 25. *Descriptive Statistics and Pearson Correlations (White- Background Condition)*

Variable	M	SD	1	2	3	4	5	6	7
1. PU	5.38	1.06	—						
2. PEOU	5.29	1.20	0.51	—					
3. PI	4.84	1.20	0.42	0.66	—				
4. BA	4.64	1.53	0.14	0.36	0.40	—			
5. TB	4.12	1.09	-0.11	0.05	0.02	0.10	—		
6. AR Familiarity	3.97	1.81	0.20	0.21	0.04	0.07	-0.22	—	
7. Privacy	5.18	1.73	-0.15	-0.08	-0.07	-0.08	0.03	0.08	—

Note. PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Purchase Intention; BA = Brand Attitude; TB = Tradition Barriers.

8.7 Levene´s Tests

Table 26. *Levene´s Test for Homogeneity of Variance (Purchase Intention)*

term	df	F.value	p.value
scenario	2	0.49	0.616
Residuals	324		

Table 27. *Levene's Test for Homogeneity of Variance (Brand Attitude)*

term	df	F.value	p.value
scenario	2	0.18	0.835
Residuals	324		

8.7 One-way ANOVA Tests

Table 28. *One-Way ANOVA Results for Purchase Intention*

term	df	sumsq	meansq	statistic	p.value
scenario	2	32.150	16.075	14.227	0
Residuals	324	366.093	1.130		

Table 29. *One-Way ANOVA Results for Brand Attitude*

term	df	sumsq	meansq	statistic	p.value
scenario	2	15.857	7.928	3.71	0.026
Residuals	324	692.488	2.137		