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Impacts of Virtual Reality on the Real Estate Consumer's Purchase Intentions

Beatriz do Carmo Silva e Gonçalves

Master in Marketing

Supervisor:

Prof. Sandra Maria Correia Loureiro, Full Professor, ISCTE - Instituto Universitário de Lisboa

Co-supervisor:

Msc Mariana de Oliveira Berga Rodrigues, Research Assistant, BRU-ISCTE

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BUSINESS
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Department of Marketing, Strategy and Operations

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Abstract

Nowadays, the world is witnessing rapid technological advances, and the real estate sector is following these trends by adopting cutting-edge solutions that provide better consumer experiences and facilitate transactions. One of the latest technologies to emerge is virtual reality (VR). This technology has the potential to completely change the way consumers purchase and sell real estate. Although there is a great deal of interest in VR, few studies have been conducted to understand how it impacts real estate companies and consumers. The present dissertation suggests a model that examines the impact of virtual reality on real estate consumers purchase intentions concerning constructs such as playfulness, informativeness, perceived risk, and purchase intentions. Thus, this research consists of a quantitative analysis in which 200 responses were collected from a questionnaire. The data and hypotheses were analysed and interpreted using the Partial Least Squares Structural Modelling approach. Findings suggest that playfulness and informativeness have a positive impact on improving real estate purchase intentions, and that perceived risk is negatively associated with real estate purchase intentions. The results further identify a positive, significant, and direct impact of playfulness on informativeness. Playfulness also influences purchase intentions, but this relationship is mediated by informativeness. However, the relationship between playfulness and purchase intention is not mediated by perceived risk, according to the results.

Keywords: Real Estate, Virtual Reality, Playfulness, Informativeness, Perceived Risk, Purchase Intentions

JEL Classification Codes: M30 – General Marketing; M31 – Marketing and Advertising: Marketing

Resumo

Atualmente, o mundo assiste a rápidos avanços tecnológicos e o sector imobiliário está gradualmente a adotar tecnologias de ponta que proporcionam melhores experiências aos consumidores e que facilitam transacções. Uma das mais recentes tecnologias a surgir é a realidade virtual. Esta tecnologia tem o potencial de mudar completamente a forma como os consumidores compram e vendem bens imobiliários. Embora exista um grande interesse na realidade virtual, poucos estudos foram realizados de forma compreender o seu impacto nos consumidores do sector imobiliário. A presente dissertação propõe um modelo que analisa o impacto da realidade virtual nas intenções de compra de imóveis por parte dos consumidores, no que respeita a constructos como o grau de entertenimento, a informatividade, a percepção de risco e as intenções de compra. Desta forma, esta investigação consiste numa análise quantitativa em que 200 respostas foram recolhidos a partir de um questionário. Os dados e as hipóteses foram analisados e interpretados através da metodologia Partial Least Square Structural Modelling. Os resultados sugerem que o grau de entertenimento e informatividade tem um impacto positivo nas intenções de compra de propriedades, e que a percepção do risco está negativamente associada às intenções de compra dos imóveis. Os resultados identificam também um impacto positivo do grau de entretenimento na informatividade. O grau de entretenimento também influencia as intenções de compra, mas esta relação é mediada pela informatividade. No entanto, a relação entre o grau de entretenimento e a intenção de compra não é mediada pela percepção de risco, de acordo com os resultados.

Palavras-chave: Imobiliário, Realidade Virtual, Grau de entretenimento, Informatividade, Percepção de Risk, Intenções de Compra

JEL Classification Code: M30 – General Marketing; M31 – Marketing and Advertising: Marketing

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List of Abbreviations

e.g.	For example (abbreviation for exempli gratia)
et al.	And others (abbreviation for et alii)
VR	Virtual Reality
H	Hypothesis
AVE	Average Variance Extracted
CA	Cronbach's Alpha
CR	Composite Reliability
VIF	Variance Inflation Factor

CHAPTER 1: Introduction

In recent years, the real estate industry has drawn significant financial investments (Ullah et al., 2018). This industry globally generated $9.5 billion in revenue in 2021 and is expected to have a compound annual growth rate of 4.8 per cent between 2021 and 2030 (Statista, 2022). Real estate is one of the most significant assets traded in person or online among other products, services, and commodities (Ullah et al., 2021). Buying a property is related to economic and socio-cultural factors that influence each person's decision (Levy et al., 2008; Hassan et al., 2021), thus, the decision-making process of purchasing a property is considered complex and challenging (Wouda & Opdenakker, 2019).

Although the real estate sector is growing rapidly, the implementation of new technologies in this sector is considered slow (Baum, 2020). To transit from conventional to a property technology (PropTech) approach, the real estate sector must enhance its use of disruptive technologies (Ullah et al., 2018; Saull et al., 2020). A Proptech company focuses on using cutting-edge technology such as virtual reality (VR) to promote innovation, improve business operations, improve consumer experiences, and remain competitive (Ullah et al., 2021; Moro et al, 2022). Also, these technologies facilitate the gathering and processing of pertinent data regarding properties, potentially accelerating the transaction process, decreasing transaction costs, improving liquidity and market transparency (Saull et al., 2020).

Virtual reality is an emergent technology that has been applied to several industries (Vishwakarma et al., 2020). According to Jaffer (2022), virtual reality's widespread use in the real estate sector has significantly altered how transactions are done. In 2021, the market for VR was estimated to be worth $27.96 billion, and by 2028, it is anticipated to be worth $252.16 billion (Statista, 2023). Nowadays, consumer software, namely video games, accounts for a considerable portion of the VR market share, as VR headsets, such as Meta's Oculus Quest and HTC's VIVE, are revolutionizing and transforming gaming and entertainment (Wohlgenannt et al., 2020). This indicates that in terms of realizing VR's full potential, it is the only beginning (Jaffer, 2022).

Virtual reality technology produces an immersive virtual world that represents reality, allowing users to manage their actions (Pleyers & Pocin, 2020). The visualization of a property through VR is different from a two-dimensional view using photos and videos. When a two-dimensional visualization is presented to a consumer, they create a mental model of the environment by converting the 2D representation into 3D (Kang et al., 2020). Thus, virtual

reality removes this mental model creation since through this technology users have the possibility to experience an immersive virtual environment (Kang et al., 2020).

Virtual reality allows property consumers to view a property from a distance as if they were physically in the property, speeding up transactions (Sihi, 2018). In addition, through this technology, agents, landlords and short-term rental hosts can improve their marketing and lead generation campaigns thanks to virtual property presentations, 3D tours, home preparation and virtual guides (Jaffer, 2022). However, the adoption of VR in the real estate sector is complex due to higher implementation costs, privacy issues and the lack of quality of the images displayed by the equipment (Sihi, 2018; Wohlgenannt et al., 2020). Indeed, return on investment may also be a challenge for real estate companies, since virtual reality is a new technology with restricted access and is still in development (Wohlgenannt et al., 2020).

According to recent studies, consumers who used VR technology to virtually tour a property felt as though they were inside of a real property and, consequently, wanted to purchase it (Xiong et al., 2022). However, little is known about potential impact of VR on real estate and its impact on real estate purchase intentions (Starr, 2020; Xiong et al., 2022).

1.1. Objectives Definition and Research Questions

Regarding the context made in the previous point and the complexity inherent to the dissertation topic, it becomes important to conduct studies on the consumer's purchase intentions when using immersive virtual reality in the real estate sector (Starr, 2020; Xiong et al., 2022). Having the main research question in consideration "What are the impacts of virtual reality on purchase intentions of real estate consumers?", the following objectives will be addressed in this research: (1) understand if playfulness, informativeness and perceived risk influence real estate consumer purchase intentions; (2) examine how informativeness mediates the relationship between playfulness and real estate consumer purchase intentions; (3) analyse the possible impacts of perceive risk, as a mediator, on the relationship between playfulness and real estate purchase intentions.

In general, research on the usage of VR devices and consumer purchase intentions has been undertaken in a variety of subjects, but there have been relatively few academic studies done in the context of real estate. With these research questions and objectives under consideration the innovation of this dissertation consists of the relationship of the real estate sector with the marketing constructs of playfulness, informativeness, perceived risk and purchase intentions

considering the use of virtual reality as a marketing tool that offers consumers in this sector a novel, playful and informative experience.

1.2. Structure of the Dissertation

The dissertation is divided into seven chapters. In the first chapter, Introduction, the topic is introduced, the research problem and the defined objectives are presented. In the second chapter, a literature review with the main concepts of the theme under discussion is presented based on existing research. This chapter will focus on contextualizing the real estate industry and virtual reality, the factors that affect consumers looking for a property, and the aspects that impact the property decision-making process through VR. Thus, a framework will be presented that demonstrates the relationship described in the literature review, along with a set of hypotheses.

Further, the Hypothesis Development chapter includes the conceptual framework and hypothesis development. In the fourth chapter of the dissertation, the methodology used in the present study will be explained through appropriate investigation procedures. The fifth chapter corresponds to the treatment of the data collected in the survey using the SPSS and SmartPLS4 programs and the testing of the hypotheses. The sixth chapter will discuss the study findings, theoretical and managerial implications. To conclude the dissertation, chapter seventh will present the conclusions, the limitations of the study, and recommendations for future research.

CHAPTER 2: Literature Review

2.1.The Real Estate Industry

Real estate is a key sector for economies around the world (Lecomte, 2019). According to historical patterns, the expansion of real estate industries has a significant impact on the overall economic growth of a nation (Urbanavičiene et al., 2009). Numerous factors, including motivation of sellers and buyers, demographic aspects, financial market limits, laws, land availability, speculative bubbles, affect the real estate market and how its agents behave (Opoko et al., 2020).

The real estate industry is based on high involvement decisions and purchases (Kumar & Khandelwal, 2018). According to Greenwald and Leavitt (1984, p.583), high involvement designates "personal relevance or importance". This concept is associated with consumers needing to have detailed product information, their evaluation of different alternatives (Zaichkowsky, 1985) and their resistance to persuasion (Greenwald & Leavitt, 1984). Buying and selling property is a significant economic event for consumers and a risky process (Ullah & Sepasgozar, 2020). It is a time-consuming process and is characterized as fundamentally social in nature since it involves setting goals, researching, discussing, and negotiating family needs, interacting with real estate agents, visiting potential properties, and examining market trends (Levy et al., 2008).

Overall, the real estate is often described as unique and complex (Wouda & Opdenakker, 2019), as a wide variety of actors, including corporations, households, intermediaries, and institutions, are part of global real estate market (Salzman & Zwinkels, 2020). Also, different types of services (sale, rental, time-sharing of public and private properties and property management) are provided to consumers in this industry (Avantaggiato & Gallo, 2019). Moreover, it is highly fragmented sector, with multiple sources of information, high economic transactions brought on by the involvement of several reliable entities, and high financial risks (Kumar & Khandelwal, 2018; Avantaggiato & Gallo, 2019; Nijland, 2019).

Furthermore, the real estate sector is also described as non-transparent with significant inefficiencies as sometimes transactions and information about real estate assets are not entirely disclosed to the public (Kummerow & Chan Lu, 2005).

2.2. Real Estate Industry Digital Transformation

According to Wounda and Opdenakker (2019), the real estate industry is known for its lag in implementing the latest innovations and consequently being resistant to change. The real estate agent still plays a significant role in this industry, acting as an intermediary between sellers and buyers, searching for properties that meet consumer's needs, offering individualized guidance, disseminating market knowledge, and assisting in price negotiations (Urbanavičiene et al., 2009). Currently, several real estate agents rely on personal interactions as well as face-to-face experiences to persuade potential consumer decisions (Moro et al., 2022).

Nevertheless, innovations are penetrating the real estate industry and disrupting the in-person services provided by real estate agencies (Urbanavičiene, et al., 2009). Thus, this sector is "facing a transformation" (Pfnür & Wagner, 2020, p.975) triggered by the four technological advancements. Technology, such as mobile internet and cloud computation, has modernised and facilitated many processes in the real estate industry such as the bureaucracies of buying or renting homes, allowed for more focused marketing to target consumers and enabled consumers to research different properties and table information through websites (Moro et al., 2022). The sharing economy, which is defined as technological innovation platforms that facilitate the usage of real estate, such as Airbnb, has also contributed to the digitisation of the real estate industry (Baum, 2020). These platforms have made it possible to inform potential buyers and sellers of real estate, as well as to conduct rental negotiations more easily and immediately (Baum, 2020).

Additionally, to the mentioned technology tendencies, the advent of smart cities represents an emergent urban trend. Every day urban dwellers face housing challenges, including accessibility, affordability, and the high demand for available properties (Shamsuddin & Srinivasan, 2021). As such, smart cities are an emerging solution to these problems. The emphasis on people, communities, and the use of cutting-edge technology defines smart cities (Ullah & Al-Turjman, 2021). It is characterized in terms of six dimensions: "smart economy, smart mobility, smart environment, smart people, smart living and smart governance" (Lancome, 2019, p. 129). Real estate companies also must adapt a Smart Real Estate strategy, implementing different electronic sensors to collect information about a properties or lands, improving their services, consumer satisfaction, accessibility and effectively manage resources and assets (Ullah et al., 2018).

A further event that significantly accelerated digitalisation in the real estate sector was the pandemic caused by the COVID-19 virus. In 2020, the prohibition on personal interaction with

clients had an immediate impact on the real estate business (Moro et al., 2022). As a result, to remain connected with consumers and offer them more visual experiences of properties, real estate companies began to focus on online solutions (Moro et al., 2022). Real estate businesses have enhanced their websites by including 2D videos, videos with drones, and 3D walkthroughs through the Matterport application (Sulaiman et al., 2020). Also, several agents implemented home visits through Skype and FaceTime (Nicola et al., 2020).

Meanwhile, real estate agencies are making efforts to implement even more disruptive technologies (Starr et al., 2020). For example, one of the immersive technologies that is being used by real estate agencies is the Matterport software. This software provides property buyers with a 3D virtual tour of the property and a dimensionally correct representation of the space that is identical to reality (Sihi, 2018). Another example is the website Realtor.com that has an augmented reality (AR) application available that allows homebuyers to discover a property in an innovative way (Farshid et al., 2018).

Due to the adoption of cutting-edge technology in this sector, the concept of Property Technology (PropTech) has emerged. PropTech is a concept that represents real estate companies whose business strategies integrate innovative technology (Shaw, 2018; Asensio-Soto & Navarro-Astor, 2022). Baum (2020) states that proptech is about information, management, and transactions. It encompasses all assets, procedures, and business models that make use of the most innovative Information and Communication Technology (ITC) resources (Tagliaro, et al., 2020). According to Tagliaro, et al. (2020) Proptech's primary goal is to enhance existing real estate value chains and achieve more efficacy and efficiency.

2.3.Virtual Reality

Virtual reality (VR) technology is emerging quickly as a promising technology that can lead consumers into virtual worlds (Spielmann & Mantonakis, 2018). Yung and Khoo-Lattimore (2019) define virtual reality as a 3D immersive simulation generated by a computer, giving users the feeling that they are in a real-world environment by simulating one or more of their five senses. Through VR devices such as “head-mounted displays (HMDs), cubic immersive environments (CAVE), big screens (power walls), and mobile devices (smartphones, tablets)” (Wedel et al., 2020, p.443), it is possible to experience an immersive reality that may or not be identical to the real world (Loureiro et al., 2020).

Furthermore, by entirely abstracting consumers from physical space stimuli and transferring them to a virtual environment (Meirinhos et al., 2022), VR delivers consumer

engagement, real-time information, and, consequently, a better user experience compared to desktop environment (Fan et al., 2022). Indeed, the immersive characteristic of virtual reality can strongly evoke an illusion of realism in the senses, which in stages of the consumer journey this technology might significantly help consumers to make better decisions (Fan et al., 2022). The ability of virtual reality technology to produce various aspects of reality has enabled new methods of engaging with consumers and brought innovative opportunities to businesses (Loureiro et al., 2019). According to Daft and Lengel's (1986) theory on media richness, the richer the media format, the more successful the communication with the consumer. By comparing the richness of 2D and 3D media, 3D virtual worlds provide a richer environment in terms of 3D computer interfaces since users can see the virtual environment realistically and interact with people (Pen & Ken, 2015). In fact, VR is considered an effective marketing tool (Kim et al., 2020b) as it allows brands to build a stronger trust connection with consumers (MeiBner et al., 2020) and improve brand reputation and legitimacy (Loureiro et al., 2019).

Considering these advantages, several sectors are investing and embracing this cutting-edge technology for a variety of applications (Juan et al., 2018; Itani & Hollebeek, 2021). An example of a sector that has adopted this VR technology is tourism and heritage (Wangler & Huns, 2018). Due to some of its characteristics, VR has been implemented in tourism as it can provide the traveller distinct and enhanced experiences (Lee et al., 2020). As Vishwakarma et al. (2020) argue, VR has more advantages than traditional brochures and websites since through this technology it is possible to visualize and feel a destination, a museum, or a hotel before making the decision to visit (Loureiro et al., 2020). Thus, consumers are often looking for new things while researching a tourist destination, and VR can provide them with a new way to explore and experience the place (Vishwakarma et al., 2020). Moreover, the implementation of VR tools has made it easier to share information and provide access to cultural heritage in a more engaging and creative manner (De Paolis et al., 2022).

Virtual reality has also been applied in e-commerce retailing. VR is a powerful technology that in the coming years will completely change the way consumers shop (Martinez-Navarro, et al., 2019). Biggest retailers around the world recently integrated virtual reality into e-commerce services (Xiong et al., 2022). Through VR, consumers can have a real-time, immersive experience, where they can explore virtual stores and interact with virtual representations of physical goods (Alcañiz et al., 2019). According to Wedel et al. (2020) VR enhances consumer shopping and product testing, increases shopping efficiency. By enabling product testing, the presentation of goods within a VR environment may help to further limit the possibility of item returns (Meirinhos et al., 2022).

2.3.1. Virtual Reality and Real Estate

Prospective home buyers and sellers often look to real estate professionals to simplify the real estate transaction process. When a client is looking for a home that matches their needs, they contact the real estate agent. However, the home buying process takes time and requires visits to several properties (Xiong et al., 2022). Therefore, the matching process can be assisted by VR, as this technology permits visualizing virtual homes allowing consumers to (re)visit a wide range of properties virtually before potentially seeing in person (Hou & Wu, 2020), thus saving money and time (Pleyers & Pocin, 2020). Virtual open houses, virtual staging and constructing information modelling are some of the VR applications that are employed in the real estate industry (Pleyers & Pocin, 2020; Xiong et al., 2022).

With immersive VR, consumers can visualize buildings and properties that are still being built (Sihi, 2018) and the physical characteristics of properties, such as the layout, amenities, geography, or neighbourhood (Hou & Wu, 2020). For that reason, VR is frequently utilized as a marketing tool in the real estate sector (Hou & Wu, 2020). According to Xiong et al. (2022) study findings, VR applied in a property marketing strategy encourages purchasers to visit the property in person, significantly reduces the time it spends on the market, and increases market transparency. Also, in comparison to 2D photographs, VR allows users to experience a 3D immersive view of the property, which offers more information and a greater level of interaction (Xiong et al., 2022).

Moreover, VR can have a significant impact on the buyers' decision-making process and throughout the consumers journey, namely on their motives, goals, information, interactions, and reactions (Juan et al., 2018; Wedel et al.,2020). Understanding the emotional and behavioural influences that go beyond the price and location of the property in the decision-making process is crucial when using VR as a home valuation tool in the residential real estate industry (Azim, et al., 2021). Juan et al. (2018) conducted research with potential home buyers in Taiwan that revealed that VR improves their knowledge of the housing project and increases their desire to purchase the property. Similar results are found in the field of tourism, Tussyadiah et al. (2018) research suggests that consumers perceptions of the virtual environment have a direct consequence on their decisions and behaviour, and consequently their desire to travel.

Furthermore, latest research suggests the beneficial effects VR technology may have on consumers' intents to make purchases (e.g., Tussyadiah et al. 2018; Xiong et al. 2022). In the real estate industry, virtual reality is important in the sense that it encourages buyers to schedule

a visit to real houses and be able to tour the house without some constraints (Pleyers & Pocin, 2020). According to Yu et al. (2020) study, real estate agencies that utilize virtual tours instead of 2D photos and videos tend to sell more properties. Thus, using VR to visit houses might improve the way consumers process information and decide whether to buy a home, and consequently, shortening the time a property is on the market and anticipating possible regrets (Chen et al., 2011; Xiong et al., 2022).

An example of a company that adopted VR technology successfully was Lianjia, a Chinese real estate broker, converted into Beike, the nation's leading digital platform for housing transactions and services (Zhang & Yao, 2022). As Zhang & Yao (2022) explain, Beike is an example of a new generation of platforms that increases efficiency by utilizing digital capabilities, such as virtual reality, to give consumers extensive and simple access to property listings with 3D and virtual reality viewing capabilities, improve matches between prospective buyers and sellers, and meet the essential needs of real estate brokers by offering an advanced digital infrastructure. Also, in the United States, some real estate agencies, including Redfin and Sotheby's, have been using 3D virtual reality walkthroughs that enable consumers to be immersed in the virtual environment and feel that are physically present in that property (Azim et al., 2021).

2.4. Consumer decisions and behavioural factors that affect the home buying process

Most studies on real estate consumers are centred on the neoclassical economic theory, which holds that people make decisions about renting and purchasing real estate according to rational economic considerations that seek to maximize utility. (Gibler & Nelson, 2003; Hoque, Islam & Khan, 2012; Salzman & Zwinkels, 2020). Considering this theory, consumers make choices that maximize wealth according to their income and the price of property (Gibler & Nelson, 2003). According to the research of Tung et al. (2014), there are four variables in the property valuation model that affect a consumers decision to purchase a home: physical, financial, distance, and environmental. Tung et al. (2014) study concludes that there are three variables that influence a consumer to buy an apartment which are physical, financial, and environmental, with the environment having the most influence (Tung et al., 2014).

However, several studies have discussed the impact of consumer behaviour in real estate purchases. Kumar and Khandelwal (2018) states that behavioural factors affect how consumers

evaluate and buy real estate. These behaviours can be characterized as internal and external to the consumer (Gibler & Nelson, 2003; Levy et al. 2008).

An internal core behaviour that influences the home purchase decision is the perceived risk. Perceived risk is defined as a consumer's unbiased evaluation of the risk attached to every potential decision possibility (Koklic, 2011). Also, Ullah & Sepasgozar (2020) research found that another key internal factor that influences purchase decisions is the regret.Regrets are typically felt when a consumers expectations are not met by a product or service and it is believed to be the second most common and strongest unpleasant feeling that purchasers go through (Chen et al., 2011; Ullah & Sepasgozar, 2020). According to Ullah & Sepasgozar (2020), the main causes of regret include the complex buying and selling process, lack of accurate information about the property and neighbourhood, housing costs and size, bank loan bureaucracy, lack of organization of the real estate agency, clients not considering that they have had enough time to visit the property in detail and emotion attachment. Consumer motivations are also an internal behaviour that impacts the property buying process. Kotler & Keller (2005) expressly argued that buyers make decisions about what to purchase in five steps: they decide what they want (needs), look for information about it, weigh their alternatives, form opinions, take attitudes into account, and then they make their purchases. When a need is sufficiently stimulated to motivate consumers to act, it forms a motivation (Kotler & Keller, 2016). Motivation is "a mental process that stimulates and directs an individual's behaviour towards a particular goal" (Grum & Kobal Grum, 2015, p. 84). Motivation is crucial to understanding consumer behaviour once it leads people to seek out and purchase goods and services (Grum & Kobal Grum, 2015). According to Maslow's Hierarchy of Needs, the two main explanations for buying a property is for reasons of affiliation and reputation (Grum & Kobal Grum, 2015). In this way, consumers purchase real estate to obtain a higher status and to increase self-esteem (Grum & Kobal Grum, 2015). Also, Hoque et al. (2012) argue that purchasing a property is a rational motivation as it requires better consumer judgment and consequently involves significant financial commitments and risks.

The way people make purchasing decisions is influenced by their reference group (Shiller, 2005). As Gilber & Nelson (2003) describe, reference groups are individuals or groups of people as a reference point for comparing attitudes, beliefs, values, or behaviours. This factor is considered an external behaviour since social pressure makes it difficult for people to make independent choices (Salzman & Zwinkels, 2020). Shiller's (2005) research shows that a paradigm of information cascades and knowledge transmission between groups occurs. Observing other consumer choices can change a person's ideas, emotions, and purchasing

decisions (Salzman & Zwinkels, 2020). When consumers' preferences are aligned with those of their group, their thoughts, emotions, and purchase decisions may converge or come together (Salzman & Zwinkels, 2020), this phenomenon is described as herd behaviour.

2.5. Factors that stimulate real estate consumers to purchase a property though VR

2.5.1. Immersion and Telepresence

One variable that influences real estate consumers to purchase a property though VR displays is immersion. Immersion refers to the psychological condition of being surrounded and engaged with a world that offers a constant stream of sensations and experiences (Flavián et al. 2019). According to Lee et al. (2020) immersion happens when visitors are actively immersed in the experience and it involves both physical and mental commitment, escaping from daily life, acting out a different role, or adopting a new identity (Hudson et al., 2019). In comparison to other forms of mass communication, virtual reality can offer potential visitors a more immersive experience which will lead to better and more informed decision-making (Vishwakarma et al., 2020).

Xiong et al. (2022) stated that with VR property tours, prospective buyers may visit and evaluate a property without physically seeing it, thus creating an immersive experience for them. These immersive visualizations can enhance a consumer's perception of a real estate asset, influence consumer behavioural intentions and boost their purchasing confidence (Ullah et al, 2018; Fan et al, 2022).

Presence refers to the "state of consciousness, the (psychological) sense of being in the virtual environment" (Slater & Wilbur,1997, p.4). The sense of presence is complicated and multifaceted, produced by the interaction of many cognitive processes and multisensory insights (Fan et al.,2022). Kim et al. (2021) research says that consumers' internal states, such as emotion (such as enjoyment), and cognition (e.g., usefulness), are influenced by their presence in a place. In this study telepresence will be considered as the feeling of being in the virtual environment (Loureiro et al., 2020). Telepresence is achieved by virtual sensory input that simulates how the user would behave and feel in a real-world setting (MeiBner et al., 2020; Wedel et al.,2020; Itani & Hollebeek, 2021).

The sensation of telepresence is a crucial part of the entire VR experience since virtual reality tries to recreate a virtual environment around (Han et al., 2020). According to

Tussyadiah et al. (2018) a user will develop a mental model of the virtual reality world about how they interact with it, how they engage with a virtual environment and whether it is like the physical environment. Whether the user feels present or not depends on how they construct mental model (Tussyadiah et al., 2018).

Studies have found that telepresence affects attitudes toward advertising, perceived product knowledge, brand characteristics, memory and recognition, and purchase intentions (Grudzewski et al., 2018). Moreover, a greater sensation of presence in virtual worlds has been linked to enjoyment and pleasure in the environment's interaction (Spielmann & Mantonakis, 2018). Higher presence levels suggest that the VR experience is more successful (Meirinhos et al., 2022).

2.5.2. Playfulness

Over the past two decades, research on playfulness has increased in marketing literature (Kang et al., 2020). The concept playfulness refers to "an experiential outcome of shopping that provides enjoyment and escapism" (Kang et al.,2020, p.71). In other words, it indicates how much a particular environment makes purchasing a fun and enjoyable activity (Hung et al., 2016). The variable playfulness is related to user presence, technology acceptance, and intention to buy (Kim et al., 2018).

According to Xiong et al. (2022) virtual reality is recognized as playing a significant role in regulating the purchase decision process through playfulness. Users usually seek enjoyable, stimulating and stress-relieving activities that allow them to escape from reality (Bleize & Antheunis, 2019). Xiong et al. (2022) explain that realistic and attractive virtual worlds may be entertaining and enjoyable even without specific gaming features because of the immersive nature of virtual reality. Subdimensions of playfulness such as fun, excitement, mental stimulation, are gained from using technology and are considered to have a higher hedonic value (Çelik, 2010). Also, playfulness is a determining factor in a person's internal drive to use disruptive technology (Han et al., 2020). A user's subjective assessment of consumer interaction with technology determines how entertaining they feel (Han et al., 2020). Çelik (2010) states that consumer's decisions to adopt online purchasing are likely to be influenced by their perceptions of playfulness. A consumer's playful ability with online shopping technology is favourably influenced by their experience, and consequently, affects their evaluation of the complexity of online shopping (Çelik, 2010).

In real estate literature, playfulness is the enjoyable experiential result of online home search and consequently, in-person visits (Xiong et al., 2022). Due to the incorporation of entertainment elements (multimedia, graphics, and animation) and the fact that consumers depend on the ability to imagine themselves in certain properties when using VR, playfulness was considered a pertinent construct for this study (Pleyers & Pocin, 2020).

2.5.3. Informativeness

More information, according to Loureiro et al. (2019), enhances the sensation of presence, which improves how people perceive the virtual world. In this way, informativeness is a critical variable for this research since additional knowledge and information about real estate assets are important to make consumers confident about their purchases (Kang et al., 2019).

Sihi (2018) argues that with VR, consumers can learn more about the properties they are looking, enabling a more favourable experience and consequently a more informed purchase decision. Consumers' who have access to more information tend to be happier and more likely to buy or rent a home (Ullah et al, 2018). According to Ullah F. et al. (2018) research, consumers frequently second-guess their purchase or rental decisions, and almost all of them are related to the scarcity of information offered by internet sources. If VR is made available to consumers, the knowledge provided by this technology might help consumers avoid regrets (Ullah et al, 2018). Potential visitors may independently experience the rooms of a property, discovering more information than they would from a simple description, photos or videos and giving them the control, they need to decide (Flavián et al., 2021). As Martìnez-Navarro et al. (2019) states real-time interaction with details, the ability to observe them realistically, and access to complete information are likely to affect purchase decisions.

In the tourism industry, VR is a widely used marketing tool as it successfully conveys information to visitors about destinations and activities (An et al., 2021). Earlier studies have shown that a destination image is created in the minds of potential tourists via "try-before-you-buy" experiences, which results in positive behavioral intentions (Tussyadiah et al., 2018; Flavián et al., 2021). When utilizing a VR application, visitors who have already been to a place correlate it with actual experiences and develop vivid mental images (Fan et al., 2022). On the other hand, Fan et al. (2022) research revealed that those who have never been there rely only on immersive technology to create vague mental images. Real visitors are more likely to move themselves into the virtual environment, but non-visitors find it challenging to conjure up mental images due to the larger psychological distance (Fan et al., 2022). According to Pleyers

and Pocin (2020), seeing locations through virtual reality may lead to the building of a mental image of the destination features, which may improve a potential tourist's ability to make a more informed decision.

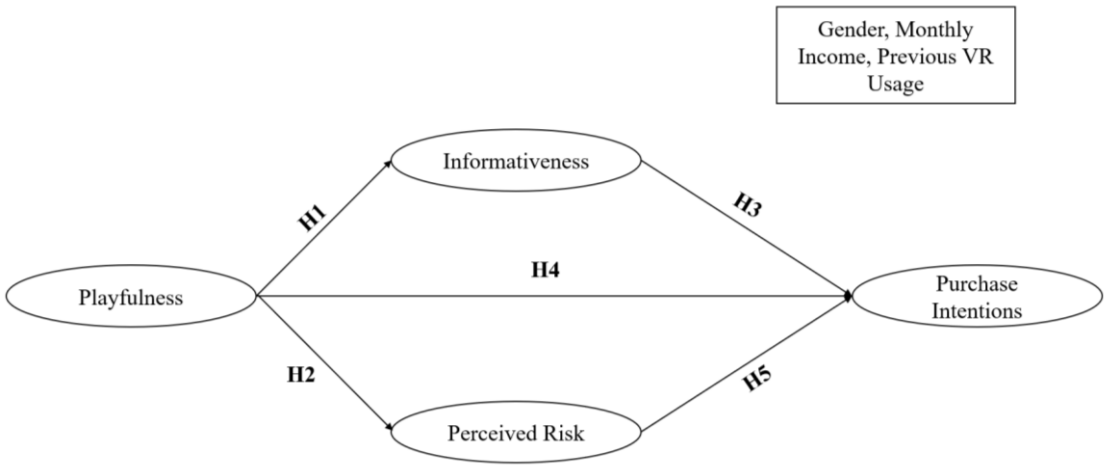
2.5.4. Perceived Risk

Risk is initially noticed by consumers when they identify a need (Koklic, 2011). When searching for information and evaluating options, consumers employ risk reduction measures if the risk is too great (Koklic, 2011). When the implications of a choice are unfavourable, unwanted, or undetermined in comparison to alternative possibilities, that choice is risky (Sarkady et al., 2021). Perceived Risk is frequently assessed using a multidimensional construct (Koh et al., 2023). Zhang et al. (2020) research states that risk perception can be divided into financial, functional, time, security, social and psychological risks. According to Chang and Chen (2008), perceived risk is considered a useful analytical tool for studying consumer behaviour since consumers are typically more motivated to avoid mistakes than to maximize value. In the tourism literature, virtual reality is gaining popularity after COVI-19 pandemic because technology makes it possible for passengers to explore the most remote parts of the globe from the comfort of their living room, offering enormous potential for usage as a trip replacement (Sarkady et al., 2021).

CHAPTER 3: Conceptual Model and Hypotheses

This study aims to analyse the impact of Playfulness, Perceived Risk and Informativeness on real estate Purchase Intentions. In this way, the conceptual framework (figure 3.1.) was developed based on the literature review presented on chapter 2 and the model intends to explain the relationship between constructs. The conceptual framework proposes that playfulness, informativeness, perceived risk will impact purchase intentions.

Figure 3.1. Conceptual Model



Source: Own Elaboration

According to the existing literature, playfulness is an important construct since consumers tend to obtain pleasure from virtual reality experiences (Kang et al., 2020). From a playful experience, it is believed that the collection of information about the property and the perception of risk improves (Koh et al., 2013; Kang et al., 2020). On this basis, the following hypothesis were proposed:

Hypothesis 1: Playfulness is positively and significantly related to informativeness when using VR to purchase a property

Hypothesis 2: Playfulness is significantly related to the perceived risk when using VR to purchase a property

VR technology can be a source for supplementary product information, which reduces risks and supports consumers in the decision-making process (Kang et al., 2020). Holdack et al. (2020) states that customers can spend more time and make more purchases due to a playful and

informative interaction with virtual reality scenarios. Also, perceived risk is considered a key factor in consumer behaviour when searching for a property to purchase since consumers decisions are affected solely by the risk that is considered perceived subjectively (De-Juan-Ripoll et al., 2018). The level of perceived risk can impact the interest of purchasing a property through VR (Sarkady et al., 2021). Based on this the following hypotheses are presented:

Hypothesis 3: Informativeness is positively and significantly associated with real estate purchase intentions

Hypothesis 4: Playfulness is positively and significantly associated with real estate purchase intentions

Hypothesis 5: Perceived risk is positively and significantly associated with real estate purchase intentions

In this study two mediators are considered significant in the relationship between playfulness and real estate purchase intentions, in virtual reality environments. Informativeness is an important concept in this model since it improves the product/service evaluation, reduces uncertainties, and leads to purchase intentions (Sihi, 2018; Holdack et al., 2020). Additionally, it is believed that perceived risk mediated the relationship between playfulness and purchase intentions. Through a playful VR experience, consumers could better evaluate the risk, and consequently lead to purchase intentions (Yung et al., 2021). Hence, this study further assesses whether informativeness and perceived risk mediate the relationship between playfulness and real estate purchase intentions.

As presented on the conceptual model, control variables such as gender and monthly income were considered. According to previous research, gender have an impact on consumers' attitudes and behaviours (Eisingerich et al., 2015; Lee et al., 2016). Also, previous research on VR adoption has found a relationship between income and the way people view VR content (Ball et al., 2021; Huang et al., 2023). In addition, the findings of Valaskova et al. (2021) show that consumers' monthly income has a significant impact on their purchasing behaviour. Previous VR usage was included as a control variable, as previous research has supported the idea that prior VR experiences may influence consumer behaviour and consequently purchase intention (Lau & Lee, 2018; Park et al., 2018).

CHAPTER 4: Methodology

4.1.Research Approach

In this chapter, the previously mentioned hypotheses of the study will be investigated using a quantitative methodology to obtain general findings. The aim of this research is to understand the relationship between playfulness, informativeness, perceived risk and real estate purchase intentions through a virtual environment generated by VR. To obtain quantitative results, data will be collected from a sample of 200 participants who will visualize a property through a VR headset and then answer a survey (see Appendix A). As a result, quantitative research will be conducted to quantify data, generalize results, and spot trends (Malhora et al., 2007). This research analyzes the hypotheses suggested taking into account the literature, measures the impacts of the variables and develops some conclusions.

4.2. Questionnaire

4.2.1. Measures and scales

The present dissertation uses several items that measure the constructs in the framework. Based on the existing literature, all scales proposed in this model are seventh-point Likert scale (1= Strongly Disagree, 7= Strongly Agree). In the section regarding playfulness, 8 items (e.g., "When you are visualizing the apartment with VR you did not realize the time elapsed"," Using VR to see the apartment makes me feel like I am in another world") were adapted and obtained from Pleyers and Pocin (2020) and Kang et al. (2020) study.

In the following section, 3 items (e.g., "The use of VR is informative when buying an apartment., "The use of VR when purchasing an apartment is resourceful") were used to measure informativeness adapted from the article *How 3D Virtual Reality Stores Can Shape Consumer Purchase Decisions: The Roles of Informativeness and Playfulness*, by Kang et al. (2020).

In the section about perceived risk, 4 items (e.g., "Overall, the thought of buying an apartment through VR caused me to be concerned about experiencing some loss", "The thought of buying an apartment through VR gave me a feeling of fear and anxiety") were used to study this variable adapted from the Kloklic (2011).

Lastly, the section concerning purchasing intentions used 3 items (e.g., "After visualizing the apartment, I become interest in purchasing an apartment like this in the future", "If I am going to purchase an apartment over the next few years, I would consider an apartment like this") adapted from the article *Smart real estate marketing using virtual reality to influence potential homebuyers' emotions and purchase intention* by Azim et al.(2021).

In terms of control variables, five demographic factors, including age, gender, naturalness, and prior VR use, are included in the proposed model.

Table 4.1. Measurement Items

Construct	Items	Source
Playfulness	When your were visualizing the property using VR glasses you did not realize the time elapsed. When you were visualizing the property using VR glasses you were not aware of any noise. When you were visualizing the property using VR glasses it led to your exploration of the property. When you were visualizing the property ysing VR glasses it aroused your imagination Visualizing the porperty through VR is enjoyable. Visualizing the property through VR is exciting. Visualizing the property through VR is fun. Visualizing the property through VR makes me feel like I am in another world.	Pleyers & Pocin (2020) Kim et al. (2020)
Informativeness	The use of VR is informative when purchasing a property. The use of VR is helpful when purcchasing a property. The use of VR when purchasing a property is resourceful.	Kang et al. (2020)
Perceive Risk	Overall, the thought of purchasing a property through VR caused me to be concerned about experiencing some loss. Buying a property through VR involves a great deal of uncertainty. Consedering the investment involved, buying a property through VR is quite risky. The thought of buying a property through VR gave me a feeling of fear and anxiety.	Kloklic (2011)
Purchase Intentions	After visualizing the property through VR, I become interested in purchasing a property like this in the future. From this viewing experience, I have a desire to own a property like this. If I am going to purchase a property over the next few years, I would consider a property like this.	Azim et al. (2021)

Source: Own Elaboration

4.2.2. Data Collection

The experiment was conducted between May 4 and June 3 and was done in person at the Imokantus – Sociedade de Mediação Imobiliária, Associação de Amigos das Artes – Teatro Metaphora and Centro Cívico do Estreito de Câmara de Lobos. In this experiment, the

participants explored a property through a virtual reality headset and then filled out a questionnaire designed using Google Forms (Appendix A). The virtual reality headset used was Oculus Quest 2, fully wireless with intuitive controllers and a field of view (FoV) of approximately 89º (Garrett, 2023). Also, the Quest 2 has a resolution of 3664x1920, which is nearly comparable to 4K indicating that this device features a greater resolution (Giovanni, 2023). Before the experiment began, the participants were briefly explained the purpose of the study, how equipment works, and informed about the possibility of motion sickness and it was further emphasized that participants could interrupt the experiment at any time.

To do the initial analysis of the sample and the model descriptive, all the data collected through the survey was analysed with IBM SPSS 28 Statistics. After that, it was imported into SmartPLS4 to produce a partial least square structural equation modelling (PLS-SEM) to study and validate the model. PLS-SEM provides a causal-predictive approach for examining complex models, concentrating on the investigation of the variance of the model's dependent constructs (Hair et al., 2018)

CHAPTER 5: Data Analysis and Results

5.1. Respondents Profile

In total, 200 responses were collected from this survey, of which 57.5% were female, 41% were male, 1% were non-binary/third gender. Most of the respondents were aged between 18 to 24 years old (28%), followed by 45 to 54 years old (22.5%) and 25 to 34 years old (20.5%). Regarding the nationality, the majority of the participants were from Portugal (97%). Furthermore, 138 of the individuals were employed, 35 were students, 16 were working students and only 8 were self-employed. Most of the respondents (47.5%) monthly salary is between 1001€ and 2500€, followed by 33% of the individuals that earn less than 1000€. In terms of previous virtual reality usage, 26% of the participants already used a virtual reality device, with 94.4% using it only once, 0.04% using it 4-5 times, and 0.02% using it more than 7 times.

Table 5.1. Sample Demographics

		N	%
Age Range	<18 years old	7	3,5%
	18-24 years old	56	28,0%
	25-34 years old	41	20,5%
	35-44 years old	31	15,5%
	45-54 years old	45	22,5%
	55-64 years old	16	8,0%
	>65 years old	4	2,0%
	Total	**200**	**100%**
Gender	Male	82	41,0%
	Female	115	57,5%
	Non-binary/Third Gender	2	1,0%
	Prefer not to say	1	0,05%
	Total	**200**	**100%**
Nationality	Portugal	194	97,0%
	Georgia	1	0,05%
	France	3	1,5%
	Poland	1	0,05%
	Venezuela	1	0,05%
	Total	**200**	**100%**
Employment Status	Student	35	17,5%
	Working Student	16	8,0%
	Employed	138	69,0%
	Self-employed	8	4,0%
	Unemployed	1	0,05%
	Retired	2	1,0%
	Total	**200**	**100%**
Monthly Income	<1000€	66	33,0%
	1001€-2500€	95	47,5%
	2501€-5000€	4	2,0%
	Prefer not to say	35	17,5%
	Total	**200**	**100%**
Previous VR Usage	Yes	52	26,0%
	No	148	74,0%
	Total	**200**	**100%**
Frequency of VR Usage	Once	49	94,4%
	4 to 5 times	2	0,04%
	More than 7 times	1	0,02%
	Total	**52**	**100%**

Source: Own elaboration based on SPSS outputs

5.2. Descriptive Analytics

The analysis of the data collected consisted of performing a descriptive statistical analysis for each construct that makes up the conceptual model. First, the mean and standard deviation of each item in the study were analysed. After this analysis, a new variable was generated for each question in the survey, obtaining the mean of the means of all items associated with that variable. These mean and standard deviation analyses were performed using SPSS.

5.2.1. Playfulness

The Playfulness (P) construct comprises eight items (P1, P2, P3, P4, P5, P6, P7, P8). As shown in Table 5.2., the item with the highest average is P3, “When you were visualizing the property using VR glasses it led to your exploration”, with 6.380. Moreover, the item with higher standard deviation is P2, “When you were visualizing the property through VR glasses you

were not aware of any noise", with 1.982 which means that the respondents presented a greater dispersion in their responses.

However, item P1 was removed from the measurement model as, according to Hair et al. (2021), the outer loadings above 0.40 should be eliminated from the model. Once loadings between 0.40 and 0.70 should only be considered for scale removal if the Average Variance Extracted (AVE) is lower than 0.50, P2 and P8 were removed from the measurement model as these items' loadings did not fulfil the minimum threshold (Hair et al., 2010). In addition, the new construct Playfulness presents an average of 6.194 and a standard deviation of 0.764.

Table 5.2. Playfulness – Descriptive Statistics

Items	Mean	Std. Deviation
P1: When you were visualizing the property using VR glasses you did not realize the time elapsed.	5.390	1.445
P2: When you were visualizing the property using VR glasses you were not aware of any noise.	4.230	1.982
P3: When you were visualizing the property using VR glasses it led to your exploration.	6.380	0.836
P4: When you were visualizing the property using VR glasses it aroused your imagination.	5.845	1.244
P5: Visualizing the property through VR is enjoyable.	6.175	1.136
P6: Visualizing the property through VR is exciting.	6.335	1.042
P7: Visualizing the property through VR is fun.	6.335	0.968
P8: Visualizing the property through VR makes me feel like I am in another world.	5.995	1.229
P: Playfulness	**6.194**	**0.764**

Source: Own elaboration based on SPSS outputs

5.2.2. Informativeness

Informativeness (I) is a dependent variable composed of three items (I1, I2, I3), presented in Table 5.3. Among these items, the one with the highest average is I2, "The use of VR is resourceful when purchasing a property", with 6.225. A 7-point Likert-type scale was used to measure the items, which indicates that, on average, the participants agree with the affirmation. The item that has higher standard deviation is I1, "The use of VR is informative when purchasing a property", with 0.983. Additionally, the new construct I presents a mean of 6.178 and a standard deviation of 0.812.

Table 5.3. Informativeness – Descriptive Statistics

Items	Mean	Std. Deviation
I1: The use of VR is informative when purchasing a property.	6.090	0.983
I2: The use of VR is helpful when purchasing a property.	6.225	0.859
I3: The use of VR is resourceful when purchasing a property.	6.220	0.822
I: Informativeness	**6.178**	**0.812**

Source: own elaboration based on SPSS outputs

5.2.3. Perceived Risk

Perceived Risk (PR) is constituted by 4 items (PR1, PR2, PR3, PR4), as described in Table 5.4. The item with the highest average is PR2, "Buying a property through VR involves a great deal of uncertainty", namely 4.63. Furthermore, PR4, "The thought of buying a property through VR gave me a feeling of fear and anxiety" corresponds to the item with higher level of disparity between responses, namely 1.959. However, PR1, "Overall, the thought of purchasing a property through VR caused me to be concerned about experiencing some loss", was removed from the measurement model since these items shows indicator loadings lower than 0.7 (Hair et al., 2018). In this way, the construct is composed of the remaining items (PR2, PR3, RR4). Additionally, the new variable Perceived Risk presents a mean of 4.428 and a standard deviation of 1.610.

Table 5.4. Perceived Risk – Descriptive Statistics

Items	Mean	Std. Deviation
PR1: Overall, the thought of purchasing a property through VR caused me to be concerned about experiencing some loss.	4.535	1.665
PR2: Buying a property through VR involves a great deal of uncertainty.	4.630	1.711
PR3: Considering the investment involved, buying a property through VR is quite risky.	4.625	1.761
PR4: The thought of buying a property through VR gave me a feeling of fear and anxiety.	4.030	1.959
PR: Perceived Risk	**4.428**	**1.610**

Source: own elaboration based on SPSS outputs

5.2.4. Purchase Intentions

The construct Purchase Intentions (PI) is represented by three items (PI1, PI2, PI3). The item that scores a higher mean value is PI3, "If I am going to purchase a property over the next few years, I would consider a property like this", with 5.68. Of all items, PI1, "After visualizing the property through VR, I become interested in purchasing a property like this", scores a greater disparity between answers with a standard deviation of 1.499. In addition, the new variable PI has a mean value of 5.725 and a standard deviation of 1.236, as presented on table 5.5.

Table 5.5. Purchase Intentions – Descriptive Statistics

Items	Mean	Std. Deviation
PI1: After visualizing the property through VR, I become interest in purchasing a property like this.	5.620	1.499
PI2: From this viewing experience, I have a desire to own a property	5.875	1.428
PI3: If I am going to purchase a property over the next few years, I would consider a property like this.	5.680	1.496
PI: Purchase Intentions	**5.725**	**1.236**

Source: own elaboration based on SPSS outputs

5.3. Model Estimation

The suggested model was analysed using the PLS-SEM - Partial Least Squares Structural Equation Modelling - approach. To understand the alterations of the dependent variables, it is necessary to repeatedly analyse the interactions between several factors (Hair et al., 2017).

According to Hair et al. (2021), the PLS-SEM is composed by two models – the structural model and the measurement model. The structural model, known as the inner model, presents the connections between the latent variables. On the other hand, the associations between the constructs and the indicator variables are shown by the measurement model of the constructs (also known as the outer models).

Before analysing the two models, an evaluation of the moderating factors was done. These analyse can alter the model's present interdependence of dependent and independent variables (Hair et al., 2019).

The proposed model is composed by 4 first-order constructs - Playfulness, Informativeness, Perceived Risk and Purchase Intentions.

5.3.1. Measurement Model – Reflective Model

The analysis of the reflective measurement model estimated by PLS-SEM is done by the examination of several measures (Hair et al., 2014). Each reflective construct will be evaluated through the internal consistency reliability, convergent validity, and discriminant validity (Hair et al., 2021).

To determine the reliability of an indicator, the first step in evaluating a reflective measurement model is to determine how much of each variable variation can be explained by its construct (Hair et al., 2021). According to Hair et al. (2018)., outer loadings only above 0.70 should be considered since they suggest that the variable accounts for more than 50% of the variation of the indicator. In this way, "higher values generally indicate higher levels of reliability" (Hair et al., 2018, p.8). However, Hair et al. (2010) research considered that outer loadings higher than 0.50 can be retained if the AVE is greater than 0.50. Hair et al. (2021) also states that the values of the outer loadings between 0.40 and 0.708 should be removed only when an indicator results in an improvement in the internal consistency reliability or convergent validity. Moreover, outer loadings above 0.40 should be removed from the model (Hair et al., 2021).

Thus, after running the PLS algorithm on SmartPLS4 and obtaining the outer loadings of each item, it's possible to observe that all the items have values above 0.708, expect the items P1, P2, P8, PR1 (table 5.6). In addition, P2, P8, PR1, with loadings of 0.504, 0.485 and 0.460, were removed from the first-order Playfulness and Perceived Risk constructs (table 5.6) (Hair et al.2010). As shown in table 5.6, the item P1 presented an outer loading below 0.40, namely value of 0.224 (Hair et al., 2021). The remaining items are reliable since they all have values greater than 0.708 (Hair et al., 2021).

Table 5.6. First order construct's Outer Loadings

	Playfulness	Informativeness	Perceived Risk	Purchase Intentions
P1	0.225			
P2	0.504			
P3	0.672			
P4	0.536			
P5	0.756			
P6	0.776			
P7	0.822			
P8	0.485			
I1		0.879		
I2		0.935		
I3		0.935		
PR1			0.460	
PR2			0.855	
PR3			0.928	
PR4			0.792	
PI1				0.810
PI2				0.847
PI3				0.858

Source: own elaboration based on SmartPLS4 outputs

According to Hair et al. (2021), analysing the internal consistency reliability through Cronbach's Alpha (CA) and Composite Reliability (CR) is the second step in evaluating the reflective measurement model.

Cronbach's Alpha is an internal consistency reliability metric which takes equal indication loadings into account and yields lower results than Composite Reliability (Hair et al., 2021). In contrast, the Composite Reliability (rho_and rho_c) is also an internal consistency reliability measures that do not assume the same indicator loadings (Hair et al., 2021). As presented in table 5.7., Cronbach's Alpha, Composite Reliability (rho_a), Composite Reliability (rho_c) scores are above the minimum value limit 0.70 indicating a high level of reliability.

Regarding the Convergent Validity of the reflective constructs, i.e., "the extent to which the construct converges to explain the variance of its items" (Hair et al., 2018, p.9). As shown in table 5.7., the score of the AVE is higher than 0.50 indicating that the reflective constructs explain more than 50% of the variance of its items (Hair et al., 2018). In this way, it is possible to verify the model.

Table 5.7. Reliability and Convergent Validity

	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
Informativeness	0.904	0.911	0.940	0.840
Perceived Risk	0.869	1.006	0.916	0.784
Playfulness	0.789	0.806	0.86	0.561
Purchase Intentions	0.788	0.791	0.876	0.703

Source: own elaboration based on SmartPLS4 outputs

Lastly, The Discriminant Validity assessment consists of analysing the degree to which a construct is empirically unique from other constructs (Henseler et al., 2015). To evaluate this measure, it was necessary to analyse the assessment of cross-loadings, Fornell-Larcker criterion and HTMT criterion scores (Henseler et al., 2015).

When assessing the cross-loadings, it is possible to conclude that Discriminant Validity (table 5.8) is established, due to the fact that each measuring item has a weak correlation with every other construct aside from the one to which it is related (Henseler et al., 2015). Also, the Fornell-Larcker criteria also suggests that Discriminant Validity is verified when the square root of each construct's AVE is higher than its highest correlation with any other construct in the proposed model (Fornell & Larcker, 1981), as we can state in table 5.9.

Table 5.8. Discriminant Validity: Cross-Loadings

	Informativeness	Perceived Risk	Playfulness	Purchase Intentions
I1	**0.879**	-0.095	0.28	0.353
I2	**0.934**	-0.076	0.317	0.344
I3	**0.935**	-0.055	0.341	0.398
PR2	-0.086	**0.891**	-0.113	-0.024
PR3	-0.087	**0.944**	-0.153	-0.092
PR4	-0.016	**0.811**	-0.077	-0.012
P3	0.289	-0.029	**0.692**	0.363
P4	0.110	-0.109	**0.512**	0.339
P5	0.316	-0.117	**0.804**	0.337
P6	0.275	-0.127	**0.817**	0.336
P7	0.270	-0.131	**0.856**	0.362
PI1	0.346	-0.035	0.358	**0.804**
PI2	0.303	-0.080	0.423	**0.849**
PI3	0.357	-0.035	0.402	**0.862**

Source: own elaboration based on SmartPLS4 outputs

Table 5.9. Fornell-Larcker criterion

	Informativeness	Perceived Risk	Playfulness	Purchase Intentions
Informativeness	**0.917**			
Perceived Risk	-0.079	**0.886**		
Playfulness	0.347	-0.135	**0.749**	
Purchase Intentions	0.399	-0.059	0.465	**0.838**

Source: own elaboration based on SmartPLS4 outputs

However, according to Hair et al. (2021), the assessment of the cross-loadings and the Fornell-Larcker criterion are not appropriate when the indicator loading on a construct differs display a small difference. In this way, the Heterotrait-Monotrait (HTM) ratio, defined as the "mean od the average of the item correlations across constructs relative to the (geometric) mean of the average correlations for the items measuring the same construct" (Hair et al., 2018, p. 9). Hair et al. (2021) states that an HTMT score below 0.90 shows that Discriminant Validity is present between constructs, as we can see in table 5.10., which means that the assessment meets the thresholds.

Table 5.10. HTM Ratio

	Heterotrait-Monotrait Ratio (HTMT)
Perceived Risk <-> Informativeness	0.084
Playfulness <-> Informativeness	0.404
Playfulness <-> Perceived Risk	0.160
Purchase Intentions <-> Informativeness	0.472
Purchase Intentions <-> Perceived Risk	0.075
Purchase Intentions <-> Playfulness	0.598

Source: own elaboration based on SmartPLS4 outputs

5.3.2. Assessment of the Structural Model

Having verified that the measurement of the constructs is reliable and valid, the following stage is the assessment of the results of the structural model, also known as inner model. Through several structural model regression equations, it is possible to understand the relationships between the constructs and predict the model ability (Hair et al., 2021). Firstly, it is necessary to evaluate the potential collinearity of the structural model and then analyse the model's explanatory and predictive power results (Hair et al., 2021).

In this way, to evaluate the potential collinearity of the structural model through the Variance Inflation Factor (VIF) scores. According to Hair et al. (2021), VIF results over 5 demonstrate that no exist collinearity issues among the independent variables. As shown in table 5.11., all scores of the structural model are under the requirements, concluding that the predictor constructs are collinear.

Table 5.11. VIF Inner Values

	VIF
P3	1.372
P4	1.094
P5	1.957
P6	2.439
P7	3.028
I1	2.205
I2	4.146
I3	3.955
PR2	2.376
PR3	2.543
PR4	2.061
PI1	1.508
PI2	1.749
PI3	1.805

Source: own elaboration based on SmartPLS4 outputs

Once the collinearity of the model is analysed, it is possible to examine the coefficient of determination value of the endogenous variables. The R^2 determines the variance of the endogenous constructs justified by the exogenous constructs. The values of this measure of the model's predictive accuracy ranges from 0 to 1, where higher values indicate greater predictive accuracy (Hair et al., 2018). Hair et al. (2017) defined the following values: 0.25 (weak), 0.50 (moderate) and 0.75 (substantial). As shown in table 5.12., Perceived Risk and Informativeness presents scores lower than 0.25 showing explanatory power is weak and the Purchase Intentions present a value of 0.281 meaning that the explanatory power is moderate (Hair et al., 2017).

Moreover, the Stone Geisser's Q^2 establishes if the model predictive relevance or not (Hair et al., 2021). This measurement determines that scores higher than 0 suggests that the endogenous constructs are relevant. According to Hair et al. (2013), if the endogenous variables present values of 0.02, 0.15 and 0.35 indicates that the predictive relevance of every effect is

weak, moderated, or strong. Using PLSPredict on the model under study, we can conclude that there are weak and moderate predictive relevance of the model (table 5.12).

Table 5.12. Coefficient of Determination and Predictive Relevance

	R^2	Q^2
Informativeness	0.120	0.100
Perceived Risk	0.018	0.003
Purchase Intentions	0.281	0.195

Source: own elaboration based on SmartPLS4 outputs

Additionally, through the f^2 effect size is possible to measure the impact of each exogenous construct on the endogenous constructs and how the R^2 value of an endogenous construct changes when a particular predictor construct is eliminated (Hair et al., 2021). Cohen (1988) established the following guidelines for the f^2 effect size explanatory values: 0.02 (small), 0.15 (medium) and 0.35 (large). According to this, we can determine that some constructs have small to medium relationship with each other (table 5.13).

Table 5.13. Effect Size f^2

	Informativeness	**Perceived Risk**	**Playfulness**	**Purchase Intentions**
Informativeness				0.090
Perceived Risk				0.000
Playfulness	0.137	0.019		0.168
Purchase Intentions				

Source: own elaboration based on SmartPLS4 outputs

Lastly, the assessment of the significance of the structure model relationships will be analysed. Through the path coefficients it will be analysed if the proposed hypothesis between the variables are significant or not (Hair et al., 2021). Conducting the non-parametric bootstrap test, with 5,000 sub-samples and a 95% confidence interval, we can conclude that H1 (β=0.47, t=4.467, p<0.05) is supported, which indicates that Playfulness is positively related to Informativeness (Table 5.14). Moreover, H3 (β=0.271, t=3.678, p<0.05) and H4 (β=0.373, t=35.232, p<0.05) are supported indicating that Informativeness and Playfulness are

significantly and positively related to real estate purchase intentions (table 5.14). However, H2 and H5 are not supported by the results (table 5.14)., and it is possible to conclude that Playfulness significantly related to Perceived Risk (β=-0.135, t=1.600, p>0.05), and Perceived risk influences negatively real estate purchase intentions (β=0.013, t=0.828, p>0.05).

Table 5.14. Path Coefficients: Direct Effects

	β	Sample Mean (M)	Standard Deviation (STDEV)	t-values	p-values	Decision
Playfulness -> Informativeness	0.347	0.355	0.078	4.467	0.000	H1 is supported
Playfulness -> Perceived Risk	-0.135	-0.142	0.085	1.600	0.110	H2 is not supported
Informativeness -> Purchase Intentions	0.271	0.270	0.074	3.678	0.000	H3 is supported
Playfulness -> Purchase Intentions	0.373	0.379	0.071	5.232	0.000	H4 is supported
Perceived Risk -> Purchase Intentions	0.013	0.013	0.059	0.217	0.828	H5 is not supported

Source: own elaboration based on SmartPLS4 outputs

A mediation analysis was conducted to evaluate the mediating role of Perceived Risk and Informativeness on the connection between Playfulness and Purchase Intentions. The findings presented on table 5.15, indicate that the indirect effect of Playfulness on Purchase Intentions was not significant (β=-0.002, t=0.197, p>0.05). This reveals that the relationship between Playfulness and Purchase Intentions is not mediated by Perceived Risk.

However, the results (table 5.15) revealed that the indirect effect of Playfulness on Purchase Intentions mediated by Informativeness was significant (β=0.094, t=2.815, p<0.05), which indicates that the relationship Playfulness and Purchase Intentions is mediated by Informativeness.

Table 5.15. Mediation Analysis: Indirect Effects

	β	Sample Mean (M)	Standard Deviation (STDEV)	t-values	p-values
Playfulness -> Perceived Risk -> Purchase Intentions	-0.002	-0.001	0.009	0.197	0.844
Playfulness -> Informativeness -> Purchase Intentions	0.094	0.095	0.033	2.815	0.005

Source: own elaboration based on SmartPLS4 outputs

Gender, Monthly Income, and Previous VR Usage are the three control factors considered in this dissertation. According to the results presented in table 5.16, none of the control variables demonstrated to affect Informativeness, Perceived Risk, and Purchase Intentions.

Table 5.16. Control Variables Analysis

	β	Sample mean (M)	Standard deviation (STDEV)	t-value	p-values
Gender -> Informativeness	-0.034	-0.033	0.098	0.341	0.733
Gender -> Perceived Risk	0.202	0.198	0.212	0.951	0.342
Gender -> Purchase Intentions	0.127	0.132	0.148	0.856	0.392
Monthly income -> Informativeness	0.005	0.005	0.046	0.101	0.920
Monthly income -> Perceived Risk	-0.001	-0.002	0.088	0.007	0.995
Monthly income -> Purchase Intentions	0.056	0.056	0.053	1.054	0.292
Previous VR Usage -> Informativeness	0.157	0.154	0.133	1.179	0.238
Previous VR Usage -> Perceived Risk	0.046	0.038	0.266	0.173	0.863
Previous VR Usage -> Purchase Intentions	0.341	0.341	0.183	1.858	0.063

Source: own elaboration based on SmartPLS4 outputs

CHAPTER 6: Discussion

The objective of this dissertation is to understand the effect that virtual reality has on real estate purchase intentions. Firstly, the impact of Playfulness on Informativeness when purchasing a property using VR was tested. The first hypothesis (H1) was supported by the results, indicating that there is strong statistical evidence that playfulness has a positive and significant effect on informativeness. The more playful the participant's perception of the property through VR, the stronger the perception of information they retain from this experience. In line with the retail literature, this result is consistent with the Holdack (2021) study that states that consumers who identifies VR as playful also perceive higher levels of informativeness. According to Violante et al. (2019), VR headsets provide extra product information in a playful manner beyond the boundaries of physical retail environments.

The effect of playfulness on perceived risk and the impact of perceived risk, as a mediator, between the relationship of playfulness and purchase intentions was tested. The analytical results indicate that playfulness does not affect consumers' perceived risk, and consequently, their purchase intention once H2 was not supported. The findings conclude that in a playful scenario, such as viewing a property through VR, consumers do not feel less risk and consequently are not willing to purchase a property. In the retail literature, Han et al. (2020) study suggests that spending money to purchase products in a virtual reality environment was thought to carry a significant financial risk. Also, it's common that users of new technologies evaluate the risks and advantages of using it (Sun et al., 2023) and Han et al. (2020) explains that that the level of psychological risk was higher on virtual environments because there was no chance to visit in person (Han et al., 2020).

According to Childers et al. (2001), playfulness is an important determinant of consumers' attitudes in an online purchasing setting. Pleyers and Pocin (2020) contents that the presentation of a property through VR promotes playfulness, which in turn increased consumer attitudes about the property and intentions to visit properties. The findings from previous studies imply that playful perceptions should also be favourably related to purchase intentions in a virtual environment (Ahn et al., 2007; Kim et al., 2017). Furthermore, Kang et al. (2020) research states that informativeness is crucial predicting consumer's purchase intentions while utilizing VR in an online shopping context. According to the same author's research, informativeness is a more significant explanatory variable for eventual purchase intentions since the probability that the consumer will proceed with a purchase should thus be increased to the extent that they feel confident in the information given to them (Kang et al., 2020). The results in the present

dissertation corroborated the findings from the previous research (Ahn et al., 2007; Kim et al., 2017; Kang et al., 2020; Pleyers & Pocin, 2020), confirming that informativeness and playfulness positively impacts real estate consumers purchase intention once H3 and H4 were supported by the results.

On the other hand, H5 was not supported by the results indicating that the perceived risk of purchasing a property through VR is negatively associated with purchase intentions. Just like the findings, Ariff et al. (2014) states that perceived risk has a major impact on online purchase intentions and Almousa (2011) shown that perceived risk negatively impacts the intention to purchase products online. Similarly in the e-commerce literature, risk among consumers has a detrimental impact on purchase intention on the internet, according to Sullivan and Kim (2018). Furthermore, Pavlou (2003) research reveals if consumers feel more in control of their transactions and their risk perceptions concerning behavioural insecurities, they are more willing to transact. Thus, customers tend to be more comfortable to transact if they felt little risk (Pavlou, 2003). In contrast, in the tourism literature, Yung et al. (2021) suggests that when using VR, users tend to feel that this technology would provide them with a complete sense of what they could predict from the destination. Yung et al. (2021) explains that VR can be a "risk reduction tool due to its ability to vicariously experience aspects of the destination before getting there" (Yung et al., 2021, p. 11). Consumers tend to lower the risk by diligently seeking out information or by developing loyalty to a certain brand, product, or service provider (Kloklic, 2011)

Additionally, this study intends to analyse the effect of informativeness, as a mediator, on the relationship between playfulness and purchase intentions. According to the findings, informativeness is good mediator of the connection between playfulness and purchase intentions. This result is consistent with the Oh et al. (2009) research that confirms that informativeness, as a mediator, has a significant impact on playfulness and purchase intentions. Pleyers and Pocin (2020) explain that virtual reality allows a more favourable experience that elicited a sense of playfulness. Sihi (2018) states that by giving buyers additional information and insight about the products before they physically see or use it, VR technology can enhance the purchasing experience.

6.1. Theoretical Contributions

This dissertation contributes to the knowledge about the impact of virtual reality in the real estate industry. There are few studies that discuss how playfulness, perceived risk, and informativeness influence real estate purchase intentions. By analysing survey data based on a VR experience, it was possible to add valuable contributions to the real estate and marketing literature.

The first contribution of the study identified that playfulness and informativeness can influence real estate purchase intentions and the present research agrees with the existing literature (Ahn et al., 2007; Kim et al., 2017; Kang et al., 2020). On the contrary, perceived risk has a negative and significant effect on real estate purchase intentions. This study helps to understand that the level of perceived risk does not decrease when using VR to visualize and consequently, purchase a property (Almousa, 201; Sullivan & Kim, 2018).

This research draws attention to the positive relationship between playfulness and informativeness in marketing and real estate literature. The adoption of real estate tours in VR would provide a playful experience, increasing market efficiency, minimizing information asymmetry, and consequently, a better clarification of the decision-making processes of potential consumers (Xiong et al., 2022). Also, the study by Pleyers and Pocin (2020) revealed the importance of VR when the consumer wants to visit a property.

Furthermore, this study offers an important theoretical contribution as it shows that there is empirical evidence of the mediating role of informativeness between the relationship of playfulness and real estate purchase intentions. In academic literature, the mediating role of informativity between playfulness and purchase intentions has not yet been extensively studied. The presented results indicate that informativeness is a good mediator between the relationship of playfulness and purchase intentions.

Additionally, this research opens theoretical discussions about the role of the level of perceived risk by the user using VR, as a mediating variable, between the connection of playfulness and real estate purchase intentions, contributing to the existing literature. According to the results presented in the previous chapter, perceived risk does not mediate the relationship between playfulness and purchase intentions. Therefore, further analysis of perceived risk is suggested, as it may be an integral component of theory building in the literature on playfulness, marketing, and real estate.

6.2. Managerial Implications

From a managerial point of view, this thesis contributes to a better understanding of the real estate consumer who uses VR to view properties, and subsequently purchase. Also, this research brings key insights for marketers and real estate companies. This study shows that potential real estate consumers purchase properties through virtual reality if the experience is playful and informative. Thus, if the image quality presented by the virtual reality device (HMD's) has good resolution, consumers consider that the experience with this device will be enhanced, increasing playfulness and informativeness and consequently purchase intentions. Moreover, it is possible to conclude that perceived risk has a negative influence on real estate purchase intentions.

Virtual reality is still under development and has some limitations, there is still a distortion of the size and scales of the property, it does not allow to see the details of the property, it does not allow to see the neighbourhood and the location of the property, which consequently increases the perception of risk by potential buyers and decreases the intention to purchase a property.

Therefore, virtual reality is a great opportunity to improve real estate consumer's experiences and present properties in a more immersive way. In this way, this research suggests real estate managers to: (1) explore VR solutions that are user-friendly, offering high quality content and providing graphics with interactive features; (2) provide realistic VR images of the property; (3) implement a room with a virtual reality device in the office where it would be possible to see the property that potential buyers would purchase; (4) integrate VR tools that enable users to visualize the neighbourhood, the location, the materials used and other pertinent information of the property; (5) develop mobile VR experiences that can be accessed through smartphones or cheap VR headsets, such as Google Cardboard, in order to be accessible to several consumers; (6) use VR as a complementary tool and always continue to privilege face-to-face contact with the consumer as well.

CHAPTER 7: Conclusion

The real estate sector has been progressively implementing numerous technologies that enhance marketing, improve consumer experience and operational efficiency (Xiong et al., 2022). VR is a technology that has gained popularity and in the real estate sector once it made it possible for prospective buyers to view properties virtually, even before they are constructed (Hou & Wu, 2020). As presented in this research, VR can be an effective real estate and marketing tool capable of increasing purchase intentions, by providing playful and informative experiences. In the future, VR will be more technical than ever, and new gadgets and solutions are being introduced to the market every day (Cipresso et al., 2018). Thus, the present thesis intends to encourage further research about the real estate consumer that uses virtual reality research and help real estate companies to improve their services and consumers' experiences.

Limitations and Future Research: While this research provides theoretical and practical understanding of VR as a fundamental tool for the real estate consumers, it has several limitations, many of which provide insights into the context of VR in marketing and the real estate industry.

In the VR experience, most participants revealed that they were not familiar with this technology, had no general knowledge about it and had never tried a virtual reality headset. In addition, participants with no experience with VR and who did not know what VR was showed fear when they were viewing the property through VR. Further studies can use this research model to assess the perceptions of the experience of participants who have never used this technology.

This study analyses how playfulness, informativeness and perceived risk affects real estate purchase intentions, testing the mediating role of informativeness and perceived risk. However, there are other potential mediating effects, such as trust, and willingness to pay, that remain unexplored and could be investigated by future research. Previous studies in the real estate literature have emphasized how trust plays a major role in the success of real estate projects (Shi & Wu, 2008). Additionally, Zalejska-Jonsson et al. (2020) suggest that the consumer's cost-benefit analysis of a home sold in the residential market yields the willingness to pay, where prices have a negative impact and advantages have a positive impact (Zalejska-Jonsson et al.,2020).

The present study consists of quantitative research. However, to complement the findings and gain deeper insights, future studies could further conduct a qualitative research approach,

such as semi-structured interviews, which would allow a better understanding of respondents' perceptions.

Finally, this research was conducted in Portugal and in high-demand housing market conditions. Therefore, only Portugal and other countries with comparable housing markets and purchasing patterns may be affected by these findings. It is suggested that further research be carried out on the current research model in markets with lower demand for housing and with other additional socio-demographic factors, such as level of education.

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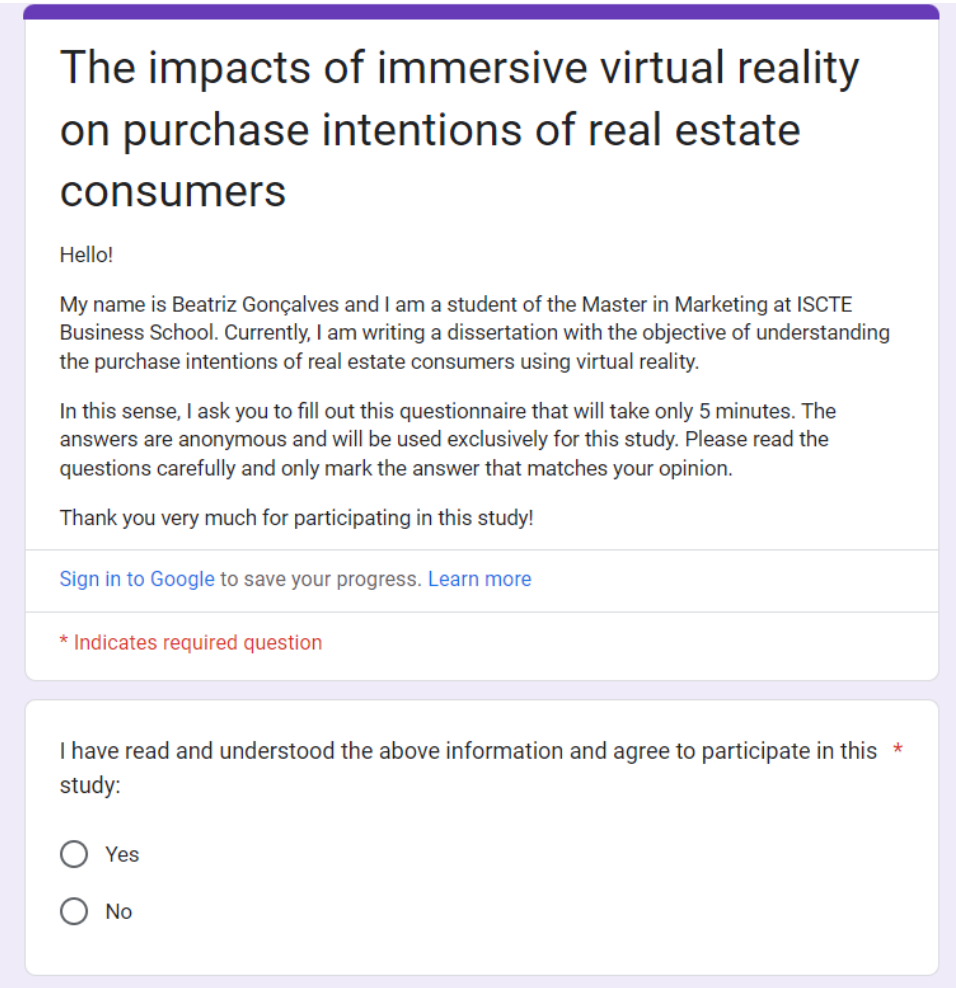
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Appendices

Appendix A.

Appendix A.1. *Questionnaire*



The impacts of immersive virtual reality on purchase intentions of real estate consumers

Hello!

My name is Beatriz Gonçalves and I am a student of the Master in Marketing at ISCTE Business School. Currently, I am writing a dissertation with the objective of understanding the purchase intentions of real estate consumers using virtual reality.

In this sense, I ask you to fill out this questionnaire that will take only 5 minutes. The answers are anonymous and will be used exclusively for this study. Please read the questions carefully and only mark the answer that matches your opinion.

Thank you very much for participating in this study!

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* Indicates required question

I have read and understood the above information and agree to participate in this study: *

- Yes
- No

Demographics

Age *

- ◯ <18 years old
- ◯ 18-24 years old
- ◯ 25-34 years old
- ◯ 35-44 years old
- ◯ 45-54 years old
- ◯ 55-64 years old
- ◯ >65 years old

Gender *

- ◯ Male
- ◯ Female
- ◯ Non-binary/Third Gender
- ◯ Prefer not to say

Nationality *

Choose ▾

What is your current employment status? *

- ◯ Student
- ◯ Working Student
- ◯ Employed
- ◯ Self-employed
- ◯ Unemployed
- ◯ Retired

What is your monthly income? *

- ◯ <1000€
- ◯ 1001€ - 2500€
- ◯ 2501€-5000€
- ◯ >5001€
- ◯ Prefer not to say

VR Usage

Have you ever used a virtual reality device? *

- ◯ Yes
- ◯ No

If yes, how many times?

- ◯ Once
- ◯ 2 to 3 times
- ◯ 4 to 5 times
- ◯ 6 to 7 times
- ◯ More than 7 times

Playfulness

Please indicate, on a scale of *Strongly Disagree* to *Strongly Agree*, the level of your agreement with the following information.

When you were visualizing the property using VR glasses you did not realize the time elapsed. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

When you were visualizing the property using VR glasses you were not aware of any noise. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

When you were visualizing the property using VR glasses it led to your exploration of the apartment. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

When you were visualizing the property using VR glasses it aroused your imagination. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Visualizing the property through VR is enjoyable. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Visualizing the property through VR is exciting. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Visualizing the property through VR is fun. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Visualizing the property through VR makes me feel like I am in another world. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Informativeness

Please indicate, on a scale of *Strongly Disagree* to *Strongly Agree*, the level of your agreement with the following information.

The use of VR is informative when purchasing a property. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The use of VR is helpful when purchasing a property. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The use of VR when purchasing a property is resourceful. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Perceived Risk

Please indicate, on a scale of *Strongly Disagree* to *Strongly Agree*, the level of your agreement with the following information.

Overall, the thought of purchasing a property through VR caused me to be concerned about experiencing some loss. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Buying a property through VR involves a great deal of uncertainty. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Considering the investment involved, buying a property through VR is quite risky. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The thought of buying a property through VR gave me a feeling of fear and anxiety. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Purchase Intentions

Please indicate, on a scale of *Strongly Disagree* to *Strongly Agree*, the level of your agreement with the following information.

After visualizing the property through VR, I become interested in purchasing a property like this in the future. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

From this viewing experience, I have a desire to own a property like this. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

If I am going to purchase an apartment over the next few years, I would consider a property like this. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree