

Evaluating the Effects of Augmented Reality Experience on Mobile Commerce

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Abstract

The use of augmented reality, which allows for a closer relationship between products and their consumers, can have a strong impact on the retail sector, particularly with the increase in online shopping due to the COVID-19 pandemic. Thus, this research seeks to analyze the impact of augmented reality experiences in mobile shopping environments on consumer purchase intentions. The model was tested using structural equations with a sample of 201 consumers who had tried an augmented reality application before responding to the survey. Results indicate that choice confidence and positive emotions mediate the impacts of the augmented reality experience on the consumer's purchase intention.

Keywords: Augmented Reality, Mobile Devices, User Experience, Mobile Commerce

1. Introduction

Augmented Reality (AR) is a technology that combines real objects with virtual objects in a real environment (Azuma et al., 2001). The AR shopping environment and experience allow consumers to perceive visual pleasure combined with sensory stimulation in a more direct and immediate way, making AR a persuasive technology, capable of forming, delivering, and influencing experiential value. It is estimated that the retail sector will be one of the most impacted by this technology, as companies are increasingly concerned with creating memorable experiences for their customers, aiming to strengthen their brands and earn their loyalty, expanding possibilities and the challenges of designing increasingly engaging and pleasurable marketing experiences for consumers.

Pantelimon et al. (2020) state that the Covid-19 pandemic caused significant changes in people's daily lives, such as the fact that people started shopping online instead of the traditional physical stores. This increase in online purchases, combined with the momentary impossibility of physically trying products, represents a huge incentive for companies to invest in virtual experimentation with AR to improve their consumers' shopping experiences.

Even so, academic studies on the use of AR in experiential marketing are still scarce. Huang and Liao (2015) point to gaps in research that address consumer reactions to this technology and Dacko (2017) indicates that the potential of AR in mobile online retail has been little explored. Given these gaps, the aim of this study is to investigate how the use of Augmented

Reality, in terms of consumer experience, affects purchase intention in online mobile retail. For this, we evaluate how the effects of the AR experience, mediated by consumer evaluation factors established after the experience (such as choice confidence and positive emotions), affect purchase intention in mobile online retail.

2. Theoretical background

The use of AR technology in retail experiences can influence consumers in their purchase decision by presenting additional information about products (Hilken et al., 2017). While the original use of this technology in retail was restricted to virtual fitting rooms on websites that overlapped virtual clothes and shoes (Poncin & Mimoun, 2014), recently, the use of AR occurs more frequently on mobile devices (Hilken et al., 2017; Poushneh & Vasquez-Parraga, 2017; Yim et al., 2017).

An important benefit of mobile devices has been the introduction of AR to the mass market. Mobile Augmented Reality (MAR) technology is enabled by media devices that combine camera, screen, location, accelerometer and compass, image recognition capability and internet access, allowing for new means of interaction between user and system (Azuma et al., 2001). For retailers, the success of Mobile Augmented Reality will depend on the value that this technology will add to their business. Dacko (2017) found, in his review of the literature on Mobile Augmented Reality applications for shopping, evidence of the potential benefits that these applications can bring to value creation for both retailers and customers.

To better explain the concept of User Experience, Poushneh and Vasquez-Parraga (2017) based their concept on the premise that User Experience is an internal state of the individual in which the characteristics of the experienced product and its context of use can be perceived. Users' internal states, along with perceived utilitarian and hedonic values, are pointed out as drivers of consumers' attitudes and reactions towards AR (Hilken et al., 2017; Yim et al., 2017).

The Constituents and Consequences of Smart Customer Experience in Retailing study by Roy et al. (2017) jointly evaluated several smart retail technologies, among them, AR. According to the study, Smart Retail Technologies can present different results when studied separately. Their model examined the consumer experience and its outcomes for smart technology, consumer, and retailer. This work presented an original construct called Smart Customer Experience, which portrays the core of the intelligent customer experience and is formed by the following dimensions: relative advantage, perceived control, perceived interactivity, perceived enjoyment, and personalization.

The model proposed here uses a modification of the Smart Customer Experience construct called Augmented Reality Experience. As this study evaluates a specific technology, AR, the Interactivity dimension of the Smart Customer Experience construct was replaced by the Perceived Augmented Reality dimension. This dimension was also used as a construct by Poushneh and Vasquez-Parraga (2017), in their studies on the consumer experience with AR. The Augmented Reality Experience encompasses a set of dimensions that assess the aspects perceived by the consumer about AR that may affect the purchase intention.

Choice confidence during the purchase process determines how confident an individual feels regarding his choice of a product. The inclusion of virtual information via AR in the retail context has been pointed out in several studies as a factor that can reduce uncertainty about a potential purchase (Poushneh and Vasquez-Parraga, 2017; Yim et al., 2017).

Thus, it becomes important to investigate whether the reduction of uncertainty made possible by the AR experience could increase consumer confidence in choosing a product since such certainty can be reinforced by additional information that would help individuals to differentiate the available alternatives. Therefore, the following hypothesis was formulated:

H1: The Augmented Reality Experience has a direct and positive effect on the consumer's perceived choice confidence during online retail purchases via mobile devices.

According to Yim et al. (2017), in a stage prior to purchase, AR's function is to attract attention or stimulate curiosity, arousing consumers' interest in experimentation. Therefore, it becomes relevant to study the relationship between the confidence obtained by virtual experimentation before purchasing the product and the intention to visit virtual retail stores to make the purchase. Based on these premises, the following hypothesis was formulated:

H3: Perceived choice confidence has a direct and positive effect on the purchase intention in online retail purchases via mobile devices.

AR online shopping experiences surpass current online service experiences, as they enable virtual product experimentation. This experimentation enables perceptions of utilitarian and hedonic value, offering customers a sense of comfort at a fundamental stage of decision making (Hilken et al., 2017). Companies strive to design purchase environments that produce specific emotional effects on the buyer and that lead to increased purchase intention (Poncin & Mimoun, 2014).

Mobile Augmented Reality has great potential to facilitate the online experience and generate positive emotions in users (Olsson et al., 2013). According to Noordin et al. (2017), the implementation of experiences with virtual fitting rooms should aim at the emotional involvement of consumers in the shopping experience. Considering this information, the following hypothesis was formulated:

H2: The Augmented Reality Experience has a direct and positive effect on the positive emotions perceived by the consumer during the online retail purchase via mobile device.

Poncin and Mimoun (2014) observed the mediating role of positive emotions between the atmosphere in the retail setting and purchase in an AR experiential event. In several studies on online purchasing of products, it was identified that emotions are important factors involved in the decision-making process of customers (Noordin et al., 2017). Previous research on AR recognizes that emotions positively influence future purchases (Brito et al., 2018; Poncin & Mimoun, 2014). Given this, the following hypothesis was formulated:

H4: Positive emotion has a direct and positive effect on purchase intention in online retail purchases via mobile devices.

This research evaluated the customer's intent to purchase online via mobile device using the Purchase Intention construct. This construct is frequently adopted in other studies with similar objectives (Merle et al., 2012; Yim et al., 2017).

3. Methodology

Data collection for the present study was carried out between June and August 2019. For data collection, individual and group meetings were organized, inside and outside universities, to experiment with the chosen augmented reality application and fill out the questionnaire. The application trials were carried out individually and all respondents received guidance and were monitored during it. The application chosen was Ray-Ban Virtual Try-On, then available for mobile devices. Several AR studies had made use of this application (Poushneh

& Vasquez-Parraga, 2017). After experimenting with the Mobile Augmented Reality app, participants were asked to fill in the survey questionnaire.

The final questionnaire contained 52 items representing the constructs present in the proposed model: Choice Confidence (3 items, Zhu et al., 2018), Positive Emotions (8 items, Brito et al., 2018), Purchase Intention (3 items, Merle et al., 2012) and Augmented Reality Experience (total sum of dimensions – 19 items), which is formed by the following dimensions: Perceived Augmented Reality (5 items, Rese et al., 2017), Perceived Control (3 items, Roy et al., 2017), Perceived Enjoyment (3 items, Roy et al., 2017), Relative Advantage (4 items, Roy et al., 2017) and Personalization (4 items, Roy et al., 2017). In addition to the construct items, 5 sample characterization items (knowledge and use of AR and online shopping habits) and 5 demographic items (gender, age, marital status, family income and education) were added. A pre-test with a sample of 12 respondents served to assess respondents' understanding of the questions, allowing adjustments to be made before conducting the field research.

The sample of 201 respondents revealed that 60% of respondents had no prior knowledge of Augmented Reality and that 71% had not used applications with this feature before. Furthermore, 65% said they are in the habit of shopping online through mobile apps. The mean age was 34.2 years with a standard deviation of 1.04. This study uses structural equation modeling (AMOS 22) to evaluate scales and carry out the hypothesis test.

The final measurement model showed adequate validity and reliability (Byrne, 2013) for all scales (SRMR= 0.064; RMSEA = 0.061 with I.C. from 0.054 to 0.069; CFI = 0.92; IFI = 0.92; TLI = 0.91; $\chi^2 = 729.320$, d.f. = 416, $p < 0.001$, $\chi^2/\text{d.f.} = 1.753$), with CRs and Cronbach's Alphas above 0.82, AVEs above 0.60 and AVEs greater than shared variances (Byrne, 2013). Finally, the correlation matrix showed consistency with what was proposed by the theory. Furthermore, the structural model also showed adequate fit indices (Byrne, 2013) with $\chi^2 = 568,388$; d.f. = 340, $p\text{-value} < 0.001$, $\chi^2/\text{d.f.} = 1.672$, CFI = 0.93, TLI = 0.92, IFI = 0.93, RMSEA = 0.058 (C.I. from 0.050 to 0.066) and SRMR = 0.0631. Figure 1 shows the relationships analyzed, their coefficients and significance levels found.

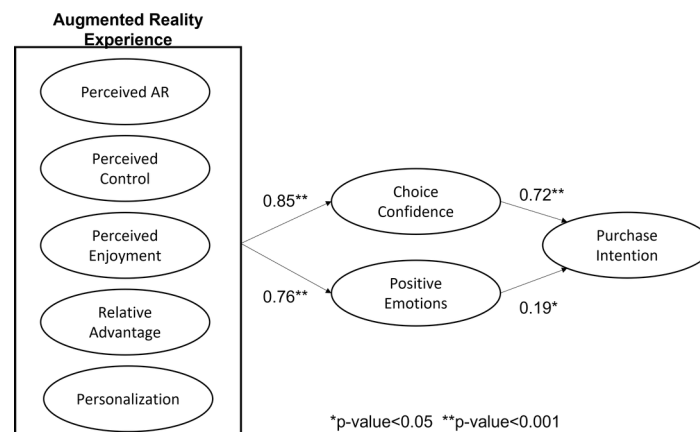


Figure 1. Proposed Model and Estimated Coefficients

4. Discussion and conclusions

The results indicate that after an Augmented Reality Experience, the individual is better able to assess the benefits and importance of using a product during the online purchase decision process. Consumers, when experiencing the product virtually using AR, had greater certainty in choosing the product (Porter & Heppelmann, 2017), reaching the goal of evaluating a

cognitive aspect of the purchase decision-making process, and feeling excited, stimulated, and excited with the experience (Olsson et al., 2013), also reaching the defined objective of evaluating affective aspects present in the purchase journey. Therefore, this research suggests that affective and cognitive aspects of the use of AR in online retail applications via a mobile device can motivate purchase, with the cognitive consideration Certainty in Choice being the most dominant for consumers (Dacko, 2017; Olsson et al., 2013; Brito et al., 2018).

For managerial implications, the results indicate that the Augmented Reality Experience is a strong antecedent of the consumers' positive evaluation of a product, influencing their purchase intention. The creation of pleasurable AR experiences can contribute to good results in experiential marketing, improving the quality of consumer shopping experiences and stimulating purchases. Thus, AR technology is a resource of great value in the composition of marketing strategies to be adopted for online retail. Regarding the construction of applications using Augmented Reality, companies must explore the sensory and visual stimuli offered by technology to enhance shopping contexts, making them more engaging. As virtual experimentation can create a familiarity with the product, which can have a persuasive effect and a motivation for the consumer in the predisposition to purchase, this technology can be a powerful and differentiated resource for retailers.

The study, however, has limitations. Choosing a single application limits the generalization of the results obtained. As this technology is new and several participants had not yet used this type of application, it is possible that the results using other types of AR applications will be different. In addition, the time available for participants to experiment may not have been enough, hampering their responses.

As a suggestion for future studies, other AR applications linked to online retail could be tested, the model could be tested with older or younger audiences, and new constructs that evaluate other aspects relevant to the purchase decision process, such as risk perception or the convenience of purchase, could be added. Finally, issues related to security and privacy could be examined in future studies, given the fear and uncertainties that consumers may feel regarding the technology to scan their faces and bodies.

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