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Value-based adoption of augmented reality: A study on the influence on online purchase intention in retail

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Abstract

The increasing use of digital technology-based retail services provides new opportunities for digital marketing. In this paper, we investigate how augmented reality (AR) technology can be leveraged as part of the firm's strategy. We explore the online purchase intention through AR smart glasses (ARSG), considering consumers' value assessment through a cost–benefit analysis and the influence of technical, experiential and social AR value drivers. We develop an augmented value-based adoption model addressing four main objectives: (1) Evaluate the effect of the perceived value of ARSG, (2) Evaluate the effect of immersion (experiential dimension), (3) Evaluate the effect of AR devices and technical complexity (technical dimension) and (4) Evaluate the importance of subjective norms (social dimension) on the online purchase intention through AR technology. Based on an ESIC Tech Lab experiment with two types of ARSG from market leaders and AR retail apps, the study uses survey data from 253 participants. The results suggest that the technical dimension has an ambiguous effect, with tech-complexity enhancing directly the perceived value of ARSG for online purchase while reducing the net value of consumers' economic cost–benefit analysis. We find strong evidence that the experiential and social AR dimensions (in the form of immersion and subjective norm) have a significant positive influence on consumers' purchase intention online, which are better predictors than the pure economic cost–benefit assessment (through usefulness and difficulty). Furthermore, the technical innovativeness of consumers is found to increase directly the online purchase intention through ARSG.

KEYWORDS

augmented reality, online purchase intention, retail digital transformation, technology-based retail services, value-based adoption model

1 | INTRODUCTION

The increasing use of (digital) technology-based retail services (TBRS) enhances the consumer experience and suggests new dimensions of consumers' value assessment of products and services, which provides new opportunities for e-commerce as well as in-store management (Wolpert & Roth, 2020; Yim et al., 2017), and changes the nature of competition towards an interdisciplinary approach of 'smart retailing' (Dacko, 2017; Pantano et al., 2018).

This becomes especially relevant in rising e-commerce with its complex and impersonal nature, which has induced researchers to study from different angles what drives the purchase decision in the online environment and consider how disruptive marketing technologies can overcome potential barriers and enhance value to create a compelling customer experience (Kotler et al., 2021; Heijden et al., 2003) and in this way stimulate online purchase intention. In particular, the perceived risk or absence of trust and technical difficulties have been identified as potential barriers of patronage of an online store (Kim et al., 2007; Silva et al., 2018; Ventre & Kolbe, 2020) while personalised interactions and involvement, which can be enhanced through immersive marketing technologies, favours patronage generating a more realistic experience (Ma et al., 2021, Schnack et al., 2019).

In particular, the disruptive innovations through Artificial Intelligence (AI) are attractive options for value creation in business in general and in e-commerce in particular, with the potential to raise online sales of retailers by 30% and penalise nonadopters in this competitive environment in terms of losing up to 20% of their cash flow (Bughin et al., 2017; Bughin et al., 2018). Recently, in particular, augmented reality (AR), as a subset of AI-based technology, is a focus for online retailers, showing a 94% higher conversion rate (Papagiannis, 2020a). AR, as well as virtual reality (VR) or mixed reality, provides visual access to different realities and new forms of interaction (avatars, virtual stores, magic mirrors, etc.). This potential of AR to explore possible realities through visualisation, annotation and storytelling, highlighted by the World Economic Forum (Papagiannis, 2020b), motivates e-commerce to make use of AR as front-end technology to respond to the demand for personalised interactions through immersive marketing, respond to consumers' desire for trust and provide enhanced touchpoints for online purchase (Bonnin, 2020; Kotler et al., 2021; Song et al., 2020). In view of the recent Covid-19 lockdown inducing the desire to overcome physical distance and isolation, AR adoption, which allows the outside world to be integrated in our physical environment, has experienced a further push, providing not just a technological solution but a new way of living (Papagiannis, 2020a), and has called attention in professional practice and research.

The implementation of AR in particular has been envisaged by retail brands since the end of the 1990s (Alcañiz et al., 2019), but it is only recently that professionals and academics have begun to emphasise that AR be incorporated into the firm's marketing strategy (McLean & Wilson, 2019; Pantano et al., 2017; Papagiannis, 2020a). Biron and Lang (2018) summarise this evolution stating that "The AR market today is similar to where the IoT market was in 2010" (p. 1). PwC (2019) explore the expected impact of VR and AR on the economy and identify a potential to boost the global economy by $1.5 trillion by 2030, with AR attributing the biggest boost to technology-driven GDP, which is denoted by the Economist (2020) as "augmented economies", changing the way people interact in the society, get informed and purchase.

Existing research on consumer behaviour in the interaction with virtual, augmented, and mixed realities has either focused on identifying drivers of online purchase intention in virtual enriched environments (Bonnin, 2020; Pillai et al., 2020; Song et al., 2020; Yim et al., 2017), the adoption of these technologies (McLean & Wilson, 2019; Pantano et al., 2017), functional aspects of a concrete technological design (Bach et al., 2018; Hübner et al., 2020) or metrics on shopping behaviour in the virtual environment (Schnack et al., 2019). However, value assessment in the adoption of these technologies is sparse, with a recent study on VR (Vishwakarma et al., 2020), but to the best of our knowledge the value assessment of AR technology in the online purchase process has so far not been studied.

With the purpose to understanding the potential of AR in the online purchase channel, we raise the question of what determines consumers' perceived value of a particular AR service technology and the purchase intention through this technology. Concretely, we aim to identify value drivers for the use of AR smart glasses (ARSG) for e-commerce. Porter and Heppelmann (2018) indicate five points to leverage AR as part of the firm strategy: Type of AR implementation, use of AR for product differentiation, cost-efficiency of AR, AR outsourcing or in-house, and AR as a communication medium.

We argue that such a strategic approach requires the integration of the economic, the experiential, the technical, and the social value of AR, which is in line with the AR value classification by Cranmer et al. (2020) and the technical mechanism highlighted by Yim et al. (2017).

Concretely, we set up the following objectives: (1) Evaluate the effect of the perceived value of ARSG, (2) Evaluate the effect of immersion (experiential dimension), (3) Evaluate the effect of AR devices and technical complexity (technical dimension) and (4) Evaluate the importance of subjective norms (social dimension) on the purchase intention through AR technology.

We apply and extend the value-based adoption model (VAM), first developed by Kim et al. (2007), exploring the behavioural intention of using ARSG for online purchase. Methodologically, the model, which is based on rational cost–benefit analysis, is augmented by the differentiation between technical, social and experiential AR-value dimensions complementary to the economic dimension.

For the analysis, we use a self-constructed data set based on an experiment at ESIC Tech Lab, where students were invited to explore a virtual retail store through ARSG and realised, after the concrete user experience, a web-based survey, where 253 valid responses were obtained and included in the analysis.

The paper contributes to fill the gap on the relationship between identified AR value dimensions and purchase intention online through this technology. A thorough literature review on value perspectives on consumers' purchase intention in the online channel together with the recently highlighted value potential of AR technology allows the value concepts to be identified to study explicitly consumers' perceived value of a particular AR technology in the purchase process online. This value assessment by consumers allows to derive management implications for the design and value proposition for AR service implementation. The results suggest that the technical dimension has an ambiguous effect, with tech-complexity enhancing directly the perceived value of ARSG for online purchase while reducing the net value of consumers' economic cost–benefit analysis. We find strong evidence that the experiential and social AR dimensions (in the form of immersion and subjective norm) have a significant positive influence on consumers' purchase intention online, which are better predictors than the pure economic cost–benefit assessment (through usefulness and difficulty). Furthermore, the technical innovativeness of consumers is found to increase directly the online purchase intention through ARSG.

2 | CONCEPTUAL BACKGROUND OF AR AND ONLINE PURCHASE INTENTION

The research lies in the intersection of consumer behaviour, technology adoption and digital transformation of retail.

2.1 | Online purchase intention

Purchase intention combines consumer interest and the possibility of purchasing a product (Kim & Ko, 2012), and is understood as an antecedent variable of actual purchase behaviour, with an intention-behaviour relationship that depends in general on the context (Miniard et al., 1983).

In an online shopping context, a variety of studies have reinforced the strong existing relationship between the shopping experience, attitude and the forecast of future behaviour (Kim & Ko, 2012; Ma et al., 2021; Pillai et al., 2020; Silva et al., 2018). The shopping experience in a digital environment, under a variety of informational cues, generates new stimuli and attitudinal responses of the potential customers, which are captured in their online purchase intention (Ma et al., 2021). The online purchase intention in turn has a positive impact on the actual amount and frequency of online purchase (Silva et al., 2018), such that understanding online purchase intention in an environment of growing e-commerce becomes crucial to be competitive.

The different theories and measurement models of online purchase intention (e.g., Theory of Reasoned Action, Theory of Planned Behaviour and Technology Acceptance Model) are all based on the assumption that consumers will behave based on their attitudes (Chen et al., 2015). That is, purchase intention is an attitudinal variable that allows to quantify the future contributions of customers to a brand, which is to be differentiated from customer equity as a behavioural variable, which accounts for purchases made.

Since the forecasting of consumer behaviour and the stimulation of purchase intention is considered a critical issue for a firm, a quantitative assessment of purchase intention is crucial for retailers' success (Das, 2015; Ying et al., 2021).

2.1.1 | Perspectives on online purchase intention

Studies on online purchase intentionality have focused on explaining consumer behaviour, which can be differentiated into two main perspectives: a technology-oriented perspective and a trust-oriented perspective (Heijden et al., 2003). Their research suggests that perceived risk and perceived ease-of-use are antecedent variables of consumer attitude towards online purchasing. While the authors find that the influence of perceived risk was strongly negative, the influence of perceived ease-of-use was identified to be positive in some cases, but there was no effect from trust in the online store and the perceived usefulness of the website. Hence, trust in online stores appears to be indirectly related to a positive attitude through its direct negative effect on perceived risk.

The trust generated towards online sales (platforms) is a factor that positively affects purchase intention and is directly related to the utility variable (usefulness) (Gefen et al., 2015). Moreover, perception of trust in the sales platform not only increases the purchase intention but is directly related to the consumers' intention to pay a higher price (Reichheld & Schefter, 2000).

Likewise, and in a circular way, a good online shopping experience improves trust in this platform (Ha & Perks, 2005) and trust is also considered as a consequence of perceived risk in the online environment (Silva et al., 2018). In any case, the inverse relationship between perceived risk and trust is a well-established important prerequisite for online purchase intention (Ventre & Kolbe, 2020). From this perspective of trust, several studies have related the influence of comments from other people on the purchase intention, either from a very close environment, such as family, friends or colleagues (Doan, 2020), with the strength of the relationship determining the generated effect on online purchase intention (Ma et al., 2021), or with a broader focus evaluating the influence of online consumer reviews, concluding that they will affect to a greater or lesser extent depending on their quantity and quality (Park et al., 2007). The mentioned study found that the quality of online reviews and the number of reviews positively influence consumer purchase intention, differentiating between low- and high-involvement consumers in terms of the quantity or quality effect of reviews.

Similarly, Ventre and Kolbe (2020) identify perceived usefulness of online reviews as the most important driver for online purchase intention, through a direct effect of reviews acting as a reference in complex and often-impersonal purchase decisions online, and, through the creation of online trust and its positive impact on online purchase intention. This emphasises the collectivist dimension of the relation between online reviews and online purchase intention. Social presence is also aimed at building trust through the perception that the seller creates through personal, sociable and sensitive human contact display on the website (Gefen & Straub, 2004). Therefore, there is a growing interest in using social media marketing to increase purchase intention (Kim & Ko, 2012). Considering different online environments, there is a relationship between the quantity and quality of information and the trust it generates (Mesch, 2012; Pötzsch & Böhme, 2010).

From a technology-oriented perspective, the analysis of the relationship interface design and how it can affect the purchase intention has also been the focus of several studies. The design of user-friendly websites or apps using a suitable language and guaranteeing a fast and precise processing speed is a factor that improves the purchase intention (Doan, 2020) as well as engagement towards the brand (Stocchi et al., 2018). Other studies analysed how design elements (human elements and computer elements), along with gratifications theory, can explain purchase intentions as well as returning to the website (Hausman & Siekpe, 2009).

Within the interface analysis, *The Concept of Flow*, explained as a cognitive state experienced during navigation (Hoffman & Novak, 1996), characterises online flow as one that includes machine interactivity, enjoyment, loss of self-consciousness and selfreinforcing. Csikszentmihalyi (1997) stated that the cognitive state is an "optimal experience" which is "intrinsically enjoyable." The way in which information is presented and found online, especially through search engines, directly affects the purchase intention of the objects on which we base our searches (Shim et al., 2001). In the same line, Ma et al. (2021) show that a greater cognitive and affective involvement of potential consumers with the website enhances the online purchase intention.

Complementary to trust and technology factors, we also find research that makes an approximation to the online purchase intention through the analysis of demographic factors, such as age and gender. In this context, Law and Ng (2016) find that young people and their affinity to technology favour purchase intention in virtual environments, but also that elderly people with higher income levels are more willing to use the internet as well as to buy products online, whereas the level of education seems to have only a positive effect on internet use (Eastman & Iyer, 2004).

2.1.2 | Online purchase intention in retailing

In the retail industry, online shopping strategies require management with a broad vision, where we must take into account aspects such as the brand, the value proposition and the management of the purchase intention (Abril et al., 2010). Thus, a large number of studies have addressed purchase intention in this industry (Cheah et al., 2010; Shim et al., 2001; Yang & He, 2011). It is worth highlighting the contributions on the influence of warranties on the increase in online purchase intention, derived from the reduction of perceived risk (Lwin & Williams, 2006) and how this increase in trust improves loyalty and favours buyback (Chinomona & Sandada, 2013) as well as the perceived risk depending on the online platform used (Ling et al., 2011).

Pillai et al. (2020) emphasise that disruptive digital innovations in physical retailing, such as AI-powered retail stores (AIPRS), require to identify context-specific variables, which drive the shopping intention through the new technology. Concretely, the authors identify, beyond standard variables of technology adoption and readiness, AI-specific variables such as perceived enjoyment, customization and interactivity, which determine the intention to shop at AIPRS. This increased understanding of the technology allows retailers to improve on their value proposition in the design of AIPRS.

Focusing on online retailing, recently, virtual interactions of the consumer with the firm and products (as a particular type of new AI-based service technology) are identified as potential 'game changers' with the consumers' perceived experience playing a crucial role in the purchase intention and empowering consumers with new tools (Blázquez, 2014; Pantano et al., 2017; Papagiannis, 2020a). At the same time, virtual online retail stores empower firms realising market research in controlled virtual environments simulating realistic shopping experiences with observed shopping behavioural metrics being mainly similar to in-store measures (Schnack et al., 2019). However, little is known about the drivers of online purchase intention leveraging new marketing technology.

2.2 | AR as a technology-based retail service for online purchase

Wolpert and Roth (2020) provide a conceptual classification of TBRS, based on a systematic literature review, as a tool for decision-making on TBRS from a retailers' perspective. The authors define TBRS as follows: "TBRS refer to interactive technologies that contribute to retail value creation by fulfilling a human purpose, enhancing customers' shopping experiences or facilitating retailers' capabilities" (Wolpert & Roth, 2020, p. 3). In a strong sense, as defined by the authors, TBRS is understood as in-store technology. However, given AR's potential as 'retail stores everywhere', we understand purchase through AR technology as an augmented technology-based retail service. Wolpert and Roth (2020) differentiate TBRS in different dimensions, which are characterised for AR technology (mobile or stationary) as follows: First, considering the participation with the technology, AR creates a technology-generated customer contact with participants acting literally on an eye-level with TBRS; Second, considering information issues, the degree of contact with the AR technology (in terms of time, information complexity and media sophistication) and bidirectional information flow determine relevant information issues in implementing the technology; Third, the intended purpose of purchase through AR can be twofold: increasing the number of touchpoints with potential consumers (ubiquitous consumption) and creating shopping experience.

The variety of AR-TBRS on the internet includes mobile AR (MAR) shopping apps using the smartphone camera (Dacko, 2017), virtual fitting rooms or a try-on experience on the retailer's website (Beck & Crié, 2018; Yim et al., 2017), which all follow the objective to overcome the lack of physical presence in e-commerce and create additional value for the consumer. Considering head-mounted AR devices, like ARSG, Rauschnabel (2018) highlighted that leading firms in the retail business (e.g., Alibaba and Amazon) had invested considerably in this technology, but so far the research is sparse, with recent studies considering the general usage intentions (Bach et al., 2018; Hübner et al., 2020) but not as a retail service technology for online purchase.

2.3 | The value assessment of AR

Cranmer et al. (2020) identify five AR value dimensions in a literature review: Economic (related to costs and whether products and services are a worthwhile investment), environmental (value related to attitudes and behaviours towards the environment), emotional (value related to feelings or affective states generated by a product or service), functional (value from perceptions of perceived quality) and social (fulfilment from product or service use, or perceptions of whether others will recognise actions). The authors state that one of AR's strongest value factors is its marketing potential, which emphasises the need to embed technologies into marketing through an appropriate value assessment and pricing.

While a decade ago value-based pricing (VBP) strategies were only applied by a few firms (Hinterhuber, 2008; Hinterhuber & Bertini, 2011), conducting a careful analysis of value-drivers from a customer perspective and evaluating the differential benefit of product attributes and the overall willingness to pay has since become a crucial competitive advantage compared to traditional pricing strategies (e.g., the widespread cost-based pricing) which ignore psychological aspects.

The need for value assessment and pricing arises for instance when selling products through a new distribution channel (Kotler et al., 2016), which is reflected in a growing literature on VBP methods for digital services (e.g., Khandker & Joshi, 2018) and retail (Rondan-Cataluña et al., 2019). For product-centric providers, the value-based approach accentuates the importance of offering superior products or services, whereas for customer-centric providers the focus is the mechanism of service provision which can follow different pricing schemes (usage-based, output-based, etc.) and determines the firm's value proposition (Stoppel & Roth, 2016).

In the context of adopting new technologies in accordance with the discussed value-based approach, Kim et al. (2007) proposed the VAM. This methodology incorporates the value dimension in a structural technology adoption model, which explains adoption intention based on a cost–benefit analysis and mediation through perceived value. The model developed by Kim et al. (2007) was first applied to the adoption of Mobile Internet, as a new information and communication technology and defined benefits in terms of *usefulness* and *enjoyment*, while costs were defined as *perceived fees* and *technicality*.

The VAM currently finds increasing application in the adoption of new technologies, for instance, Vishwakarma et al. (2020) explore the evaluation of tourist destinations through VR adapting the VAM considering both of the identified non-monetary cost types (risk in terms of *physical risk* and difficulty in terms of *perceived complexity*), exploring the direct effect on perceived value. Likewise, the same authors identify a direct positive influence of immersion on the perceived value of VR adoption.

With regard to AR attributes, the focus of the literature has so far been on the technology adoption, approached from a concrete perspective. Considering consumer experience, McLean and Wilson (2019) define a set of specific AR attributes for mobile applications in retail—interactivity, vividness, novelty, which are analysed within a technology adoption model (TAM, developed by Davis, 1989) and identified to influence consumer satisfaction with the experience and intention of use through brand engagement. In the same line, Pantano et al. (2017), partitioning from the traditional TAM, study the effect of AR use for a particular virtual try-on system on the web (for glasses by the brand Ray-Ban) on consumer shopping behaviour, incorporating an "interactive dimension" in the adoption model, and identify new experiential constructs like aesthetic quality, interactivity, response time and quality of information as having a positive effect on standard benefit measures (usefulness, ease of use and enjoyment). Yim et al. (2017) show that the functional mechanisms of AR, such as "interactivity" with the technology (e.g., speed, mapping, range of content manipulation, etc.) and "vividness" (e.g., quality and sensory dimensions), influence the online purchase intention through a strong mediation effect of immersion.

Approached from a purely functional perspective, Bach et al. (2018) find that ARSG can improve concrete tasks (speed and precision) through better matching of human perceptual and interaction capabilities. Hübner et al. (2020) study the purely technical performance of the depth sensor and tracking system on indoor mapping quality. Furthermore, socialisation and the building of self-image have been found to influence positively the general intention of adopting this technology (Rauschnabel, 2018).

Other studies have approached the potential of AR for realising transactions from a content approach. For instance, van Esch et al. (2019) analyse how variables like anthropomorphism, endowing AR technologies with human features, have a positive influence on the perceived convenience of conducting transactions with AR, which in turn influences consumers' attitude towards the brand.

Note that the existing literature on new service technologies, especially VR or AR, explicitly or implicitly emphasises the differentiation between utilitarian value and hedonic value in assessing technology-based services as an influence on purchase intention (Blázquez, 2014; Bonnin, 2020; Papagiannidis et al., 2017). However, dimensions like social or functional aspects have been stated as potential AR values, but research in this line is still sparse and the influence on the purchase intention online remains to be explored. Table 1 provides an overview of the existing literature adressing different value dimensions and the contribution of the present paper.

Considering our objective to assess the effect of value drivers on consumers' perceived value of ARSG and online purchase intention through this technology, note that the identified AR value dimensions (economic, emotional, functional and social) are in line with the main perspectives discussed in the literature on online purchase intention. In particular, the trust perspective focuses on the *social* presence. The technical perspective emphasises *functional* aspects, such as the interface design and complexity. The concept of flow highlights the process of being *immersed* in the experience. And last but not least, classical *economic* determinants such as usefulness are considered. Hence, we make use of these concepts to study explicitly the relationship between AR value dimensions and purchase intention through this technology, mediated through consumers' perceived value of ARSG.

3 | HYPOTHESIS DEVELOPMENT AND RESEARCH MODEL

Following a consumer-centric firm perspective, with the aim of identifying relevant value drivers of consumer intention on online purchase using ARSG, we consider the identified dimension of AR experience, AR technology and AR social and develop our hypothesis to be tested within an augmented VAM (AVAM) as illustrated in Figure 1.

3.1 | Perceived value of AR and online purchase intention

In line with the increasing trend of perceived value assessment in marketing (as outlined in Section 2.3), and in line with Kim et al. (2007)

TABLE 1 Research contribution

	Technology type		Value dimension					Outcome	
	VR	AR	Device	Economic value	Experiential value	Functional value	Social value	Perceived value	Purchase intention
Kim et al. (2007)				✓	✓	✓		✓	
Vishwakarma et al. (2020)	✓			✓	✓	✓		✓	
Jin et al. (2013)				(✓)	✓			✓	
Yim et al. (2017)		✓		(✓)	✓	✓			✓
Bonnin (2020)		✓	✓	✓					✓
Papagiannidis et al. (2017)		✓	✓	(✓)					✓
Pillai et al. (2020)	✓	✓		✓	✓				✓
Song et al. (2020)		✓			✓				✓
Ventre and Kolbe (2020)							✓		✓
McLean and Wilson (2019)		✓		(✓)	✓		✓		
Rauschnabel (2018)		✓		(✓)	✓		✓		
Pantano et al. (2017)		✓		(✓)	✓				
Bach et al. (2018)		✓				✓			
Hübner et al. (2020)		✓				✓			
This paper		✓	✓	✓	✓	✓	✓	✓	✓

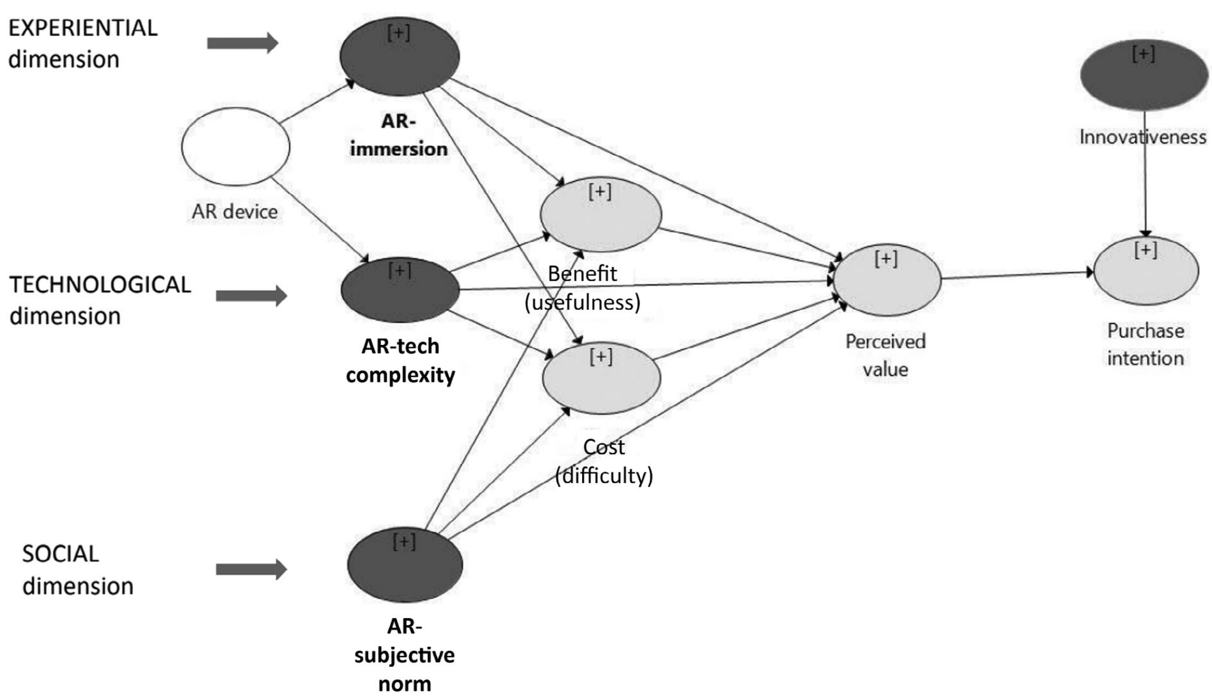

FIGURE 1 Research model: Augmented reality (AR) dimensions in the value-based online purchase intention

in the development of the VAM, here perceived value is understood as the overall evaluation of the relative perceived benefits and costs associated with the use of ARSG for purchase. Considering the perceived value in the virtual world context, Vishwakarma et al. (2020) find that it is an essential determinant of the behavioural intention to use VR. Hence, considering the use of AR glasses for online purchase, we set up the following hypothesis in the AR context:

Hypothesis H1. *The perceived value of the AR technology has a positive effect on the intention to use augmented reality smart glasses for shopping online.*

3.2 | AR: Experiential dimension

AR implied immersion has been identified by several authors as having a positive impact on the purchase decision (Papagiannidis et al., 2017; Song et al., 2020; Yim et al., 2017). Applied to purchase in e-commerce, Yim et al. (2017) show that immersion is determined by many other consumer experiences (like interactivity, vividness and media novelty) and has an impact on purchase intention mediated through usefulness and enjoyment. Note that these two elements are the components of benefits evaluation in the VAM by Kim et al. (2007). Hence, we understand immersion experience as antecedents of the economic benefit analysis, which consumers carry out consciously or unconsciously when evaluating whether to use AR technology. In the same line, but based on means-end theory, Jin et al. (2013) show that experiential quality as psychological outcome directly impacts the perceived value, which in turn mediates the impact on behavioural intention. Therefore, analogous to Vishwakarma et al. (2020) for VR, we also expect a direct effect of AR immersion on the perceived value.

Hence, the joint consideration of these findings suggests a differentiation in a direct and indirect effect of immersion on the perceived value of the AR service technology.

Hypothesis H2. *Existence of an enhancing effect of immersion (experiential dimensions) on the purchase intention.*

Hypothesis H2a. *AR immersion has a direct positive influence on perceived value.*

Hypothesis H2b. *AR immersion has a positive influence on perceived usefulness (benefits).*

Hypothesis H2c. *AR immersion has a negative influence on perceived difficulty (costs).*

3.3 | AR: Technological dimension

Rogers (1995, p.13) defines technology as a mixture of hardware and software components where the benefits for adopters are not always clear, such that any technology innovation creates a certain uncertainty for the user. In this study, we concentrate on the technological uncertainty in the adoption process (Hirshleifer & Riley, 1979), in terms of difficulty and complexity and on the technical device itself.

Perceived difficulty in the adoption of a particular technology is usually analysed in terms of technicality (Kim et al., 2007) or as the opposite of the well-established concept of ease of use. Complexity has been considered by Vishwkarma et al. (2020) for the adoption of VR, based on Roger (1995, p. 15), who defines complexity as "the degree to which an innovation is perceived as difficult to understand and use" and suggests that those technologies that are more difficult to understand usually take more time to be adopted. Note that it may be tempting to equate difficulty with the concept of complexity, which is considered as a cost aspect by Vishwakarma et al. (2020). However, Kinni (2017) argues that complexity and difficulty are different aspects. While difficulty refers to problems or tasks, which are hard to solve, complexity just involves many unknown or interrelated aspects, which is the case in the process of a variety of technical disruptions. In order to manage complex issues, Nason (2017) states the importance of a 'try, learn and adapt' operation strategy and the development of a complexity mindset.

Moreover, considering different virtual retail environments, Papagiannidis et al. (2017) analyse desktop technology versus immersive technology and find differences between the existence or non-existence of immersive 3D on purchase intention. This is in line with Bonnin (2020) who finds a positive effect of the presence (vs. absence) of AR technology on patronage intention. In the AR context, considering different types of ARSG, value propositions by the providers (Microsoft, 2020; Magic Leap, 2020) as well as corresponding academic research (Bach et al., 2018; Hübner et al., 2020) have highlighted immersion and the technical functionality in terms of product differentiation. Hence, taking all this together, we set up the following hypothesis:

Hypothesis H3. *There is an effect of the technical dimension on the purchase intention.*

Hypothesis H3a. *There is a positive influence of Tech-complexity on perceived value.*

Hypothesis H3b. *Tech-complexity has a negative influence on perceived usefulness (benefits).*

Hypothesis H3c. *Tech-complexity has a positive influence on perceived difficulty (costs).*

Hypothesis H3d. *Differences in the type of ARSG impact the perceived immersion and complexity of the experience.*

3.4 | AR: Social dimension

In the light of possible difficulties and complexity in the adoption of new technologies, it is a well-established fact that technology innovations induce consumers to search for some information (Roger, 1995, p.13). The information gathering to assess product characteristics can be facilitated by the firm through the product or service design, advertising and marketing (Bar-Isaak et al., 2010; Bar-Isaak et al., 2012).

While information constructs like familiarity with the technology have been found to have a significant influence in AR adoption, in terms of a possible moderating effect on the perceived risk of online shopping (Bonnin, 2020), the effect of the social dimension of information on purchase intention through AR technology has not been considered.

Shalev and Morwitz (2012) argued that adopting new technological products may be done in order to signal a high level of innovativeness. That is, others' opinions or behaviours in using a new technology device or service may create ‘gadget lust’ and enhance the purchase intention. In the adoption of AR, recently the social pressure on the consumer behavioural intention, denoted as the concept of the subjective norm, has been found to have a positive effect on AR brand engagement using mobile apps (McLean & Wilson, 2019). Considering ARSG, they may serve as a form of ‘conversation starter’ in social media communities and serve in communicating a self-defined image (Kalantari & Rauschnabel, 2016; Rauschnabel, 2018). Furthermore, Dacko (2017) highlight that social media is the dominant source for initial learning about the technology, which suggests that social opinion is expected to have an influence on the value assessment of consumers to adopt ARSG for online purchase. Hence, the following hypotheses are set up:

Hypothesis H4. *Existence of an effect of the subjective norm (social pressure) on the purchase intention through AR.*

Hypothesis H4a. *There is a direct positive influence of the subjective norm on the perceived value.*

Hypothesis H4b. *The subjective norm has a positive influence on perceived usefulness (benefits).*

Hypothesis H4c. *The subjective norm has a negative influence on perceived difficulty (costs).*

3.5 | Innovativeness (interest in technology)

Yim et al. (2017) identify, in a sentiment analysis assessing opinions about AR product presentations that ‘technology’ was the word most used by the participants. Hence, in line with the considered technical dimension of the ARSG for online purchase, considering the potential influence of personality trait on purchase intention, we hypothesise that people who are innovative in terms of trying out new technologies are more likely to adopt ARSG to make an online purchase. Note that the identification of being technically innovative is to be distinguished from the influence of the subjective norm through the perceived value of a good.

Hypothesis H5. *Innovativeness (in terms of interest in technology) has a direct positive influence on purchase intention through AR.*

4 | METHODOLOGY AND DATA

With the objective of exploring the purchase intention through AR, following an ‘outside-in’ approach considering manageable value dimensions of implementing ARSG from a firm perspective, we use a PLS-SEM approach (Henseler et al., 2012; Garson, 2016). Concretely, as outlined in Figure 1, following Kim et al. (2007, 2017), the model is based on an economic cost–benefit analysis (CBA) with the perceived value modelled as the mediating effect of purchase intention, which is augmented by the authors incorporating different AR value dimensions (assessing the direct effect on consumers' perceived value as well as the indirect effect through the CBA) and the effect of consumer innovativeness (in terms of technology proficiency) on the purchase intention.

4.1 | ESIC tech lab AR experience

To this end, we designed a consumer experience of purchase through ARSG in the ESIC Tech laboratory, a university space for learning about and experimenting with new technologies at a Spanish university. Students were randomly assigned one of two types of ARSG from market-leading firms (Magic Leap or HoloLense) and were exposed to concrete user experiences in two steps, firstly by familiarising themselves by interacting with the technology to select and locate abstract objects, and secondly by interacting with an AR retail app, as illustrated in Figure 2 and described in detail in Appendix A1 and Table A1.

A web-based questionnaire through Google Forms was prepared (based on validated Likert scales from the reviewed literature) to be provided to students through a QR code after the experience in the virtual enhanced environment.

4.2 | Data collection

The AR experience was implemented at ESIC Lab in the winter term, from September to December 2020. Given that we aim to identify the value drivers of ARSG as a disruptive interactive service technology, we focus on students between 18 and 30 years old, who can be supposed to consider technology as a natural part of their everyday life. A total of 830 undergraduate students across all degrees were targeted to visit ESIC Lab in groups of seven students with the objective to experience the ARSG technology. However, among them only 277 students were asked to fill in the survey (given the extension of the survey, which was conducted during class time after the visit at the lab) and out of this 253 were valid responses that entered the analysis. Table 2 provides the profile of respondents, with two-thirds being men, and a slightly larger fraction of business students compared to students studying a marketing and communication degree. Considering the type of ARSG devices, the SG from Microsoft (HoloLens) had more than twice as much presence in the survey data than the ones by Magic Leap. Given that the devices were randomly assigned to each group, our conjecture is that Magic Leap were assigned more often to the groups that were scheduled in the second half of the class such that there was no class time for the survey left.

FIGURE 2 Augmented reality retail experience in the ESIC tech lab (Microsoft HoloLens)

TABLE 2 Profile of respondents

Measure	Items	*N*	%
Gender	Male	172	68.0
	Female	81	32.0
Age (years)	18–24	240	94.9
	25–30	13	5.1
University undergraduate degree (enrolled)	Business administration studies	149	58.9
	Marketing studies and communication studies	104	41.2
AR device	HoloLens	180	71.1
	Magic leap	73	28.9
Total		253	

4.3 | Measurement scales

The study uses the adopted (and adapted) validated scales presented in Appendix A2 Table A2, which were developed in English and translated into Spanish. For each component, we report the corresponding indicators and reference as well as reliability of the items, reliability of the construct, convergent validity and discriminant validity.

The variables used are mainly from the extant literature of structural equation models in the context of technology adoption and, whenever possible, adapted from research on the most similar technology, VR. The measure *perceived usefulness* has been adapted from the research by McLean and Wilson (2019). As for the cost measure, we use *perceived difficulty of use*, adapted from Do et al. (2020), inverting the scale for perceived ease of use. Moreover, we use the concept of *tech-complexity*, adapted from Vishkawama et al. (2020) and modified following the complexity definition by Kinni (2017) and Nason (2017). The measure of the social component in terms of the *subjective norm* has been adapted from McLean and Wilson (2019), used in a similar context studying the adoption of VR. Similarly, we make use of recent research on a value-based approach of adoption of VR, using the adapted measures *perceived immersion*, *perceived value* and *behavioural intention* from Vishwakarma et al. (2020).

The general personal trait of technical *innovativeness* has been adapted from Shalev and Morwitz (2012), but we use only five instead of 10 indicators, which does not matter much in reflective models (Garson, 2016).

5 | DATA ANALYSIS AND RESULTS

5.1 | Power analysis of sample size

With the objective to guarantee accurate results and reduce type 1 errors (Hair et al., 2013; Hair et al., 2018; Memon et al., 2020), following Hair et al. (2019), we perform a power analysis using the G*Power 3.1 programme (Faul et al., 2007). Here we use the power analysis program to conduct an "a priori power analysis," as suggested by Cohen (1988), computing the necessary sample size to guarantee a minimum statistical power of 0.80. The number of predictors is here defined based on the largest number of antecedent latent variables directed on a dependent construct, which is the perceived value with the five value dimensions as predictors (three AR dimensions and two CBA dimensions). Given the novelty of the study, we apply Cohen's suggestion using a standarised medium effect size of 0.15, specify an F-test and apply a significance level of 5%. For the full model, the power test requires a minimum sample size of 92 observations (with a 1-β error probability> = 0.8). For an even stronger significance level of α=0.01, the total sample size required was 127. Figure 3 illustrates the required sample size for any given power level, which confirms that our total sample size of 253 observations yields a power higher than 0.95.

5.2 | Preliminary analysis: Established value-drivers of AR adoption

Before estimating the proposed model, we verified important established effects identified in the AR literature in the context of purchase through ARSG based on our sample. Concretely, we replicated the relations of immersion studied by Yim et al. (2017) and a simplified value adoption model, based on Kim et al. (2007), as illustrated in Appendix A3, Figure A1 and A2. In the VAM, we concentrate on the benefit in terms of *usefulness* and the cost in terms of *difficulty of use*, identified as robust and important measures of perceived value and attitude for a variety of technology adoption such as VR, Mobile Internet, IoT smart home services, voice and electronic mail (Vishwakarma et al. (2020); Kim et al., 2007; Kim et al., 2017; Adams et al., 1992). The results are provided in Appendix A3 Figure A3 and confirm the relevant influence of immersion on the usefulness of the technology (Yim et al., 2017), the effect of consumers' CBA through the perceived value on purchase intention (Kim et al., 2007), but both models do not allow to confirm the relevance of enjoyment. Hence, in our research model we concentrate on one representative variable for the economic benefit measurement (usefulness) and one for the cost measurement (difficulty of use).

5.3 | Measurement model analysis

The model was estimated using the SmartPLS software package. The correlation loadings for each item used in our model, as outlined in Figure 1, are reported in Appendix A2 in Table A2. Following Carmines and Zeller (1979), a loading of at least 0.708 indicates that the corresponding item explains sufficient variance of the corresponding indicator. Note that the criteria is met for all loadings. We also indicate the reliability of the constructs reporting Cronbach's Alpha (CA), which is confirmed showing for all latent variables values larger than the critical 0.70 (Nunnally & Bernstein, 1994). Additionally, we indicate the composite reliability (CR) following the threshold of 0.7 as indicated by Nunnally and Bernstein (1994). Similarly, we analyse convergent validity by reporting the average variance extracted (AVE) following the criteria by Hair et al. (2019) with a minimum value of the explained variance of more than 50%. All constructs are reliable with an AVE > =0.5.

Furthermore, we carry out a discriminant analysis. Appendix A2, Table A3, presents the correlations between constructs to validate the measurement instruments following the Fornell and Larcker (1981) criteria. Since the square root of the AVE of each construct is larger

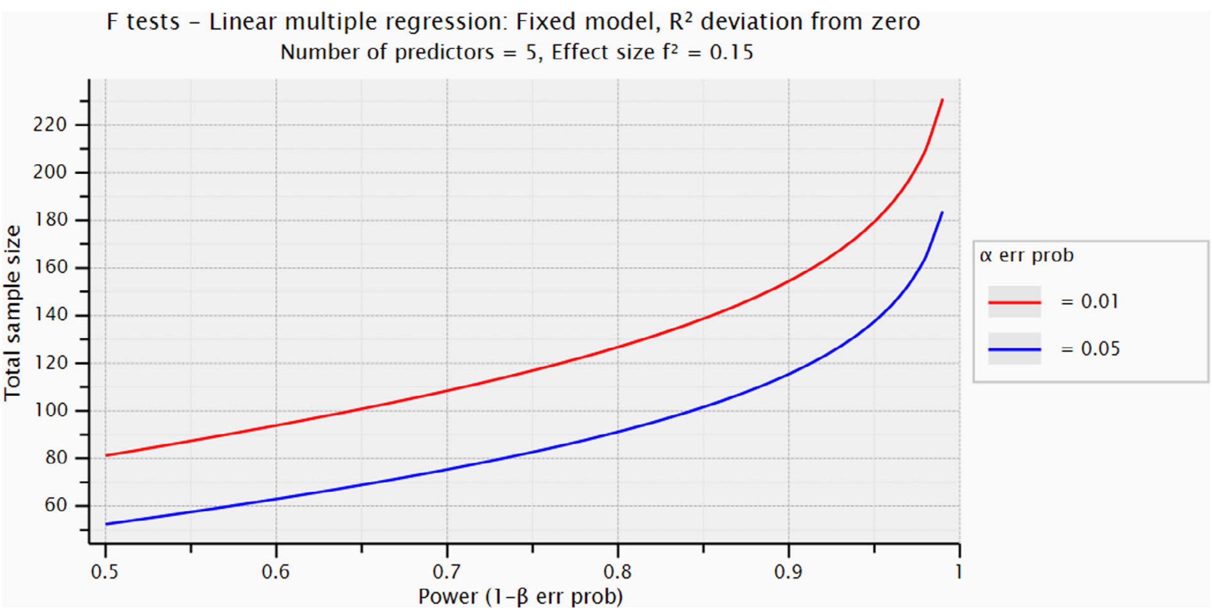

FIGURE 3 Power analysis of sample size

with the associated items than the correlations between variables, the validity is given.

5.4 | Structural model analysis

Significance testing of the estimates of the regression paths is conducted using bootstrapping. The overall effect size for the structural model is $R^2 = 0.5$, which implies that 50% of the variance in online purchase intention through AR is explained by the model, which is considered a moderate strength of predictive capacity of the model (Hair et al., 2013) and is similar to comparable studies (e.g., Pantano et al., 2018). The corresponding coefficient of determination for a perceived value is $R^2 = 0.25$ (which has improved considerably compared to the value of $R^2 = 0.06$ in the basic cost–benefit consideration from the preliminary analysis or $R^2 = 0.11$ of the benchmark model including enjoyment).

TABLE 3 Results of the hypothesis testing

	Path coefficient	p value
AR device → AR-immersion	0.142	.008
AR device → AR-Tech complexity	0.175	.002
AR-immersion → benefit (usefulness)	0.185	.010
AR-immersion → cost (difficulty)	−0.173	.011
AR-immersion → perceived value	0.224	.001
AR-subjective norm → benefit (usefulness)	0.339	.000
AR-subjective norm → cost (difficulty)	−0.367	.000
AR-subjective norm → perceived value	0.222	.001
AR-tech complexity → benefit (usefulness)	−0.251	.000
AR-tech complexity → cost (difficulty)	0.344	.000
AR-tech complexity → perceived value	0.110	.038
Benefit (usefulness) → perceived value	0.102	0.141
Cost (difficulty) → perceived value	−0.033	0.361
Perceived value → purchase intention	0.675	.000
Innovativeness → purchase intention	0.111	.015

TABLE 4 Total effect on online purchase intention through augmented reality smart glasses

	Total effect	p value
AR device → purchase intention	**0.032**	.010
Benefit (usefulness) → purchase intention	0.069	0.146
Cost (difficulty) → purchase intention	−0.022	0.361
AR-immersion → purchase intention	**0.168**	.002
AR-subjective norm → purchase intention	**0.181**	.000
AR-tech complexity → purchase intention	0.050	0.126
Innovativeness → purchase intention	**0.111**	.015

Table 3 presents the estimated path coefficients and Table 4 provides the total effect of the considered variables on online purchase intention through AR. Additionally, Appendix A4, Figure A4 provides a graphical representation of the estimates within the AVAM.

6 | DISCUSSION AND IMPLICATIONS

6.1 | Discussion of the results

We find a significant positive effect of the perceived value of the ARSG on the intention to use this technology for purchase online (H1). This confirms the findings by Vishwakarma et al. (2020) on the adoption of VR in the online purchase process, which is found to hold as well for the use of AR service technology. The result is also in line with previous research on purchase intention online in general, which has identified a positive effect of perceived benefits (as part of the perceived value) on online purchase intention (Silva et al., 2018).

Immersion, as the experiential value of ARSG, has been confirmed to have a significant influence in the purchase intention online, directly through the perceived value (H2a), and indirectly through an increased perception of usefulness (H2b) and a decrease in perceived difficulty (H2c), which confirms and complements the previous literature on the adoption of VR as well as on AR in e-commerce (Vishwakarma et al., 2020; Yim et al., 2017).

The technological dimension, in terms of tech-complexity, has also been identified to have a direct positive influence on the perceived value (H3a), however, the complexity effect reduces the economic net benefits (H3b, H3c). This reveals a suppression of the effect of tech-complexity on perceived value. In a comparable study, Vishwakarma et al. (2020) show a negative direct effect of perceived complexity of VR technology, but do not consider the differentiation between complexity and difficulty.

The type of ARSG has been found to be a confounding factor in the prediction of purchase intention online with influence on immersion and tech-complexity (H3d). These results confirm the relevance of the ARSG supplier in terms of hardware as well as the programming features of the experience and hence contribute to the need for device-specific AR research (Rauschnabel, 2018). Concretely, the results extend the knowledge on a positive effect of the presence (opposed to absence) of AR technology in an online store and the implications for patronage intentions (Yim et al., 2017) for the differentiation of AR technologies across providers.

The effect of the social AR dimension, in terms of the subjective norm, is confirmed as a positive direct effect on perceived value (H4a), as well as indirect effects through an increase of the perceived usefulness (H4b) and a reduction of the perceived difficulty (H4c). This is in line with the discussed trust-oriented perspective, in particular, with customers seeking a reference and opinions of others when it comes to online purchase decision, which has identified a direct beneficial effect of trust on online purchase intention (Park et al., 2007; Ventre & Kolbe, 2020) or a moderating effect on drivers of online purchase intention (Ma et al., 2021). The identified mediating effect of perceived value between the social AR dimension and online purchase intention is comparable with Silva et al. (2018) identifying perceived benefits as an intervening variable between trust on the internet and online purchase intention. Likewise, the inverse relationship between trust and perceived risk (Ventre & Kolbe, 2020) is mirrored in the inverse relationship between subjective norm and perceived difficulty, such that expectations of others towards the behaviour act as a reference of being not too difficult to handle, which becomes especially relevant if it is a complex or unknown purchase environment.

Regarding the economic AR dimension, in terms of the standard CBA, we find that usefulness and difficulty lose significance in light of the presented AR dimension. This is partially in line with Vishwakarma et al. (2020), who likewise did not find a significant effect of perceived costs on the perceived value of VR. In contrast, Pillai et al. (2020), considering the usefulness of smart in-store retail technology, find a positive effect of perceived usefulness on purchase intention through the technology. Our conjecture is that this is either due to differences in the value assessment of smart retail technology online and offline or due to the fact that the authors did not base their research on the perceived value theory. Overall, this suggests the relative importance of the experiential, technical and social AR dimension compared to rational economic decision-making.

Finally, the effect of consumers' personal innovativeness has been identified to enhance the adoption of AR service technology in online purchase intention. This is comparable with the research on the intention to use VR, which has shown a positive direct relationship between sensation seeking consumers and usage intention (Vishwakarma et al., 2020). Hence, beyond the identified service characteristics, the segmentation of consumer types yields additional insights.

Thus, ARSG as technology-based retail service comes along with new dimensions of consumers' value assessment, as studied in our conglomeration of value dimensions in the structural AVAM. Note that the importance of these dimensions in the purchase intention through smart service technology (beyond standard economic constructs like usefulness or ease of use) extends the insights by Pillai et al. (2020) from physical retail to virtual retail stores online.

Moreover, methodologically the study is one of the first papers to consider beyond technology adoption or technology readiness, consumers' value assessment of the adoption of smart service technology (Vishwakarma et al., 2020; Kim et al., 2017).

This value-based understanding of technology adoption suggests opportunities for the online channel of retailers to stimulate purchase intention and to derive value-based management implications for the implementation of ARSG in the online purchase process.

6.2 | Management implications

In the context of the restructuring of business practice under the concept of service-dominant logic, customer orientation is crucial in leveraging different operant resources (Beitelspacher et al., 2012). The results obtained by using ARSG for connecting customers with the firms' e-commerce suggest that the main value-drivers are immersion and social pressure, which should be enhanced for successful implementation of AR within the process of retail digital transformation, given that AR technology is becoming essential in retail and promises a significantly higher conversion rate compared to conventional e-commerce (Papagiannis, 2020a).

The identification of these value dimensions allows manageable digital technology objectives to be defined in order to achieve the business objective of motivating online sales. These objectives can be measured through regular experiments in the virtual store environment. Contrary to shopping metrics based on observed behaviour in virtual store experiments (Schnack et al., 2019), dealing with consumer perceptions requires a subsequent survey to be conducted. These analyses can be complemented by tracking the prevalent social opinion through the choice of an appropriate set of metrics of social media analysis (here it is not so much the value of the metric that matters, e.g., positive mentions in Twitter, Faceboook etc., but the evolution). Furthermore, since social norms or social conformity will be an important factor to favour or not online purchase intention through ARSG, it is recommended to integrate the access to social networks during the shopping experience in the virtual store and in this way leverage the social influence.

The implementation of ARSG for purchase contributes to overcome past limitations of e-commerce, drive technology enhanced online purchase further and position the firm for the future. On the one hand, the young people (as analysed in this study), as first digital natives, are expected to be the most significant market for products and services by 2025 and have been found to consider marketing technology in general as enabling as opposed to being mere gimmicks (Kotler et al., 2021). The analysed ARSG technology use in online retail has been found to deliver this enabling value and we deduce that this technology provides an opportunity to generate satisfaction for this consumer segment beyond the basics of e-commerce. On the other hand, purchase through ARSG responds to the trend of integration between purchase channels online and offline since the use of AR as service technology in retail blurs the lines between physical and digital experience and maintains physical distancing as a key aspect in the post Covid-19 crisis.

Furthermore, implications for the pricing of the digital retail service can be derived. Making use of the mediating effect of perceived value allows different value aspects to be considered jointly, and to draw implications on the relative importance of each dimension (as opposed to the partial analysis of a single dimension, e.g., Ma et al., 2021) on the purchase value, which becomes essential when a VBP approach is applied to establish concept-related price premium. For instance, if the prevalent social opinion increases, the perceived value may be reflected in a larger markup for the service. This is in line with the value of trust, which implies an increased willingness to pay in e-commerce (Reichheld & Schefter, 2000). Likewise, an increase in perceived immersion can be captured in a price premium for this experience, which is in line with previous literature showing that customers are willing to pay a price premium for an increased consumer experience up to 16% (Kotler et al., 2021; PwC, 2018).

Moreover, the perceived value should be aligned or close to the external value communicated by the company, so that the firms' value proposition should be aligned with the AR value dimensions of the target audience and the personality trait in terms of innovativeness of customers.

7 | LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Our research examines the value dimensions that drive online purchase intention through ARSG based on university students. However, if applied to different consumer segments, the value dimensions need to be revaluated so it would be interesting to study the generalisation of the results with respect to demographic variables like age groups and gender (Chen & Chan, 2011; Law & Ng, 2016), or for different geographic markets (Pantano et al., 2017). Our conjecture is that the motivation of older generations or less digitalized countries to use ARSG for online purchase changes and may incentivise some consumers to migrate to the digital channel for fashion purchases.

A further limitation of the study is that the effect of non-technical device-specific features on purchase intention remains a black box. As reflected in the detailed description of the different ARSG devices used in the study (Appendix, Table A1), product differentiation of devices goes beyond technical functionality and perceived immersion, including accessories and design. Recent literature has shown that the perceived visual typicality of wearable technology, such as smartwatches, can negatively influence the perceived performance of the device and hence influences technology adoption (Lee, 2020). If ARSG becomes mainstream, this gives rise to further exploration of the effect of product differentiation with focus on design aspects using a sufficiently large set of different ARSG designs.

Moreover, we may consider to adapt the established model to explore the value-based adoption of ARSG as service technology in online purchase for the automotive industry, where digital information is the primary information source for becoming informed before purchase and cars are becoming increasingly high-tech products but at the same time physical stores are the main touchpoint with consumers (Kotler et al., 2021), which presents the opportunity to leverage ARSG.

Finally, the value based approach of the present study suggests that the enhanced experiential value through personalised immersion in online shopping, the attractivity of new complex enabling technology and the expectations of the social environment give rise to capture this generated value through an appropriate price premium when implementing AR environments in digital marketing strategy, which remains to be explored in future research in a complete pricing analysis based on the identified value drivers.

8 | CONCLUSION

Research on online purchase intention and TBRS has identified opportunities to leverage digital technology to stimulate purchase intention for e-commerce. Recent studies highlight the potential of AR front-end technology for immersive marketing and to overcome barriers of trust and physical distance in retail. However, the value assessment in the adoption of AR technology for purchase has so far not been considered.

This work has developed and evaluated an AVAM, identifying constructs from the experiential, technical and social dimension of AR as drivers of adopting ARSG for purchase online. The AVAM complements and combines existing literature through the joint consideration of the device used, a standard cost–benefit analysis and the AR value dimensions, which determine, mediated through the perceived value, the consumers' purchase intention, and thus provides a value-based approach to AR adoption in e-commerce.

This provides a starting point for further research within the increasing academic interest in AR (since 2017 there has been an annual increase of approximately 30% in the number of papers about AR on the Web of Science databases platform) and the increasing demand for value assessment of digital services (Khandker & Joshi, 2018; Stoppel & Roth, 2016; Vishwakarma et al., 2020).

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

DATA AVAILABILITY STATEMENT

Data available upon reasonable request from the authors.

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APPENDIX A.: APPENDICES

A.1. | Esic tech experiment details

Description of the ESIC Tech lab experience and technological features of ARSG

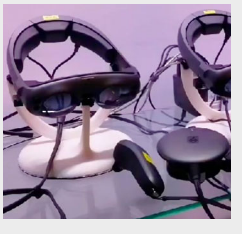
The AR-based retail experience was organised in groups of seven students with random assignment of one of two types of AR glasses (using different types of ARSG allows, on the one hand, to verify the robustness of the results and on the other hand the direct impact of the device on the AR dimensions that are the subject of this research). Students put on the AR glasses (and received the necessary complementary device), and during the 15 minutes of participation in the experiment, the rest of the people in the room are unaware of the participant's experience (unless if we were to connect a projector to visualise the images in real-time that are being reproduced through the lenses of a participant).

The first type of augmented reality smart glasses used is *Magic Leap One*, which differs from the other devices in its Lightpack unit (where the CPU and the battery are located) and the interaction the user has through remote control. Infrared sensors that are part of the Lightpack map the surrounding surfaces and the polarised lenses project the image through an infrared emitting camera system that allows the eyeball of the participant to be monitored, but none of the technical elements is visible during the AR application. The applications and contents can be developed through different platforms (Lumin SDK, MagicScript, Helio Web Platform) depending on the programming language that is used (Magic Leap, 2020).

The second type of ARSG, the HoloLense, developed by Microsoft, is made in a single piece that is located on the head, with four sensors mapping the environment. The corresponding apps and content creators rely on the Mixed Reality platform (Microsoft, 2020). The table below provides the detailed technical characteristics of each of the ARSG used.

In order to adapt to the systems, for both devices, participants are first shown different rooms or windows, and they are instructed to enter and choose elements in the insight and locate different elements in the room using the remote control (for Magic Leap) or use of touch gestures (for HoloLense). The second application is a virtual retail store placed in the surrounding of the participant who is asked to explore the store for purchase. When selecting the stores, the stands with the products or mannequins are displayed, the consumer can freely move around the stands, and it allows to see the detailed design of the objects and relative information of the products such as price, shape, size and colours.

TABLE A1 Technological features of ARSG

AR device	Technical AR feature description	Image
Microsoft HoloLens	• 8 GB RAM • 128 GB of internal storage • Battery with an average autonomy of 3 h • Lumin OS operation system • Bluetooth, WiFi and USB-C connectivity • Image resolution 1280x960 pixels • Six channel dual RGB system to obtain two planes of focus (depth effect) • Lumin SDK platform (compatible with Unreal y Unity) • MagicScript platform (based on Java, C API for development in C++) • Helio Web platform (for development in HTML)	
Magic leap One	• 2GB RAM • HPU with 1 GB of memory 64GB internal flash storage • Intel 32-bit SOC with four cores • Bluetooth, WiFi and Micro USB connectivity • Four sensors that capture and map the environment • Image resolution 1280 × 760 pixels • RGB optical projection system • Mixed reality platform (compatible with unreal and unity)	

A.2. | Model variables, reliability and validty

TABLE A2 Model variables, reliability and validty

Variable	Item	Description	References	Loading	CA	CR	AVE
AR- Immersion	IMM1	Once the AR glasses were worn, I was unaware of what was happening around me	Adapted from Vishwakarma et al. (2020)	0.809	0.861	0.904	0.702
	IMM2	Once the AR glasses were worn, I felt disconnected from the outside world		0.865			
	IMM3	I felt that I was actually within the store during my experience wearing the AR glasses		0.800			
	IMM4	During the AR glasses experience, I felt as if I were in another world.		0.874			

TABLE A2 (Continued)

Variable	Item	Description	References	Loading	CA	CR	AVE
AR-Subjective Norm	SubjNorm1	People important to me think I should use the augmented reality feature on the *glasses*	Adapted from McLean and Wilson (2019)	0.848	0.771	0.867	0.684
	SubjNorm2	It is expected that people like me use the augmented reality feature on the *glasses*		0.786			
	SubjNorm3	People I look up to expect me to use the augmented reality feature on the *glasses*		0.847			
AR-Tech complexity	Complex1	Augmented reality glasses have seemed excessively complex	Adapted partially from Vishwakarma et al. (2020)	0.802	0.884	0.914	0.681
	Complex2	The augmented reality glasses seemed very complicated to use		0.884			
	Complex3	Many things had to be learnt before one could use augmented reality glasses		0.861			
Benefit (Perceived Usefulness)	Useful1	By using the AR glasses, I achieved the desired results (in the virtual store)	Adapted from McLean and Wilson (2019)	0.873	0.851	0.929	0.867
	Useful2	By using the AR glasses, I could navigate how I wanted (through the virtual store)		0.909			
	Useful3	Using AR glasses makes it easier to shop		0.953			
Costs (Perceived Difficulty)	Diff1	Learning to use *AR glasses* would be difficult for me	Adapted from Do et al. (2020)	0.870	0.863	0.936	0.879
	Diff2	My interaction with *AR glasses* is not very clear and understandable		0.855			
	Diff3	It would be difficult for me to become skilful at using *AR glasses*		0.939			
	Diff4	I find the AR glasses difficult to use		0.937			
Purchase Intention	PAR1	I plan to use *AR* for *shopping* in the near	Adapted from Vishwakarma et al. (2020)	0.840	0.878	0.925	0.805
	PAR2	I intend to use AR in *shopping* in the future		0.933			
	PAR3	I predict that I will use *AR* technology in the future for *shopping*		0.016			
Perceived Value	PV1	Compared to the *price of AR glasses* I need to pay, it offers better value in *shopping*	Adapted from Vishwakarma et al. (2020)	0.798	0.823	0.895	0.740
	PV2	Compared to the time that I need to spend, the use of *AR glasses for shopping* is worthwhile for me		0.874			
	PV3	Overall, the use of *AR glasses for shopping* delivers better values for me		0.906			
Innovativeness	Innov1	In general, I am among the first in my circle of friends to buy a new high-tech product when it is available	Shalev and Morwitz (2012)	0.919	0.929	0.946	0.778
	Innov2	If I heard that a new high-tech product was available in the market, I would be particularly interested in buying it		0.915			
	Innov3	I am usually one of the first people to become aware of new high-tech products		0.900			
	Innov4	I will buy a new high-tech product even if I have not tried it yet		0.869			
	Innov5	High-tech products are a very important product category for me.		0.803			

TABLE A3 Discriminant validity (Fornell & Larcker, 1981)

Constructs	AR-immersion	AR-subjective norm	AR-tech complexity	Benefit (usefulness)	Cost (difficulty)	Perceived value	Purchase intention	Innovativeness
AR-Immersion	**0.838**							
AR-Subjective norm	0.490	**0.827**						
AR-Tech Complexity	0.512	0.348	**0.825**					
Benefit (Usefulness)	0.222	0.342	0.039	**0.931**				
Cost (Difficulty)	0.177	0.332	0.127	0.762	**0.938**			
Perceived value	0.418	0.416	0.294	0.249	0.210	**0.860**		
Purchase intention	0.418	0.356	0.239	0.229	0.151	0.699	**0.897**	
Innovativeness	0.328	0.294	0.191	0.236	0.245	0.218	0.258	**0.882**

Note: All estimates, except Benefit (Usefulness) → Perceived value (0.102) and Cost (Difficulty) → Perceived value (−0.033), are significant at the 5% level.

A.3. | Preliminary analysis of established value-drivers of ar technology adoption

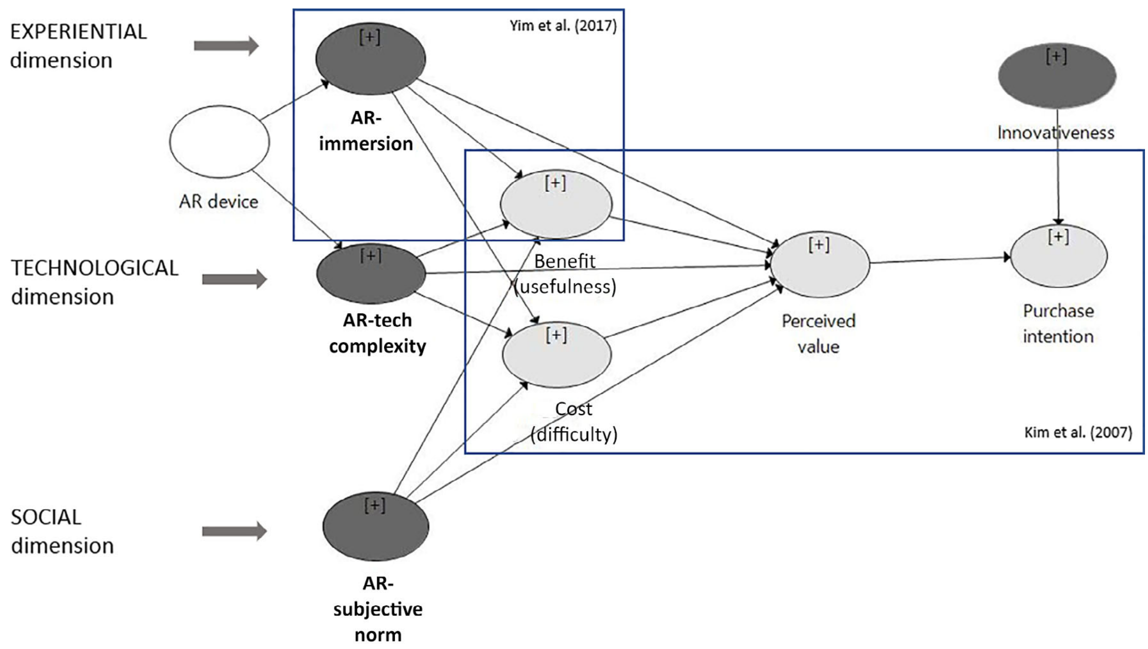


FIGURE A1 From VAM to AVAM: What is known? [Colour figure can be viewed at wileyonlinelibrary.com]

As the benchmark for our model, we set up a baseline VAM model (Kim et al., 2007), considering only two (three) well-established attributes of the economic evaluation of technology adoption, namely usefulness and difficulty, with the following results reporting the R^2 for endogenous variables and the path coefficients on the arrows:

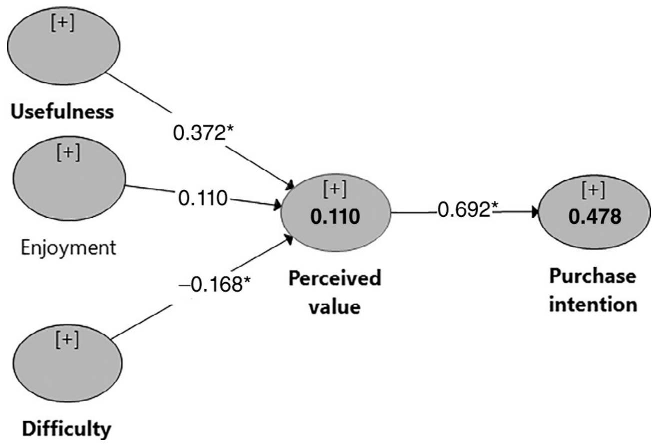


FIGURE A2 Basic VAM - Adaptation of Kim et al. (2007)

Additionally, we replicate the structural relationship established by Yim et al. (2017), based on the sample data used in our paper, reporting the R^2 for endogenous variables and the path coefficients on the arrows:

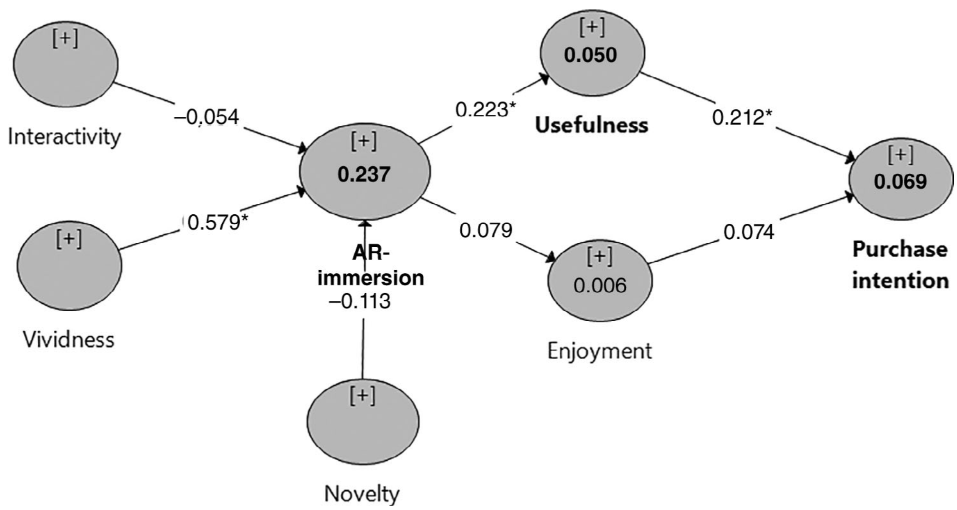


FIGURE A3 The role of immersion - Adaptation of Yim et al. (2017)

A.4. | Avam with estimated path coefficients

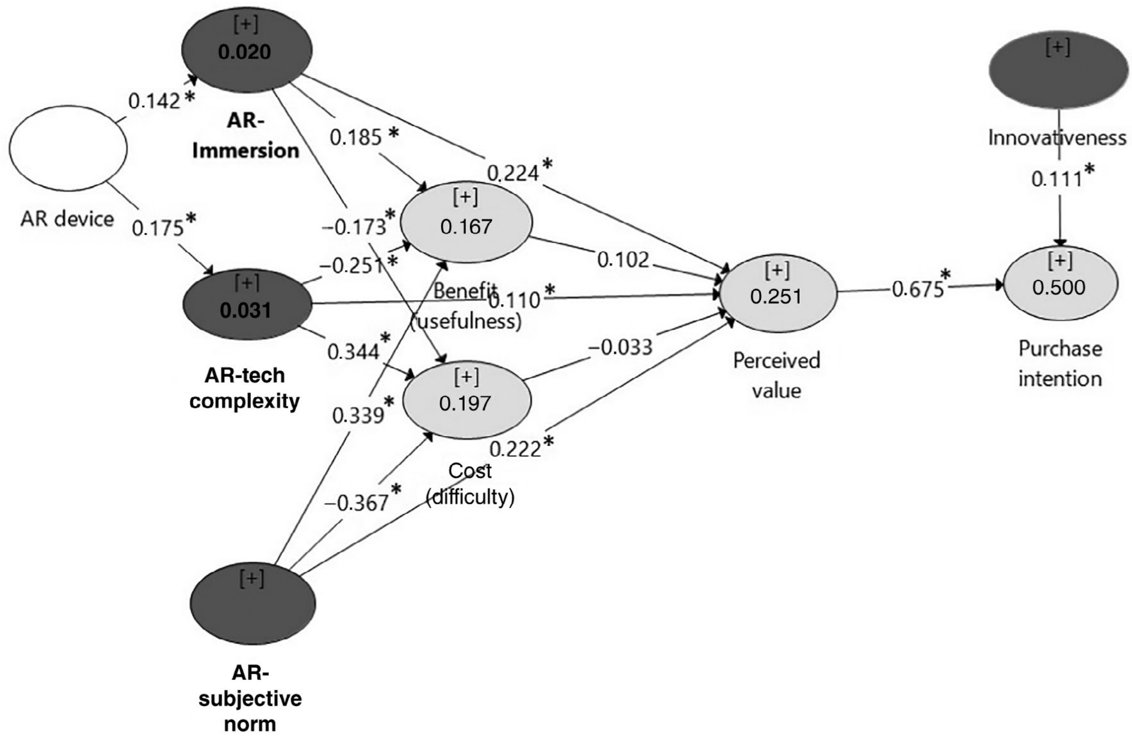


FIGURE A4 AVAM with estimated path coefficients