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Mediating effects of Augmented Reality Shopping Experiences? Immersion, presence and satisfaction

Abstract

Purpose

Augmented Reality (AR) is transforming the business and interactive marketing landscape. This research aims to investigate consumers' degree of involvement and if a feeling of immersion, and presence influences AR shopping satisfaction, comparing high and low immersive AR experiences.

Design/methodology/approach

This paper utilized a quantitative approach. Two studies were carried out: a highly immersive AR experiment with 173 participants; and a low immersive AR experience with 222 participants. Findings were analyzed using PLS-SEM with SmartPLS.

Findings

Results indicate the antecedents of immersion and presence differ when it comes to different immersive AR levels. In a high-immersive AR experience, flow, information seeking and novelty are attributes related to immersion, while enjoyment and personalization are associated to presence. Contrastingly, in a low-immersive experience, only flow is related to immersion. Rather, information seeking, novelty and personalization are related to presence. These results highlight the role of immersion and presence as mediators for AR shopping satisfaction experience.

Originality

This study's originality lies in the use of a rival model for analysis. Findings suggest a contingent perspective of AR experience, depending on high or low-immersion experience, so companies must pay attention for how to measure AR experiences to increase the involvement, and satisfaction.

Keywords: Augmented reality; consumer engagement; customer satisfaction; immersion; presence

Introduction

Traditionally, consumers made purchase decisions in store, however the emergence of engaging digital offerings have shifted the power from traditional brick and mortar stores and marketing concepts, towards consumer and online services (Reinartz *et al.*, 2019). Therefore, it is imperative to understand how the marketing landscape is changing because of digital innovations (Hilken et al., 2018). For example, new technologies enable interactive marketing, which facilitate multi-way communication between buyers and sellers (Lim et al., 2022), to encourage proactive behaviors, interactivity and value creation (Wang, 2021). Augmented Reality (AR) has had a significant impact, changing how consumers interact with, and gather information (Mishra *et al.*, 2021). Considering the disappearance from Gardner's Hype Cycle in 2020, AR is no longer considered a technology to look out for, but one that is well established within various industries and settings. According to Chiang *et al.* (2022), AR has profound impacts on marketing strategies (e.g. products visualization, personalization); reducing the risk of buying online, and Rauschnabel *et al.* (2019) claimed that AR should be an integral part of any marketing campaign.

In recent years, an increasing number of companies have started to engage with AR. For instance, IKEA is using its Place app to allow customers to virtually place furniture in their home. Wanna Kicks enables users to virtually try-on trainers, and make-up brands have developed applications for consumers to experiment with different looks. Such apps have been found to create engaging, immersive and personalized experiences for consumers (Heller *et al.*, 2021). The recent pandemic disrupted the way we shop, experience, and communicate information, which further boosted the effects and enhanced interest in AR (tom Dieck and

Han, 2021). Consequently, and from a practical perspective, exploring how AR applications and its characteristics lead to consumers' satisfaction is a timely and important endeavor.

From a theoretical perspective immersion, users' deep involvement in an activity, and presence, the feeling of being present in a particular place, have gained increasing importance within marketing studies due to their link to immersive technologies (de Ruyter *et al.*, 2020; tom Dieck and Han, 2021). Daasii and Debabbi (2021) suggested for future studies to use experiential methods to explore the effects of immersion on presence. Teng (2010, p. 1553) recommended that future research should explore "individual tendencies to experience presence are related to immersion satisfaction and gamer (or user) loyalty". This was reiterated by Choi *et al.* (2011, p. 150), highlighting a general gap in the literature on the relationship between social presence and satisfaction within the online store environment. Considering the immersive technology and retail and interactive marketing focus of the present study, we respond to the call of further research on the effects of immersion, presence and satisfaction through the development and validation of the I-P-S model (Immersion-Presence-Satisfaction).

This study has a number of contributions. First, it proposes a model by testing the mediating effects of immersion and presence on satisfaction (c.f. Choi *et al.*, 2011; Daasii and Debabbi, 2021). Second, it explores several AR retail-specific external variables and their effects on the proposed mediator variables. Finally, one interesting aspect relates to the degree of immersion and resulting intentions. Peukert *et al.* (2019) found significant differences in VR adoption between highly immersive and low immersive experiences. Cummings and Bailenson (2016) conducted a meta-analysis to explore the optimal level of immersion within immersive environments and found that certain features in virtual environments result in higher degrees of presence. For example, Georgiou and Kyza (2018) reported positive relationships between higher levels of immersion and learning gains, in this way cognitive and domain-specific motivations were found to influence levels of immersion. Regarding the type of AR device

facilitating the experience, head mounted AR devices (e.g., glasses) have been reported to create higher degrees of immersion (Di Serio *et al.*, 2013). However, to date there has been limited research focusing on users' satisfaction according to different AR immersion levels. Therefore, this study uses two conditions in two separate studies to test the influence of high versus low immersion on users' satisfaction (c.f. Gelbrich *et al.*, 2021).

Theoretical background

Presence and immersion within an augmented world

Presence has long been considered one of the key elements of virtual reality (VR) (Tussyadiah *et al.*, 2018). However, there are fundamental differences between VR and AR. Within VR environments, users are completely immersed within the virtual experience (Kim *et al.*, 2021), whereas users engaging with AR experience a hybrid environment as digital information is overlaid onto the real environment (tom Dieck and Han, 2021).

When compared to VR (which creates a strong experience of presence), AR integrates virtual and real elements into the environment to augment the user's perception of their real-world surroundings. Within the VR environment, according to Tussyadiah *et al.* (2018) users feel a strong sense of presence when the technology and physical environment start to disappear from existence; creating the illusion of being in the created environment (Kim *et al.*, 2021). Hence, forgetting about the medium and focusing on the actual experience is considered key to achieve presence. This shares many similarities with presence within AR, whereby the real environment is still visible and due to the realness of the environment, users feel as if they are actually part of the experience. According to Rauschnabel *et al*. (2022), the advancement of AR technologies will bring a stronger degree of local presence to the interactive experience as shown in the XR framework. Tang *et al.* (2004) claimed AR users can perceive the real-world

just as well as when fully immersed in VR, hence presence is a psychological state associated with both mediated and unmediated experiences (e.g. AR). Lavoye et al. (2021) referred to presence as "local presence" within the AR context; while others referred to it as telepresence, spatial presence or co-presence depending on various contexts (Klippel et al., 2020). In the interactive marketing context, Bao and Wang (2021) revealed that social presence is a sense of togetherness and a perception of social contact. Compared to traditional e-commerce platforms, immersive technologies tend to create stronger social connectedness. Recently, there has been research on the effect of social presence on behavioral intentions within the video commerce context (Huang et al., 2022); while Liao et al. (2022) explored the path from immersion to behavioral intentions within the live shopping context. Our study contributes to the interactive marketing literature by specifically exploring the mediating effects of immersion and presence. This is in response to a number of scholars (e.g Muetterlein & Hess, 2017; Witmer & Singer, 1998) who argued that immersion needs to be considered a prerequisite of presence. In addition, this study adds to knowledge within the interactive marketing discipline by focusing on AR.

To achieve presence, involvement and immersion are essential (Witmer and Singer, 1998). In immersive experiences, presence enhances the user's state of reality, increasing their levels of enjoyment, and generating positive consequences such as belief, intention and performance (e.g., Suh and Lee, 2005). In digital marketing, presence is reported to increase advertising effectiveness, improving brand awareness, product knowledge and purchase intention (e.g., Choi *et al.*, 2001). Levels of perceived presence can be determined by involvement, control, quality, realness, spatial presence and how natural the interface is to interact with (Witmer and Singer, 1998). A number of scholars proposed to further explore the mediating effects of immersion and presence within the immersive technology context (c.f. Daasii and Debabbi, 2021).

Hypotheses development

Enjoyment

AR has been found to improve enjoyment of experiences (Marto *et al.*, 2020). Studies have explored perceived and increased enjoyment when using AR in a range of settings, such as retail (Vaidyanathan, 2020), AR games (Qin, 2021), and eCommerce (Yim *et al.*, 2017). Enjoyment can be expressed and experienced in a variety of ways; from feeling impressed, escapism, amusement, overall satisfaction, competence and being in control (Marto *et al.*, 2020; Qin, 2021). The higher levels of enjoyment, the higher reported levels of knowledge, value of the experience and immersion (Marto *et al.*, 2020). In relation to AR, immersion is the extent to which the experience absorbs the user's attention (Yim *et al.*, 2017), whereas enjoyment is the degree to which the use of AR is perceived to be enjoyable, irrespective of the anticipated outcomes of use (Davis *et al.*, 1992).

In a retail context, Viadyanathan (2020) examined how enjoyment, with regards to feelings of entertainment and visual appeal, of AR creates a more complete shopping experience. Concluding that AR enhanced enjoyment of shopping experiences by adding virtual information to real information, thus allowing "users to immerse in an environment to enjoy the setting without having to walk around the store looking for products, pricing and fitting" (Viadyanathan, 2020, p. 31). Comparing web-based and AR apps, Kowalczuk *et al.* (2020, p. 362) found AR outperformed web-based apps, by generating higher levels of immersion and enjoyment. Hence, immersion and enjoyment are considered the most common affective user responses to interactivity facilitated by AR (Kowalczuk *et al.*, 2020) and immersion positively influences enjoyment of AR (Yim *et al.*, 2017). Therefore, we propose:

H1: Enjoyment is positively related to immersion.

Flow Experience

Flow has been commonly referred to the 'optimal' experience, an experience that meets in the middle of challenges and skills. There has been a long debate around the similarities of flow and immersion (c.f. Frochot *et al.*, 2017) and flow and presence (c.f. Weibel *et al.*, 2008). Weibel *et al.* (2008, p. 2278) highlighted that there are differences between the concepts, and that they should not be considered interchangeably as flow "refers to an experience of immersion into a certain activity thus, the concept of flow focuses more on task characteristics, while the concept of presence is more focused on technological characteristics of a medium". In the current study, we propose that the construct of flow focused on the application whereas immersion and presence focused on the characteristics of AR and its ability to lose track of time and being transformed into another environment. We argue that flow experiences occur when online consumers are free from any distraction, which therefore results in an immersion in using the AR experience. We thus hypothesize the following:

H2: Flow is positively related to immersion.

Information Seeking

One of the main advantages of AR is the ability to provide enhanced, contextually relevant information. Hence, "AR has become an important information source that seamlessly combines the real world and the virtual environment" (Park and Stangl, 2020, p. 33). The most common use of AR is to add information related to the real-world environment, or to support a user in performing specific tasks (Han *et al.*, 2013). Much recent AR research has focused on improving situated visualization of information to create enhanced experiences using see-

through AR devices (c.f. Rauschnabel *et al.*, 2019). As well as how to best design AR user interfaces to support information seeking (c.f. Park and Stangl, 2020).

In a recent study, Park and Stangl (2020) examined users' experiences of information seeking with AR apps, proposing that an individual's personality predicts their level of information-seeking. They suggest users' biosocial personality traits, or sensation-seeking which is an individual's attitude toward external information (c.f. Pizam *et al.*, 2004), is a predictor of their information-seeking propensity. In this way, adventurous risk takers are more likely to be high sensation-seekers (Leung and Law, 2010), which also reflects their information seeking perspective, and preference for external stimuli (Lu *et al.*, 2014). Greater effects of consumers' AR information seeking (e.g. the degree of helpfulness and usefulness of the digital information provided in AR) leads to a stronger sense of immersion. Thus, we propose that:

H3: Information seeking is positively associated with immersion.

Personalization

As part of the overall digital transformation agenda, an increasing number of companies and researchers acknowledged the important role of personalization and individualization as part of the value creation process (Reinartz *et al.*, 2019). Tailoring information and content to individuals' needs and preferences has long been discussed as an essential endeavor of profitable interactive marketing campaigns (Rust, 2020). Especially in recent years, the emergence of technology has resulted in the increase of personalization. Social media allowed for tailored strategies, enabling businesses to push relevant and customized information (Lies, 2021). Immersive technologies create even further possibilities, for instance AR content can be triggered in specific locations onto users' direct field of vision. Consequently, personalization will play an even more important role in the future (tom Dieck *et al.*, 2018). In

regard to interactive marketing, Lim et al. (2022) called for further investigation of the use of innovative technologies, such as AR, for personalized experiences enabling marketers to reach specific target users. Within their immersive technology adoption study, tom Dieck *et al.* (2018, p. 6) found "that there should not be a one-fits-all approach to application [and content] design". According to Teng (2010), immersion is mediating the effect of personalization and behavioral intentions within the gaming context. Their study revealed that personalized experiences are extremely important in order to provide users with a sense of immersion, allowing them to escape reality which consequently influences behavioral intentions. The idea of personalizing content for users to be more immersed in an experience has received limited attention in the AR context and therefore, adding to the work of Teng (2010) we are proposing:

H4: Personalization is positively related to immersion.

Novelty

AR has a long history and has been on the 'cusp' of wide scale implementation for some years, however, ARs disappearance from the Hype Cycle perhaps signals that it is no longer regarded as an emerging technology. Nevertheless, use cases and applications of AR are still not commonplace, and thus in many contexts the use of AR is still considered a novelty. For example, in the context of interactive marketing, AR is considered a "new-age technology" providing new ways for marketers to engage and interact, facilitating two-way interaction, customer-generated content and new promotional opportunities (Lim et al., 2022). AR has been used and continues to be used to capitalize on benefits associated with novel experiences. Novelty is associated with something that is new, unfamiliar, different, distinctive and fresh, specifically something with which the user lacks "experience and familiarity" (Forster *et al.*, 2011, p. 384) or that elicits "a sense of uniqueness or originality" (Ang and Low, 2000, p. 837).

"Novelty substantially influences the amount and depth of information processing undertaken by individuals" (Burke and James, 2008, p. 280). In marketing, Feng and Xie (2019) found that novelty of AR was associated with increased short and long-term brand message recall, as well as advert and brand attitude. Yim *et al.* (2017) found a positive relationship between AR novelty and immersion, reporting increased interactivity allowed users to gather more information thus increasing immersion. In this way, AR novelty gains users' full concentration, improving information processing, and engrossing the user which increases immersion in the AR experience (Yim *et al.*, 2017). Hence, we propose:

H5: Novelty is positively associated with immersion.

Immersion, Presence and Satisfaction

According to Cadet and Chanay (2020, p.1), "even if we assume that a clear separation exists between immersion and [sense of presence], there is some experimental evidence showing that users feel more present with a more immersive system". This was confirmed by Peukert *et al.* (2019) within their study on VR shopping experiences. Looking more closely at the definitions of both, presence has been defined as the "Subjective experience of being in one place or environment, even when one is physically situated in another" (Witmer and Singer 1998, p. 225) while immersion refers to the "Psychological state characterized by perceiving oneself to be enveloped by […] an environment that provides a continuous stream of stimuli and experiences" (Witmer and Singer 1988, p. 227). As argued by Cummings and Bailenson (2016) higher degrees of immersion are generally perceived to be linked to a strong feeling of presence. However, according to Wedel *et al.* (2020, p. 458) a high level of immersion does not automatically result in a stronger sense of presence and therefore, more research is needed to explore these effects. Sylaiou *et al.* (2010, p. 246) suggested "the goal of an immersive

simulation is the ability to mislead one's senses, reinforcing illusion of being somewhere other than one's physical location". Concerning the relation of immersion to presence, according to Witmer and Singer (1998), perceived immersion is a prerequisite for the sense of presence and therefore an integral part of it. According to Klippel et al. (2020), immersion can be created through different technologies and its set-ups, while presence is a highly subjective state of feeling of being drawn into experiences. From an interactive marketing perspective, the immersive capabilities of digital experiences are linked to experiencing presence. However, particularly within the AR context, the link between immersion and perceived presence has received limited attention and therefore we propose:

H6: Immersion is positively associated with presence.

Presence was found to be a strong influencer of satisfaction within various contexts. One of the contexts that has mostly focused on the mediating effects of the two variables is education. For instance, Bulu (2012) supported that presence has a strong impact on virtual learning. On the other hand, Tsai *et al.* (2021) explored how social presence communication affects interaction satisfaction within chatbots and interestingly failed to find a direct significant effect, however when mediated through parasocial interaction the effect became significant. This was explained by a need to create an interconnectedness with consumers to foster intimacy for satisfying experiences. However, within the interactive marketing context the effect of presence on satisfaction has received limited attention and according to Choi *et al.* (2011) more research is required to explore the influence. Therefore, we propose:

H7: Presence is positively associated with satisfaction.

Methods

Study 1 – High Immersive Experiments

The first study consisted of highly immersive experiments. This stage of data collection took place from January until April 2021 at a Business School of a UK university using a convenience sampling. There has always been a debate around the value, reliability, and generalizability of student samples. King and He (2006) conducted a meta-analysis of technology adoption studies and found that students are valuable surrogates and represent a population that lies between "normal" users and professionals. The current study focused on the use of AR within the marketing context. We have controlled for previous AR experience to increase robustness of the sample. All students participated voluntarily, and no compensation was provided. The survey was developed based on adapted measurement items from prior studies (see Table 4), measured on a five-point Likert scale from strongly disagree to strongly agree.

Prior to the experiment, participants were instructed to download the AR applications. Participants attended the experiments as part of their taught units. Due to local Covid-19 restrictions experiments were staged online. The researchers provided participants with an introduction and instructions via Microsoft Teams. Experiments lasted about 60 minutes and included an introduction to AR, a description of the various use cases as well as student hands-on experiences with the Ikea Place app (AR furniture viewer), Wanna Kicks (AR shoe try-ons) and Specsavers (AR virtual glasses try-on). Participants explored these applications in their own surroundings allowing 8 minutes for each application. After the AR experiences, participants were asked to complete an online survey via Qualtrics. A total of 175 participants completed the survey, after assessing attention checks, variance and incomplete responses a total of 173 usable data was collected. Data was analyzed through Partial Least Square Structural Equation Modelling (PLS-SEM) with SmartPLS software, and a two steps approach was performed to assess the measurement model then structural model.

The sample has a good distribution in terms of gender – 49.7% male and 50.3% female. An amount of 84.4% of respondents are aged between 18 to 30 years old, 14.5% aged between 31 to 50 years old, and 1.1% 51 or more years old. Further, regarding the education level, 73.4% are undergraduate, 19.1% are postgraduate and 7.5% are MBA students. Finally, 60.7% of them have not had any prior contact with AR technology.

Study 2 – Low-immersive AR videos

For study 2, an online survey was applied whereby participants watched 2D videos of AR experiences as part of the low-immersive experience. To collect data, we used Prolific.co, a professional data collection tool. Consumers over the age of 18 and residents of the UK were chosen as a sample and rewarded for their time spent completing the survey. The use of professional data collection services has been found to provide reliable and valid findings and results (Palan and Schitter, 2018). To ensure data quality, three attention checks were incorporated into the survey. Before starting the same survey as the student sample, participants were shown two 20 second videos of the Wanna Kicks and the IKEA Place app AR experiences. The videos were considered the *low-immersive* experiences within this study. To confirm that participants watched the whole video, they had to answer questions about the content. A total of 252 participants submitted the survey, 222 of which were usable data.

The majority of participants were female (77.0%) and aged in two groups – between 18 to 30 (38.7%) and 31 to 50 years old (52.3%). Interestingly, participants had a good distribution of prior AR experiences (55.0%). Full-time employment (50.5%) was the largest set of the sample, whereas 22.0% indicated being part-time employed, 27.5% were sorted as students, unemployed, housewife/husband, or retired.

Findings

Study 1

Structural Equation Modelling (SEM) approach was adopted to analyze data. Table 1 presents descriptive data, such as mean, standard deviation, and correlation. All relations show a positive correlation and a reasonable variation in the data.

Please insert Table 1 about here

Measurement Model

The measurement model was assessed by four measures: indicator and construct reliability, and convergent and discriminant validity. First, indicator reliability was evaluated by assessing the loading of each item by Confirmatory Factorial Analysis (CFA). We kept items with loadings greater than .70 to maintain increased reliability. Only one item was removed: "It was an unusual experience" (NV4) (loading= .675). Second, construct reliability was assessed through Composite Reliability (CR) and Cronbach's Alpha (α). Current literature recommends both measures greater than .70 for a good consistency of constructs (Hair *et al.*, 2019). As shown in Table 3, while CR ranged from .863 to .938, α reached a range between .787 to .912. These measures suggest a good construct consistency. Third, to establish convergent validity, we considered the Average Variance Extracted (AVE). AVE measures the amount of variance captured in a construct and values higher than .50 indicate a good convergent validity re (e.g., Fornell and Larcker, 1981). Table 2 presents a range of AVE between .614 to .791, which suggests satisfactory AVE. Fourth, we evaluated discriminant validity through the square root of the AVE. Constructs differ from each other when the root of the AVE appears at higher correlation loadings. According to the diagonal in Table 1, there are no concerns related to

construct similarities. If all four measures indicated satisfactory indices, we proceed to the Structural model analysis.

Please insert Table 2 about here

After model purification, we assessed the model fit with the following indicators: Standardized Root Mean Square Residual (SRMR), discrepancy of the squared Euclidean distance (d_ULS) and discrepancy of the geodesic distance (d_G). We did not include the NFI - Normed Fit Index regarding its disadvantage of inflating the indicator in the case of models with large number of parameters, once it does not penalize model complexity. Additionally, the RMS_theta has not been applicable due to the formative characteristic of our model. While the SRMR indicates a good fit when values are below 0.08, d_ULS and d_G must reach an original value lower than the upper level of confidence interval (95%) to indicate a satisfactory fit (Dijkstra and Henseler, 2015). Our model shows a SRMR of .069 (<0.08), d_ULS of 3.530 with upper bound of confidence 21.604 (< bootstrapped HI 95% of d_ULS) and d_G of 1.441 with upper bound of confidence interval of 1.784 (< bootstrapped HI 95% of d_G). These present a satisfactory model fit and no concerns were raised.

Structural Equation Modelling

As shown in Table 3, we found support to accept hypothesis H2: "Flow is positively related to immersion" (load= .592, p-value=.001), H3: "Information seeking is positively associated with immersion" (load= .164 p-value=.041), H5: "Novelty is positively associated with immersion" (load= .144, p-value=.031), H6: "Immersion is positively associated with presence" (load= .694, p-value=.001), H7: "Presence is positively associated with satisfaction" (load= .632, p-value=.001). However, we did not find support to confirm hypothesis H1: "Enjoyment is

positively related to immersion" (load= -.046, p-value=.653) and H4: "Personalization is positively related to immersion" (load= -.027, p-value=.714).

Please insert Table 3 about here

We ran a rival model to explore the relationships not supported (H1 and H4). As suggested by prior literature, enjoyment and personalization are directly related to presence (Marto *et al.*, 2020), and there has been an open call for further research on the antecedents of presence (Wedel *et al.*, 2020). In the rival mode, we found significant effects when considering Enjoyment and Personalization being directly related to Presence (see Table 4).

Please insert Table 4 about here

Please insert Figure 1 about here

Study 2

The second study explores the low-immersive sample. As shown in Table 5, we found support to accept hypothesis H2: "Flow is positively related to immersion" (load= .602, p-value=.000), H6: "Immersion is positively associated with presence" (load= .640, p-value=.000), H7: "Presence is positively associated with satisfaction" (load= .660, p-value=.000). However, we did not find support to confirm hypothesis H1: "Enjoyment is positively related to immersion" (load= .073, p-value=.303), H3: "Information seeking is positively associated with immersion" (load= .079 p-value=.186), H4: "Personalization is positively related to immersion" (load= -.028, p-value=.709), and H5: "Novelty is positively associated with immersion" (load= .107, p-value=.072).

Please insert Table 5 about here

Also, within study 2, we ran a rival model to explore the not supported relationships (H1, H3, H4 and H5). As suggested by Marto *et al.* (2020) enjoyment and personalization are directly related to presence and Wedel *et al.* (2020) point out an open call for further research on the antecedents of presence. Also, enjoyment experience is directly associated to overall satisfaction within the use of AR (Marto *et al.*, 2020; Qin, 2021). Based on that, we tested these additional relations through a rival model. As presented in Table 5, Information seeking, Personalization and Novelty are positively related to Presence. Further, Enjoyment is associated with Satisfaction. The model fit indicators of rival model appear satisfactory, so it provides statistical support to accept the rival model (as shown in Fig.2) rather than the original model.

Please insert Figure 2 about here

Figure 3 provides an overview of the differences in terms of relationships between the high and low immersive AR experiences.

Please insert Figure 3 here

Discussion and Conclusion

AR is becoming increasingly popular as an interactive tool for consumers to gather information, experience products, and share experiences. As such it has most certainly earned its label as one of the most disruptive technologies of modern society (Rauschnabel, 2021). This paper has conceptualized and discussed the importance of immersion, presence and satisfaction as part of the AR experience. However, the conceptualized relationships could not be entirely supported. In both studies (low and high immersive experience) we confirmed that

rival models were more appropriate than the proposed model, a crucial finding of our study. To date, there has been limited acknowledgement within previous research that a rival model is actually more powerful and robust (c.f. Sandvik and Sandvik, 2003). We claim that research, especially in a fast-paced discipline such as immersive technology, is diverse and unpredictable. As a result, research needs to be adaptable to account for unforeseen circumstances and changes in conceptualizations. In our case, the effects were different than initially conceptualized and called for by previous researchers (e.g. Choi *et al.*, 2011; Daasii and Debabbi, 2021). For instance, using the rival model, this study confirmed the validity of the proposed effects; however, it also proved that personalization and enjoyment directly affect presence, instead of immersion as originally proposed (c.f. Choi *et al.*, 2011; Daasii and Debabbi, 2021). An interesting finding that builds on Qin (2021) reporting that enjoyment is related to need-satisfaction, and goes some way toward answering the call by Wedel *et al.* (2020) for more research on this.

Within the low immersive AR experience, information seeking, novelty and personalization were mediated by presence instead of immersion, while enjoyment is directly related to satisfaction (c.f. 2001; Marto *et al.*, 2020; Qin, 2021). This finding is not surprising considering that participants watched a 2D video of an AR experience and therefore, immersion (the sense of losing track of time, full involvement and unawareness of surrounding) seems to play a less important role as part of the model due to the static experience. Interestingly, presence was found to be an important part of the low-immersive experience model, demonstrating that static 2D videos of AR experiences can still results in a feeling of being drawn, being there and able to manipulate objects as part of the experience. This provides interesting food for thought for marketing who might be able to use low-immersive AR experiences that can be portrayed on consumers devices without the need to download applications to promote products and services. Ultimately, the main takeaway for companies is that they must measure their

customers' AR experiences to increase involvement and satisfaction. The academic evidence base presented, combined with the empirical research and resultant analysis and discussion makes a theoretical contribution, and perhaps more usefully for practitioners, has a number of defined practical implications. We present these in the subsections below to showcase them directly.

Theoretical contributions

This research has several specific theoretical implications: I) It is the first to propose the developed I-P-S model, specifically applying it to the context of AR within the marketing context; II) The strength of the I-P-S model was confirmed through the evaluation of the proposed and rival models; III) Also, although AR was removed from the recent Gartner' Hype Cycle, our study revealed that AR's perceived novelty is still an important external factor influencing behavioral intentions within the marketing context. Therefore, researchers should not be discouraged to implement novelty into their theoretical framework as users' actual AR adoption is still influenced by the newness and hype factors of AR; IV) We believe research should be more forthcoming. As shown in our study, there is a need for rival models as often our data fails to prove existing hypotheses. In our case, the effects were different than conceptualized based on previous research. Therefore, the approach and acceptance of a rival model should be an accepted and useful approach.

Regarding future theoretical development: V) Immersion was always found to be one of the most important mediators within the AR environment (e.g. tom Dieck *et al.*, 2021; Wedel *et al.*, 2020). So, what could be the reasons for the lack of mediating effect of immersion in both the highly immersive and low immersive study? Perhaps it is the very nature of mobile AR in general, whilst it is both enjoyable and interesting it is not particularly immersive (as the wider

environment does tend to encroach). How might this change going forward? Current predictions suggest that smart glasses will result in stronger immersive experiences and possibly then we will see the difference between so-called high versus low immersive experience.

Practical implications

This study has a number of practical implications: I) First and most important, it highlights the strength of immersion and presence as part of AR experiences, leading to satisfaction. Businesses therefore need to design their AR marketing campaigns with a focus on creating fully engaging and involving experiences that allow users to lose track of time, while creating a feeling of being present in the actual AR environment. Distractions from the actual content should be minimal in order to achieve this goal which has important implications for app design and curation in particular; II) This study has also shown the reasons why users engage with AR for shopping experiences in the first place. Personalized experiences, information seeking, enjoyment, novelty and having a sense of flow were all found to influence the AR experience as external dimensions. Industry and in particular marketing managers and app designers/developers should integrate these findings into their AR strategies in order to develop and implement applications that lead to users' satisfaction; III) With specific regard to level of immersion, Cummings and Bailenson (2016), Georgiou and Kyza (2018) and Peukert *et al.* (2019) have conducted some impressive work, our practical findings take this further by clearly establishing that flow, information seeking, and presence have a very direct impact on perception of immersion, and interestingly enjoyment and personalization appear to have less effect.

Limitations and Future Research

As with every study, our research has a number of limitations. First, as discussed thoroughly during the methods section, this study used a student sample as part of the experimental stage of this study. To overcome this limitation, a second stage of data collection was conducted. Second, the external variables chosen as part of this study were identified from previous literature within the digital marketing and business field. Further research is advised to conduct a mixed methods study in order to identify context-specific variables before validating the model using a quantitative approach. This study used a convenience sampling and therefore an empirical replication with a different sample is required to confirm the generalizability of our findings. Geographical restriction might be an issue as the data was collected solely in the UK, limiting generalizability to other countries and cultures. Incorporating cultural dimensions could be an avenue of future research to account for this limitation. Finally, this study focused on AR. Future research could compare the levels of immersion from a virtual reality/metaverse experience with that of the AR experience to explore if a strong difference in level of immersion influences the proposed model. All of this will be important in the future of the metaverse which brings a lot of opportunities for the creation of escaping, immersive experiences. Selling products and services will most likely be influenced by factors such as flow, enjoyment, personalization, and we advise future research to explore the IPS model and corresponding factors within the metaverse context.

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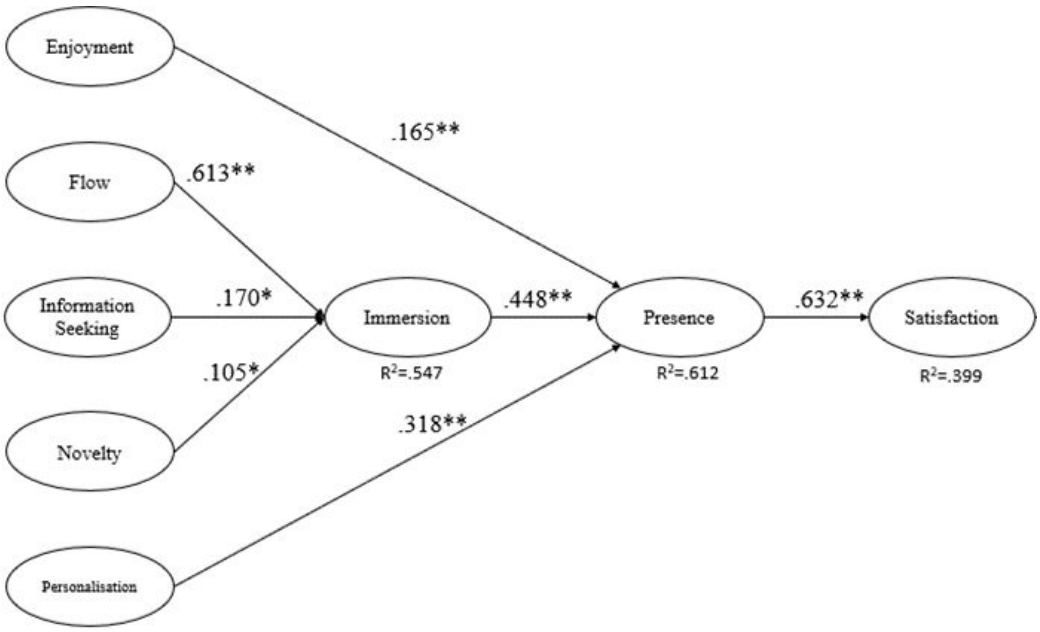
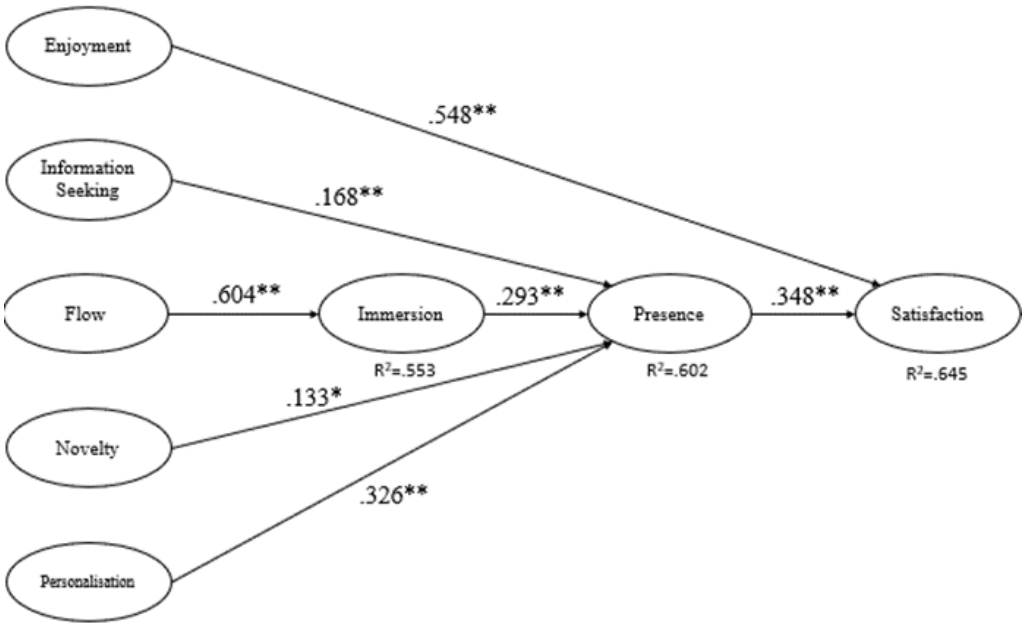
Figure 1: Accepted rival model for high-immersive experience



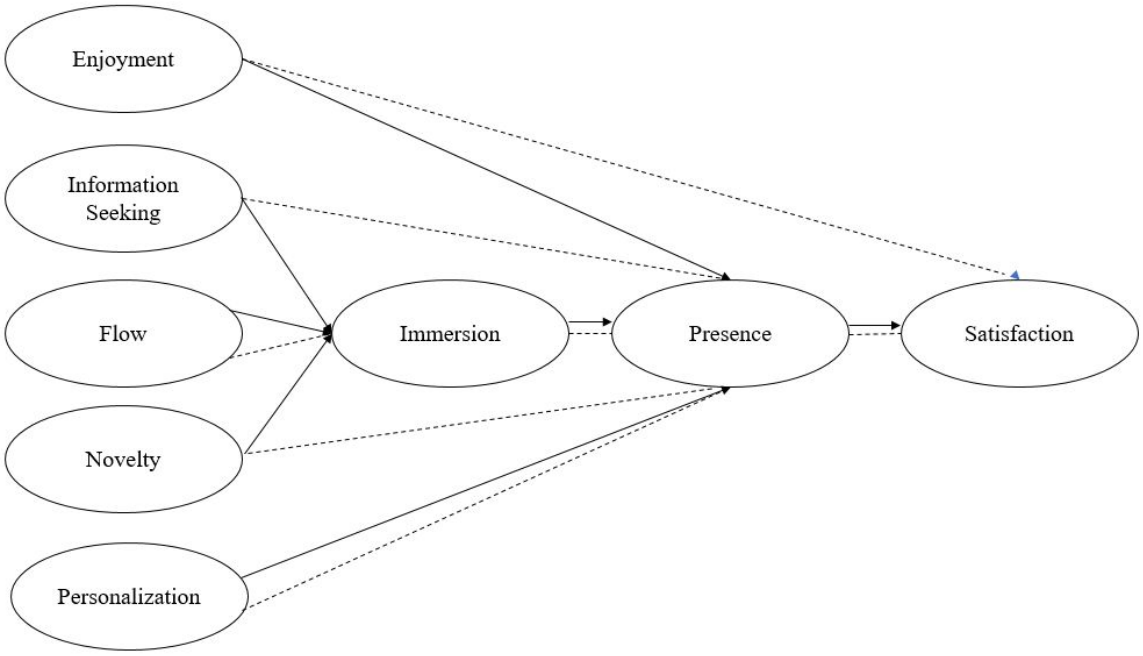
**p-value < 0.01, *p-value < 0.05.
Model fit: SRMR=.067 (<.08), d_ULS= 3.199 (< bootstrapped HI 95% of d_ULS= 12.244), d_G= 1.367 (< bootstrapped HI 95% of d_G= 1.602).
Source: Research Data (2022)

Figure 2: Accepted rival model for low-immersive experience



**p-value < 0.01, *p-value < 0.05.
Model fit: SRMR=.075 (<.08), d_ULS= 4.002 (< bootstrapped HI 95% of d_ULS= 6.441), d_G= 1.220 (< bootstrapped HI 95% of d_G= 1.361).
Source: Research Data (2022)

Figure 3: Model comparison



Note: Solid lines – High immersive experience; dotted lines - - Low immersive experience

Table 1. Descriptive data

	Mean	SD	ENJ	FLW	IMM	IFSK	NOV	PER	PRE	SAT
ENJ	4.286	0.781	*.890*							
FLW	3.880	1.001	.682	*.821*						
IMM	3.127	1.245	.511	.721	*.867*					
IFSK	4.084	0.833	.634	.573	.526	*.851*				
NOV	3.857	1.068	.466	.585	.516	.515	*.842*			
PER	3.814	0.959	.610	.652	.504	.666	.453	*.838*		
PRE	3.446	1.298	.567	.671	.694	.554	.546	.621	*.806*	
SAT	3.882	0.917	.682	.563	.523	.722	.489	.700	.623	*.871*

Label: ENJ - Enjoyment, FLW - Flow, IMM - Perceived Immersion, IFSK - Information Seeking, NOV - Novelty, PER - Personalisation, PRE - Presence, SAT - Satisfaction. The square root of AVE is presented at diagonal.
Source: Research data (2022)

Table 2. Indicators, Measures and References

Construct / Indicator	Load[1]	AVE[2]	CR[3]	α[4]	References[5]
Enjoyment		.791	.938	.912	Yim et al. (2017), Marto et al. (2020), Qin (2021)
The AR experiences were fun (EJ1)	.864				
The AR experiences were pleasant (EJ2)	.876				
The AR experiences were enjoyable (EJ3)	.911				
The AR experiences were exciting (EJ4)	.906				
Flow		.674	.892	.841	Rauschnabel et al. (2017)
While experiencing the AR applications, I experienced a "flow" (FL1)	.847				
When experiencing the AR applications, my attention was totally focused (FL2)	.870				
Experiencing the AR applications excited my curiosity (FL3)	.768				
Experiencing the AR applications was intrinsically interesting (FL4)	.794				
Information seeking		.725	.913	.875	Park and Stangl (2020),
The AR experiences were useful to get information about products or services (IS1)	.800				
The AR experiences were useful to get information I didn't know before (IS2)	.870				
The AR experiences were useful to learn about things related to my interests (IS3)	.852				
I think the information obtained from the AR experiences is helpful (IS3)	.881				
Personalization (Trying glasses/furniture/shoes/ different learning opportunities in the apps…)		.703	.904	.859	tom Dieck et al. (2018)
Was tailored to my situation (PE1)					
Felt like a personal experience (PE2)	.834				
Matched my needs (PE3)	.822				
Was personally relevant to me (PE4)	.864				
	.833				
Novelty (Thinking about the AR applications you just experienced…)		.614	.863	.787	Yim et al. (2017)
It was a new experience for me (NV1)	.735				
It was a unique experience (NV2)	.865				
It was a different experience (NV3)	.843				
It was an unusual experience (NV4) - excluded	.675				
Perceived Immersion		.751	.924	.890	Yim et al. (2017)
I was completely immersed in the AR experiences (IM1)	.845				
I lost track of time while using the AR applications (IM2)	.866				
I became very involved in the AR applications forgetting about other things (IM3)	.904				
I became unaware of my surroundings while experiencing AR (IM4)	.850				
Presence		.618	.906	.876	Qin (2021)
I felt like I was actually there in the AR environment (PR1)	.823				
It was as though my true location had shifted into the AR environment (PR2)	.759				

The objects in AR gave me the feeling that I could do things with them (PR3)	.819				
It seemed to me that I could do whatever I wanted in the AR environment (PR4)	.797				
I felt 'drawn in' to the experience (PR5)	.789				
I felt I could move or manipulate objects in the environment (PR6)	.725				
Satisfaction		.759	.926	.894	Jung et al. (2018)
I feel satisfied with the AR experiences provided (SAT1)	.912				
I feel contend with the experiences provided by the AR applications (SAT2)	.894				
I like the experiences provided by the AR applications (SAT3)	.841				
The AR experiences were exactly what I needed (SAT4)	.835				

[1] Standardised loading, [2] Average Variance Extracted, [3] Composite Reliability, [4] Cronbach's Alpha, [5]Scale adapted from these references.
Source: Research data (2022)

Table 3. Causal effect and hypothesis test

Relationships	Coefficient	P-value	Hypothesis support	adjusted R^2
H1. Enjoyment > Immersion	-.046	.653	No	.552
H2. Flow > Immersion	.592	.001	Yes	
H3. Information seeking > Immersion	.164	.041	Yes	
H4. Personalisation > Immersion	-.027	.714	No	
H5. Novelty > Immersion	.144	.031	Yes	
H6. Immersion > Presence	.694	.001	Yes	.482
H7. Presence > Satisfaction	.632	.001	Yes	.399

Source: Research data (2022)

Table 4. Rival model comparison

	Original Model[1]			Rival model[2]		
Relationships	Coef.	P-value	adj. R^2	Coef.	P-value	adj. R^2
H1. Enjoyment > Immersion	-.046	.653	.552	-.048	.610	.547
H2. Flow > Immersion	.592	.001		.613	.001	
H3. Information seeking > Immersion	.164	.041		.170	.032	
H4. Personalisation > Immersion	-.027	.714		-0.028	.711	
H5. Novelty > Immersion	.144	.031		.105	.102	
H6. Immersion > Presence	.694	.001	.482	.448	.001	.612
Enjoyment > Presence	**-**	**-**		**.165**	**.010**	
Personalisation > Presence	**-**	**-**		**.318**	**.001**	
H7. Presence > Satisfaction	.632	.001	.399	.632	.000	.399

Source: Research data (2022)

[1]Original model fit: SRMR=.069 (<.08), d_ULS= 3.530 (< bootstrapped HI 95% of d_ULS= 21.604), d_G= 1.441 (< bootstrapped HI 95% of d_G= 1.784).

[2]Rival model fit: SRMR=.067 (<.08), d_ULS= 3.199 (< bootstrapped HI 95% of d_ULS= 12.244), d_G= 1.367 (< bootstrapped HI 95% of d_G= 1.602).

Table 5. Causal effect, hypothesis test and rival model comparison

	Original Model[1]				Rival model[2]		
Relationships	Coef.	P-value	Hypothesis Support	adj. R^2	Coef.	P-value	adj. R^2
H1. Enjoyment > Immersion	.073	.303	No	.553	.073	.288	.553
H2. Flow > Immersion	.602	.000	Yes		.604	.000	
H3. Information seeking > Immersion	.079	.186	No		.077	.180	
H4. Personalisation > Immersion	-.028	.709	No		-.032	.680	
H5. Novelty > Immersion	.107	.072	No		.107	.059	
H6. Immersion > Presence	.640	.000	Yes	.409	.293	.001	.602
Enjoyment > Presence	**-**	**-**	**NA**		**.090**	**.143**	
Information Seeking > Presence	**-**	**-**	**NA**		**.168**	**.003**	
Personalisation > Presence	**-**	**-**	**NA**		**.326**	**.000**	
Novelty > Presence	**-**	**-**	**NA**		**.133**	**.019**	
Enjoyment > Satisfaction	**-**	**-**	**NA**		**.548**	**.000**	
H7. Presence > Satisfaction	.660	.000	Yes	.436	.348	.000	.645

Source: Research data (2022)

[1]Original model fit: SRMR=.075 (<.08), d_ULS= 3.760 (< bootstrapped HI 95% of d_ULS= 23.363), d_G= 1.159 (< bootstrapped HI 95% of d_G= 1.576).

[2]Rival model fit: SRMR=.075 (<.08), d_ULS= 4.002 (< bootstrapped HI 95% of d_ULS= 6.441), d_G= 1.220 (< bootstrapped HI 95% of d_G= 1.361).