

## **The Impact of Augmented Reality Shopping Applications on Consumers' Purchase Intention in Saudi Arabia**

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*Abstract.* This study aims to investigate the effect of augmented reality (AR) use on Saudis' purchase intentions in online shopping. Specifically, the study investigated the impact of consumer engagement and experience using AR on purchasing intent among online shoppers in Saudi Arabia. The quantitative research method was adopted. A survey questionnaire was developed comprising measurements of the variables of this study - perceived value, purchase intention, hedonic and cognitive experience, and perceived interactivity. 397 online shoppers who have experience using AR apps in online shopping were involved in the study. The findings indicated that customer-perceived value and perceived interactivity have a significant positive relationship with user experience. In addition, customer perceived value and perceived interactivity have a significant relationship with intentions to purchase. User experiences (UX), both hedonic and cognitive experience, were also found to have a significant relationship with purchase intentions. In addition, two demographic factors, age and gender, were found to affect purchase intention significantly. The study's findings help bridge the gap in the literature concerning the use of AR applications in online shopping activities within Saudi Arabia by exploring the effect of various factors derived from the use of AR applications on the purchase intentions of online shoppers.

*Keywords:* Augmented reality, online shopping, Saudi customer experience, hedonic and cognitive experience.

### **Introduction**

The ever-advancing field of technology has significantly impacted the company's marketing function. Marketing innovation technologies are impacting the world and reshaping customer needs. Consumers demand more than the product or service, with most looking forward to enjoying an excellent customer experience while making the purchases (Ahmed et al., 2019). The customer experience enhances the perceived value of the purchased product in the consumer's mind (Ahmad et al., 2020). Augmented Reality (AR) and Virtual Reality (VR) constitute some of the current technological advancements creating waves in the marketing domain. Marketers are applying them in innovative ways in their advertising efforts to create a superior customer experience for their clients (Tsai, 2020). Currently, AR is one of the most applied marketing technological innovations, as it has proven useful in creating a fascinating experience for the audience. The use of screens and projectors adds virtual nature in a real-life environment, visually altering the real-time environment (Qin et al., 2021). The application of AR forms a holistic experience for the customer.

While AR has been used in different areas such as education and medicine, its use in marketing is a relatively recent phenomenon. AR technology is a complex innovation that allows the combination of the real world and layers of real-time digital illustrations and information (Steinberger & Qureshi, 2020). According to Carmigniani et al., 2011, experiential marketing using AR emerged in 2008, when a car manufacturer simulated a 3D model of their MINI. Since then, its application in marketing has continued to flourish, necessitating in-depth study on its impact. Understanding the effects of AR marketing technology on customer behavior is critical to support companies' efforts in influencing their purchasing decisions (Yadav et al., 2014). Some studies indicate that multinational corporations such as Proctor & Gamble already uses AR in their marketing strategies (Yadav et al., 2014). The market for AR apps is likely to expand as more companies implement the technology in their marketing strategies.

There have been studies suggesting that AR technologies change the ways customers experience the shopping process by enhancing the level of engagement of customers by creating/adding more value and interactivity (Erdman et al., 2023; Park & Yoo, 2020). AR technologies enable customers to content however they want, or they could directly interact with the product virtually, which reflects better engagement levels and unique shopping experiences that further increase purchase intention (Jiang et al., 2021). Similarly, the perceived value of using AR in online shopping can also influence the purchase decision-making of customers (Caboni & Hagberg, 2019). AR technologies used in retail or e-commerce allow consumers to have this augmented shopping experience by providing more information about products, which can trigger positive responses and purchase intention, including impulse purchase decisions (Hsu et al., 2024; Schmidt et al., 2021).

On the other hand, the hedonic and cognitive dimensions of AR experiences in online shopping can also influence the purchase intentions of customers (Chiu et al., 2012). Hedonic aspects of using AR like graphics, design, animation, and others offer consumers a unique and enjoyable experience. AR visualization of products could increase positive emotions among consumers, which further creates a hedonic motivator to purchase the product (Trivedi et al., 2022). AR technologies can also enhance cognitive value, giving improved opportunities for consumers to better inspect products resulting in improved online shopping experiences as well as purchase intention and decision-making (Hilken et al., 2017).

This research aims to examine the impact of consumer engagement (perceived value and perceived interactivity) and experience using AR (hedonic and cognitive dimensions of AR experiences) on purchasing intent among online shoppers in Saudi Arabia. The main research question is: What is the impact of augmented reality shopping apps and websites on purchase intention in Saudi Arabia? From the primary query, sub-questions have emerged as follows:

1. What is the impact of consumers' engagement (i.e. perceived value and perceived interactivity) and AR experience (i.e. hedonic and cognitive experiences) on purchasing intention among shoppers in Saudi Arabia?
2. Do demographic variables impact the consumers' purchase intention using AR among Saudi Arabia's online customers?

The projections on AR uptake in Saudi Arabia are fairly optimistic. Statistics indicate that as high as 45% of Saudi Arabian shoppers will view their desired products through AR before paying

for them (Statista, 2021a). It is expected that Saudi Arabians will surpass the number of shoppers from the US and Europe who will use the technology for shopping purposes. In effect, the AR apps market in Saudi Arabia will expand exponentially. As the Global AR market expands, the need for studies on its impacts on consumer behavior becomes ever more relevant. Data from such studies would inform the advertisers' strategies across the diverse marketing channels (Ahmed et al., 2020). While the global AR advertising market is expanding, concerns linger regarding its long-run impacts. It is unclear whether it is just another marketing platform, or it can create effective consumer-brand partnerships (Yadav et al., 2014). However, most practitioners in the field are convinced that AR has a significant role in marketing as it supports experiential advertising strategies (Rauschnabel et al., 2018). They state that it has a great potential of creating a strong brand-consumer relationship by enhancing customer experience.

### ***Problem Statement and Objectives***

Augmented reality provides an interactive tool in the marketing context, with a wide array of applications in developing smart device apps and use in retailing (Ghosh, 2023). AR provides the marketers and brand managers with the capacity to cover the physical environment with virtual (Abrar, 2018). In effect, the physical environment can interact with information and images created virtually in real-time, enabling new ways for content delivery to clients. Therefore, it can modify consumer activities such as information and product search (Javornik, 2016a). More importantly, AR solves consumers' problems when shopping online, especially the lack of physical interaction with the product and the sellers (Ma & Choi, 2007). It solves the problems by bringing the virtual world into the real world. Through AR, customers can do online shopping the same way they would in the physical store. They interact with the product and the shop attendants, and they can also try on some products before making the final purchasing decision (Ma & Choi, 2007). AR makes Online shopping an enjoyable experience, in some cases better than undertaking physical purchases.

Despite the ever-growing consumer base, most marketers and brand managers in Saudi Arabia are reluctant to apply AR in their business strategies due to the lack of scholarly work on its impacts. We found that it has been applied and studied more in the education field such as in (Alsayyar & Almakki, 2021; Hassan Al-Ahmadi, 2019; Alkhatabi, 2017). The application of AR is a relatively new phenomenon with limited information on the factors influencing decisions to use it and its effect on purchase intention. The limitation prevents the advertisers from making effective use of the technology. They lack a reference point to inform their strategies on applying AR and related technologies in their businesses. Therefore, they cannot make objective decisions regarding its application, preventing them from taking optimum advantage of the technology to create effective brand-customer relationships. An analysis of previous studies indicates that most of them focused on the effect of AR on e-commerce, consumer satisfaction, and technology effectiveness (Rese et al., 2017; Yim et al., 2017). Purchase intention, which consists of the next frontier in customer satisfaction, has limited data. Purchase intention measures the client's desire to purchase an item in the future. Morrison (1979) considers purchase intention a measure of actual customer buying behavior. Thus, in this study the researcher will investigate the AR impact on the customers' intention to purchase. The objectives of this study are: (1) to examine the relationship between AR and purchase intention; (2) to examine the relationship between consumer's engagement and AR; (3) to examine the relationship between purchase intention and consumer's experience; and (4) to

investigate how elements of demographic variables such as gender, age, and education level affect the consumers' purchase intention.

### ***Literature Review***

The application and use of augmented reality and artificial intelligence have been subject to several conflicting discourses and debates, further launching several ideas and notions concerning its future use. One prominent argument is how AI can replace humans in the future, which the great Stephen Hawking even predicted. In a discussion by Grier (2023), 's statement of Hawking, suggesting that full development of AI can eradicate the human race, acted as the root cause for disagreement with regards to the application or uses of AI. Such a statement is said to defeat the fact that AI contains several different viewpoints and how most researchers actually seek to improve human productivity using AI, than replace human beings. From this argument, the four large groups of AI was elaborated—showing the different goals and different methods of each. The following groups can pass as the different philosophies and thoughts about AI:

- Classical AI – According to Grier (2023), this is the group that attempted to build computer systems that can replicate human behavior. This group is therefore responsible for the idea of AI aiming to replace humans with machines. Most researchers in this group worked on natural language transition and game playing. However, the group that began in the middle of 1950s usually failed to reach its goals, although created interesting and useful research or technology.
- Human-computer interaction – This is the second field of AI that represented one of the bigger sub disciplines of computer science today. Compared with the classical AI, its goals are more modest and better in attaining them. This group is also responsible for the graphical user interface (GUIs) commonly used today. It also contributed on the research towards algorithms and processes, which made cellphones and mobile platforms.
- Machine learning – The third group emerged in the mid-1980s. Leaders of this group has recognized the failure of the classical AI to reach its goals and the idea that computer systems can actually do more than what they are attaining in human interactions. Herb Simon's ideas and works were influential to this group. The group sought to develop programs that would monitor or gather information to refine machine operations in an organization. This group as well highlights the role of mathematical statistics tools for the development of diverse types of identifying and classifying algorithms.
- Artificial AI or Collective Intelligence – The final type is the newest subfield of AI, which can flip the relationship of computers and human beings, such that human beings tried to handle tasks that are difficult for computers. One example is how several medical records systems rely on human beings to transcribe the doctor's signatures and notes and humans use conventional computational methods to perform such function. Designers in this group would create computing systems using two aspects of human behavior: (a) how humans can recognize complex patterns in ways that cannot be easily computerized; and (b) human groups generally know more than any individual can know, as groups can have several points of views, assumptions and reasoning to reach conclusions.

On the other hand, augmented reality technology has been applied in many application areas such as medical treatment, tourism, education, entertainment, emergency management and shopping (Chen et al., 2019). AR creates a different perception of realism by integrating virtual products

(created using computers) and real-world environments (Kazmi et al., 2021). According to Javorink (2016), AR uses object recognition and sensor capability of input devices such as cameras to scan the physical environment and identify objects. It then puts on top virtual objects on the physical environment in view. The virtual items could be text, sound, or two or three-dimensional images. The combined images enhance a person's hearing and seeing the experience of the objects. They also allow the user to manipulate the objects physically, creating an interactive environment. AR, unlike VR, can be experienced through many standard devices such as a smartphone or a tablet (Javornik, 2016b). Virtual reality does not aim at creating an entirely artificial environment. Instead, it supplements real-world images by supplying the possible missing aspects.

### ***Augmented Reality (AR) vs. Virtual Reality (VR)***

Augmented reality consists of the digital channel involving the overlap of data to construct a different perception of reality. The person using the AR app experiences simulated objects over the actual physical environment (Perannagari & Chakrabarti, 2020). AR allow consumers from the device's screen to gather all information needed of product, not only information but also to see everything about a product and try it before buying and opening its packaging (Chen et al., 2019). As one views the object, one can read all the interesting facts recorded concerning it. Such convenience enhances the user's experience, and the person enjoys it more than watching a static image (Azuma, 1997). AR that appears on the device combines virtual and actual reality, unlike VR, which separates the viewer from reality (Huang & Liu, 2014). On its part, virtual reality disengages the user from the physical environment puts them in a frightening world. It requires specialized equipment, and not everyone can access or use it. Also, the disengagement and shutting out of the real world confuses and frightens the user instead of allowing them to enjoy the experience (Tussyadiah et al., 2018). It is inappropriate and expensive to use in the retail sector.

Many firms have already implemented AR in their marketing campaigns. Notable companies using the technology in advertising include IKEA, Toyota, and Porsche (Craig, 2013 as cited Kazmi et al., 2021). IKEA sets the pace in the AR app use. Its Place app allows customers to visualize the position and fit of furniture in their home before buying the item. The AR potential in marketing is still under discussion to provide adequate definition to improve its practice. Sephora has brought the technology to the beauty industry and launched an AR tool called Virtual Artist. It lets consumers try multi-products and find the perfect color shade that matches their skin (Dingwall, 2017).

In the use of augmented reality, interactivity and value are key aspects that shape the overall experiences, perceptions, and attitudes of users. Interactivity reflects the technological system's capacity that focuses on improving the way users can interact and/or become engaged with technology use (Kumar et al., 2023). From a user-centered design philosophy, designers of technology (i.e. AR applications, websites, e-commerce platforms, etc.) should place utmost emphasis on the needs, preferences, and expectations when designing technologies (Kleiber et al., 2012). In AR applications, interactivity is a crucial factor generally preferred by users, and the level of interactivity would influence the level of perceptions users have on the technology (Kim et al., 2023). Interactivity features in AR applications create better engagement, and ultimately improve the experiences and behaviors of users (Qin et al., 2021). Similarly, perceived value is also an important construct to consider when it comes to AR-based online shopping and purchase intentions. The means-end chain (MEC) theory suggests that consumers tend to make purchase decisions that reflect their individual goals, including achieving benefits and values from the purchase (Kumar et al., 2024).

Moreover, the user experiences in using AR represent an important element for AR application designers to consider. Literature suggests that user experience is a multi-dimensional construct that is important in evaluating user behavior (Holbrook & Hirschman, 1982; Kousi et al., 2023). From the utilitarian-hedonic approach to user experience, it is assumed that consumers who perceive that they achieved high utilitarian (cognitive) and hedonic values from their experiences would likely develop positive behavioral intentions, including purchase intentions, repeat purchases, and continued usage (Akdim et al., 2022).

### ***Use of Augmented Reality in Retail***

Augmented reality use in retail to enhance customers' shopping experience. The technology offers marketers opportunities to engage with the customers favorably. Marketers use AR technology to entertain, educate, evaluate, and enhance their experience (Tan et al., 2022). The four functions of AR in shopping are similar to the stages a customer experiences during the same process in actual reality. A customer first becomes aware of an interest in an object, decide to acquire it, and then buys to consume it. Literature indicates that using AR in marketing benefits both retailers and consumers. Dacko (2017) conducted a study in the US regarding the application of AR in marketing, its benefits, and future outlook. The study found that technology takes up, including the application of AR Apps in the marketing, in the US is high. The scholar's findings indicate that AR Apps in the US are likely to become a norm as user satisfaction is relatively high. The scholar's findings suggest that the application creates systemic experiential value to the customer and increases the customers' purchase certainty. Further empirical studies indicate that the application of AR in retail provides the customers with the correct details impacting their attitudes and marketing behavior. Baytar et al. (2020) conducted their study on female students in America. It involved comparing the physical and virtual try-on. They aimed to investigate whether the AR shopping provided adequate details about the product, including color, shape, and size. Such details affect the user's attitudes and their likelihood to purchase. They found that the current AR Apps provided adequate details concerning a product, positively impacting the shoppers' attitudes, and purchasing decisions. AR enhances customer satisfaction and drives sales (Baytar et al., 2020). Another study indicated that interactivity might support the development of mental imagery, which impacts attitudes and shopping decisions. According to Park & Yoo (2020), there is a close relationship between AR use, creation of imageries, and shopper's attitude. They conducted their study on South Korean female online shoppers. Their findings indicated that interactivity, especially AR's playfulness, and controllability aspect, influenced mental imagery. The mental imagery impacts the person's attitude toward a product positively and their behavioral intentions. While most studies in AR's application show positive results, lack of adequate knowledge concerning the technology indicates negative findings. In a survey conducted online, Plotkina & Saurel (2019) found that AR app with Virtual Try On (VTO) did not fare well against images or pictures of models with features similar to the customer. Also, the shoppers considered VTO less efficient and less enjoyable than the traditional in-commerce interfaces. From the study, it was clear that people will still consider the traditional way of doing things more appealing and better than modern apps. It is especially prevalent in cases of lack of knowledge and experience using the new technology.

## ***Purchase Intention and AR***

Purchase intention refers to the consumer's willingness to buy a particular product in particular situation (Morinez et al., 2007 as cited Mirabi et al., 2015). Literature indicates that AR affecting consumers purchase intention. According to Whang et al. (2021), the authors have investigated the impact of AR on the cosmetic industry and purchase intention. They have distributed a questionnaire to Youcam Makeup App users and gathered 202 responses from women. The authors found that AR provides playfulness for consumers. Besides, it encourages their exploratory behavior and thus will affecting their intention to purchase directly. Furthermore, Khan & M (2019) examine whether AR shopping apps influence purchase intention in south India. The study aims to study the influence on only Millennials generation. They have collected the primary data through a questionnaire and interviews targeting millennials who born between 1982-2004. The authors have collected 384 responses manually as well as using online forms. The result of the study shows that AR affects customers' purchase intention as well as the credibility of the Augmented Reality marketing. The authors of this study believes that the findings could be of major benefit to organizations marketing and selling their products online.

## ***Hypothesis Development***

Several factors influence the consumers' purchase intention in online shopping using AR technology such as engagement, user experience and demographic factors. Each will be discussed in the following points:

### ***1. Consumer Engagement and Purchase Intention***

Augmented Reality (AR) applications can help brands create stronger connections with customers by facilitating easier and more fluid engagement. Such engagement offers customers higher perceived value and interactivity, which positively influences their buying behavior (Caboni & Hagberg, 2019). One key feature of AR is user customization (interactivity). Consumers can easily select tailored content to interact with on AR platforms, which increases engagement with the content and results in an improved customer experience. Perceived value, involving an understanding that the benefits from a product are commensurate with the cost, also significantly influences the purchase intention (Ehab et al., 2020). Therefore, AR provides consumers with a heightened user engagement, which contributes to higher perceived value and interactivity, enhancing consumer buying behavior.

### ***2. Consumer Experience and Purchase Intentions***

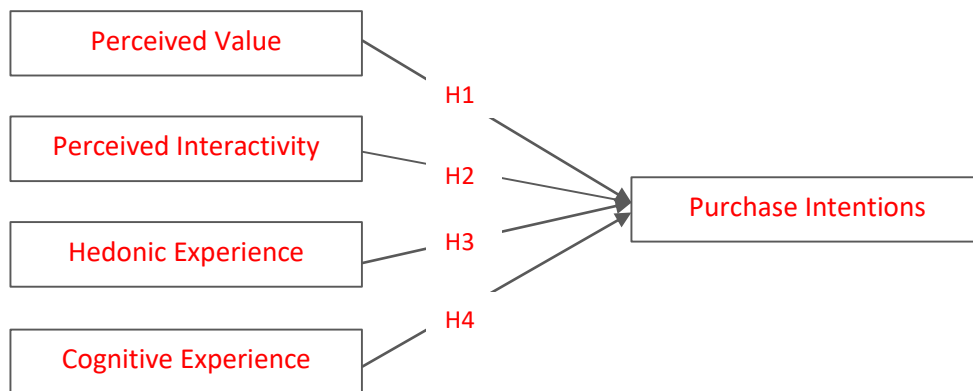
In the context of user experience in AR situations, cognitive and hedonic factors significantly influence consumer shopping experience. Hedonic factors improve user experience by incorporating AR interfaces' design features, including color, graphics, and animation (Papagiannidis et al., 2013; Rese et al., 2017; Papagiannidis et al., 2017 as cited Ehab et al., 2020). These dimensions direct users to what they perceive as interesting, shaping purchase decisions, consumer behavior, and enhanced user experience. Cognitive value also enhances user experience as it helps users achieve their shopping goals with ease and minimal errors. It focuses on the task and rational thinking, while the user experience needs to help consumers meet their intended goals efficiently (Papagiannidis et al., 2017).

### 3. Demographic Factors and Purchase Intentions

Demographic factors can also have an effect on one's intention of purchasing goods online. Factors like age, gender and level of education can help in determining the consumers' behavior toward online shopping (Zhou et al., 2007). Due to technology awareness and knowledge, adults are more involved in online shopping than the older generation of consumers. (Ainin et.al, 2008; Rezai et. al., 2013 as cited in Sharma & Parmar, 2022). Consumers with high education have relatively control over their purchase intentions due to their expected knowledge of products and services. (Gustafson et al., 2016 as cited in Rajagopal, 2020). The three factors mentioned before are considered in the study due to their impact on consumers' purchasing decisions. The use of AR enhances the consumers' shopping experience through higher interactivity and engagement; thus, it increases the consumer's intention to purchase. AR also provides consumers with higher perceived value. Consequently, customers enjoy their shopping experience, leading to increased purchase intention. Moreover, the demographic factor is also essential as it gives insight into the consumers' preferences, which could benefit marketers.

#### *Conceptual Framework*

Figure 1 below shows the conceptual model for this research. The model consists of four independent variables, perceived value and purchase intention as the dependent variable. This model is a modified version of the model used in (Ehab et al., 2020). Four hypotheses were tested.



**Fig. 1. Conceptual Framework of the Study.**

#### *Research Hypotheses*

Based on the conceptual framework, four hypotheses were tested:

- H1: There is significant relationship between the customers perceive value and intentions to purchase.
- H2: There is significant relationship between the customers perceive interactivity and intentions to purchase.
- H3: Customer's hedonic experience has significant influence on purchase intention.
- H4: Customer's cognitive experience has significant influence on purchase intention.



In addition to the four main aforementioned hypotheses, this study also tested whether purchase intention differs based on key demographic variables of consumers, including age, gender or education level of participants. Therefore, it is hypothesized that:

H5: There is no difference in purchase intention according to age, gender or education level of participants.

## Methods

### *Population and Sample*

The study aimed at investigating the effect of Augmented Reality shopping apps on consumers' purchase intention in Saudi Arabia. To fulfill this aim, quantitative research was conducted which took around seven months. In this study, the population comprises Saudi consumers who used Augmented Reality shopping apps in Saudi Arabia at least once. The data is collected in this research through an online questionnaire distributed by social media. We distributed questionnaires among 730 participants, out of which 397 questionnaire were received at the end, where gender was not used as a selection criterion. The 333 responses have been discounted as the participants have not used AR before. The sample comprises 24.69% male responses and 75.31% female responses.

### *Instrumentation*

A survey questionnaire was developed for this study as the primary tool for collecting data. The questionnaire consist of three sections. In the first section, the researcher has given respondents an idea about augmented reality and its usage in online shopping. Respondents were asked a filtering question. The question is whether they have shopped online using AR technology before or not. Respondents with previous experience proceeded to part two to fill the demographic questions. Demographic variables included age, gender, income, educational level, monthly Income, region, and end with how many times they have used AR. Third section consists of the five variables/constructs that include (17) statements on 5-point Likert scales. Table 1 are statements used to measure this study's variables.

**Table 1. Construct items.**

Constructs	Measures/Statements	References
Perceived Value	AR shopping provides an easy and clear virtual experience in online shopping	(Ehab et al., 2020 ; Cranmer et al. 2020 as cited in Qin et al., 2021 )
	The use of AR makes it easy to find what I am looking for and successfully complete my purchase.	
	The time I spent shopping using AR was fun and entertaining	
	The shopping using AR is stimulating and makes me feel satisfied	
	AR shopping provides an effective and efficient virtual experience	
Perceived Interactivity	Interaction with AR shopping allows getting the tailored products information	(Ehab et al., 2020; Martensen et al., 2016)
	The amount of interaction during AR shopping is sufficient and allows me to buy what I want and to do shopping the way I want.	
Hedonic	AR provides an interesting and exciting virtual experience	(Ehab et al., 2020)
	AR makes me feel a sense of adventure al., 2020) and gives me excitement	
Cognitive	My shopping process using AR is successful and rewarding	(Ehab et al., 2020)

	I have become skillful at using AR technology in shopping online.	
	I plan to purchase with AR even when the same items are available at the store.	
Purchase Intention	There is high chance that I will buy a product after using AR	(Ehab et al., 2020; Leonnard et al., 2019)
	I would purchase again from websites and applications supported with AR	
	I would recommend my friends and family to buy products with AR.	
	I prefer online shopping that use augmented reality.	

### Reliability and Validity

To test the reliability and validity of the developed survey questionnaire instrument, a pilot study was conducted involving 30 Saudi consumers who have used AR shopping apps in Saudi Arabia. In testing the instrument's validity, inter-item correlation was shown for items measuring the five constructs/dimensions. Tests indicated that the correlations of items for each construct are acceptable and prove that the questionnaire is validated. Reliability tests were also conducted to test the internal consistency of the study's questionnaire that measured by Cronbach's alpha (George & Mallery, 2006). The scales used for the study's constructs are of acceptable and the (Table 2).

**Table 2. Reliability of scales used.**

Constructs	Cronbach's Alpha	Interpretation
Perceived Value	0.89	Good
Perceived Interactivity	0.78	Acceptable
Hedonic	0.83	Good
Cognitive	0.81	Good
Purchase Intention	0.87	Good
Overall reliability	<b>0.94</b>	<b>Excellent</b>

### Results

Majority of the surveyed participants are female (75.31%), while male participants represent 24.69% of the sample size. The majority of the participants hold Bachelor's degree (58.2%), and most of them are aged 26 to 35 years old (43.3%). The participants, on average, also displayed agreement on statements related to the constructs or AR dimensions investigated in this study – i.e. perceived value, purchase intention, hedonic and cognitive experience and perceived interactivity (See Table 3).

**Table 3. AR Dimensions Ranked Descending According to Dimensions' Means.**

Construct / Dimension	Mean	Std. Dev.	Rank	Scale
Perceived Value	3.68	0.95	1	Agree
Purchase Intention	3.6	0.934	2	Agree
Hedonic	3.53	1.086	3	Agree
Perceived Interactivity	3.49	0.973	4	Agree
Cognitive	3.43	0.923	5	Agree
Augmented Reality	<b>3.57</b>	<b>0.873</b>		<b>Agree</b>

Based on the analysis, H1 and H2 were supported. Findings indicated a significant positive correlation between customer-perceived value and intention to purchase, which means that customer perceived value has a significant positive impact on intent to purchase ( $P > .005$ ;  $B = .782$ ;  $T = 24.976$ ). There is also a significant positive correlation relationship between customer perceived interactivity and intention to purchase, which means that customer-perceived interactivity has a significant positive impact on intention to purchase ( $P > .005$ ;  $B = .76$ ;  $T = 23.229$ ).

The findings also supported H3 and H4. It is indicated that there is a significant positive correlation between Hedonic and intention to purchase, which means that Hedonic has a significant positive influence on intention to purchase ( $P > .005$ ;  $B = .776$ ;  $T = 24.42$ ). There is also a significant positive correlation between Cognitive and intention to purchase, which means that Cognitive has a significant positive influence on intention to purchase ( $P > .005$ ;  $B = .816$ ;  $T = 28.079$ ).

H5 postulated that there is no difference in the type of purchase intention according to age, gender or education level of participants. To test this, the One-way ANOVA Test was conducted. Findings indicated that there are significant differences between participants on intention to purchase according to participants' age at a significant level ( $\alpha < 0.05$ ), since ( $\text{Sig.} = 0.029 < 0.05$ ). In addition, to check for what groups the mean differences a post-test (LSD) was conducted, in which that the statistically significant mean difference was in favor of participants in the age category (26-35). On the other hand, to examine the impact of gender variable on intention to purchase, an independent samples t-test was conducted. Findings indicated that there is a statistically significant difference between participants' mean in intention to purchase depending on the gender of the participants. Since the mean of males (3.69) is greater than the female's mean, which is (3.33), these differences are due to females. Lastly, to examine the impact of education level variable on intention to purchase, One-Way ANOVA Test was conducted. Findings suggested that there are no significant differences between participants on intention to purchase according to participant's education level at a significant level ( $\alpha < 0.05$ ), since ( $\text{Sig.} = 0.205 > 0.05$ ). Table 4 summarizes the hypothesis test findings conducted.

**Table 4. Confirmation of Hypotheses.**

No.	Hypothesis Path	Beta	P-value	Supported?
H1	customer perceive value à purchase intention	0.782	.000	Yes
H2	customer perceive interactivity à purchase intention	0.76	.000	Yes
H3	Hedonic à purchase intention	0.776	.000	Yes
H4	Cognitive à purchase intention	0.816	.000	Yes
H5	age, gender or education level à purchase intention			Yes (except education level)

## Discussion and Conclusion

There is a growing interest in the use of augmented reality-based (AR) applications and websites in the retail and e-commerce industry, suggesting opportunities to increase purchase intentions (Khan & M, 2019; Watson et al., 2018; Whang et al., 2021). The findings of this study found that customer engagement in the form of perceived value and perceived interactivity impacts online purchase intentions among Saudi consumers. First, Saudi online shoppers generally reported positive attitudes when it comes to the perceived value of using AR in online shopping. AR technologies offer simple virtual experiences for users, with features that allow them to find products easily and influence their purchase decisions. These positive perceived values of AR-based online shopping applications further influence purchase intention behaviors, as shown in the findings. Ehab et al. (2020) corroborated this noting that consumers perceiving greater value from using AIR in their online shopping increases user engagement, which contributes to increased purchase intention. Jiang et al. (2021) also shared the same evidence. Similarly, the findings also noted perceived interactivity influencing the purchase intentions of Saudi online shoppers. Shoppers surveyed in this study, on average, positively perceived AR's interactivity in terms of customization, and information seeking, as well as the application's reliability and responsiveness. These aspects of interactivity further

influence the purchase intentions of consumers, which corroborated findings by Ehab et al. (2020) and Caboni and Hagberg (2019).

In terms of user experience in using AR-based online shopping applications, this study found that both hedonic and cognitive experiences achieved from usage influence purchase intentions. Online shoppers generally perceived that using AR allowed for interesting and unique virtual shopping experiences, which resulted in them likely making purchase decisions. Some studies even noted that such a hedonic aspect of user experience in using technologies like AR can increase impulse purchase intentions (Trivedi et al., 2022). Similarly, cognitive or utilitarian aspects of user experiences in using AR-based applications for online shopping were also found to have a positive influence on purchase intentions, which corroborated past evidence (Akdin et al., 2022).

Regarding the demographic variables, 46 % of the population are unfamiliar with AR. 54 % of them have tried it three times. Most of the respondents were women with bachelor's degrees. Significant differences in intention to purchase were found between participants according to participants' age and gender. Consequently, the researcher concluded that Saudi customers were familiar with AR and highly interested in trying it again. Moreover, demographic variables such as age and gender could impact the customers' purchase intention.

### ***Theoretical Contribution and Practical Implications***

The findings of this study have theoretical contributions. Firstly, the findings of this study suggested the impact of interactivity on purchase intentions. This finding could enrich the user-centered design philosophy/view by enhancing the understanding of user/customer engagement within the context of augmented online shopping applications. Such understanding and insights could be of great help in including and prioritizing technical features and capabilities of AR-based online shopping applications that exhaust the possibilities of interactivity in creating engaging and unique shopping experiences. Second, the findings noting the link between perceived value and purchase intention validate the former as a central construct relevant to decision-making processes within the view of the means-end chain theory. Such a finding provides insights into perceived value as a key factor bridging the attributes of the product and the desired outcomes. It shows that customers do evaluate the value of using AR-based shopping applications related to the benefits and their costs, which ultimately influence customers' purchase intentions. Lastly, the finding suggesting hedonic and cognitive factors in user experience influence purchase intentions, which enriches the understanding of consumer behaviors within the lens of user experience (UX) theory. The study was able to evaluate both the cognitive and hedonic elements of user experience, which further offers a multifaceted view of user experience that shapes the purchase decisions of consumers within an AR-based shopping environment. Besides the theoretical contribution of the findings, the study also has practical implications. The effect of engagement through perceived interactivity and value can be used as key metrics to consider when it comes to designing AR-based online shopping applications. There are also opportunities for AR designers to identify design elements and features that leverage interactivity and value creation in order to create a more unique and immersive

engagement and experiences, which ultimately stimulate increased purchase intentions and behaviors of consumers.

### ***Limitation and Future Work***

The study has a few limitations. One of the key limitations of this study concerns the gender distribution of the study's sample. This limitation was identified during the data collection phase. Most of the study's participants are females, which might be attributed to some factors. First, the study had a filtering question in the survey questionnaire, screening participants about their experience using augmented reality technology online shopping. Most of the active social media platforms that provide AR applications are used in Saudi Arabia and the Gulf region, and they are used in the fashion industry, which is often dominated by women consumers (Badghish, 2019). Similarly, Dasha (2019) indicated that women tend to be more active online shopping for clothing and sports apparel than men.

Moreover, although the current study offered insights into the effect of customer engagement (i.e. perceived value and perceived interactivity) and experience (i.e. hedonic and cognitive experience) on the purchase intentions of Saudi online shoppers within the context of AR, it is relevant to recognize the limitation related to the generalizability of the findings. The study focused specifically on online shoppers in Saudi Arabia. This study's scope could limit the degree to which the study's findings are generalized to other populations, samples, or contexts.

For future studies, researchers may consider replicating and extending the findings into different demographic contexts. In addition, this study also focuses on the use of AR in online shopping; hence, care should be considered when generalizing the findings to other technologies like VR. In addition, while the study provided insights into the differences in purchase intentions by demographic (i.e. age, gender, and educational background), it did not focus on the potential moderating effect of these demographic variables on the linkages between independent and dependent variables. Therefore, future studies may consider establishing the moderating effect of demographics on the relationships. For example, future studies may look into whether or not gender has a moderating influence on perceived interactivity and value on purchase intentions, considering that women tend to be more active in online shopping than men.

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## Appendices

### Appendix A: Questionnaire Form

Dear participants:

It gives me a great pleasure to invite you to take part in a study entitled "The impact of augmented reality (AR) shopping apps on consumers purchase intention in Saudi Arabia", conducted by Afnan Althabaiti.

Kindly note that this questionnaire is a requirement for MBA at King Abdulaziz University.

The researcher

Afnan Al-Thabaiti

For any questions or for further information

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The impact of augmented reality (AR) shopping apps on consumers purchase intention in Saudi Arabia.

#### Section One: What's Augmented Reality?

Augmented Reality (AR) creates a different perception of realism by integrating virtual products (created using computers) and real-world environments (Kazmi et al., 2021). AR is used in online shopping to allow consumers from the device's screen to gather all information needed of product, not only information but also to see everything about a product and try it before buying (Chen et al., 2019).

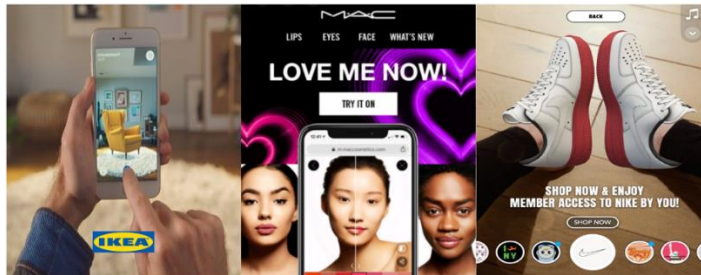


Fig. A.1 Examples of augmented reality shopping App.

Please select only one answer for each question:

Have you ever used Augmented reality technology "Try-before-buy" in shopping online (for example: IKEA place, Snapchat marketing filters, Fakeeh Vision, M.A.C Cosmetics, Sephora, LV sunglasses, Tiffany& Co ,RP concept... etc.)?

- Yes
- NO

#### Section Two: Demographic information

This section will capture the respondents' socioeconomic information, including age, gender, income, country, and education level.

1. **Age:**
  - 16-25
  - 26-35
  - 36-45
  - Above 45

**2. Gender**

- Female
- Male

**3. Education level**

- High school or less
- Diploma
- Bachelor's degree
- Postgraduate degree

**4. Monthly Income**

- 5000 SAR or less.
- 6000 to 10000 SAR.
- 11000 to 16000 SAR.
- 17000 SAR or More.

**5. Which of these best describes where you live?**

- City
- Village
- Small city
- Big city

**6. Location**

- Central region
- Western region
- Northern region
- Southern region
- Eastern region

**7. How often have you used Augmented Reality before?**

- 1
- 2-5
- More than 5

**Section Three: Study variables**

1. The following statement measure the Perceived Value. Please select the number that reflects your view of each answer.

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
------------------------	---------------	--------------	------------	---------------------

1	AR shopping provides an easy and clear virtual experience in online shopping	1	2	3	4	5
2	The use of AR makes it easy to find what I am looking for and successfully complete my purchase.	1	2	3	4	5
3	The time I spent shopping using AR was fun and entertaining.	1	2	3	4	5
4	The shopping using AR is stimulating and makes me feel satisfied.	1	2	3	4	5
5	AR shopping provide an effective and efficient virtual experience.	1	2	3	4	5

2. The following statement measure the Perceived Interactivity.. Please select the number that reflects your view of each answer.

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
------------------------	---------------	--------------	------------	---------------------

1	Interaction with AR shopping allows getting the tailored products information.	1	2	3	4	5
2	The amount of interaction during AR shopping is sufficient and allows me to buy what I want and to do shopping the way I want.	1	2	3	4	5
3	The interaction with AR shopping helps to make a purchase decision of the products.	1	2	3	4	5

3. The following statement measure the Hedonic Dimension . Please select the number that reflects your view of each answer.

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
------------------------	---------------	--------------	------------	---------------------

1	AR provides an interesting and exciting virtual experience	1	2	3	4	5
2	AR makes me feel a sense of adventure and gives me excitement.	1	2	3	4	5

4. The following statement measure the Cognitive Dimension. Please select the number that reflects your view of each answer.

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
------------------------	---------------	--------------	------------	---------------------

1	My shopping process using AR is successful and rewarding.	1	2	3	4	5
2	I have become skillful at using AR technology in shopping online.	1	2	3	4	5
3	I plan to purchase with AR even when the same items are available at the store.	1	2	3	4	5

5. The following statement measure the Purchase Intention. Please select the number that reflects your view of each answer.

1	There is high chance that I will buy a product after using AR.	1	2	3	4	5
2	I would purchase again from websites and applications supported with AR.	1	2	3	4	5
3	I would recommend my friends and family to buy products with AR.	1	2	3	4	5
4	I prefer online shopping that use augmented reality.	1	2	3	4	5

## تأثير تطبيقات التسوق بتقنية الواقع المعزز على نية الشراء لدى المستهلكين في المملكة العربية

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المستخلص. تهدف هذه الدراسة إلى استكشاف تأثير استخدام الواقع المعزز (AR) على نوايا الشراء لدى السعوديين في التسوق عبر الإنترنت. بحثت الدراسة بشكل خاص في تأثير تفاعل المستهلك وتجربته باستخدام الواقع المعزز على نية الشراء بين المتسوقين عبر الإنترنت في المملكة العربية السعودية. تم اعتماد منهج البحث الكمي، وتم تطوير استبيان شمل قياسات لمتغيرات هذه الدراسة - القيمة المدركة، نية الشراء، التجربة الوجدانية والمعرفية، والتفاعل المدرك. شارك في الدراسة ٣٩٧ متسوقاً عبر الإنترنت لديهم خبرة في استخدام تطبيقات الواقع المعزز في التسوق عبر الإنترنت. أظهرت النتائج أن قيمة العميل المدركة والتفاعل المدرك لهما علاقة إيجابية كبيرة مع تجربة المستخدم. بالإضافة إلى ذلك، وجدت علاقة ذات دلالة بين قيمة العميل المدركة والتفاعل المدرك مع نوايا الشراء. كما وجد أن تجارب المستخدم (UX)، سواء كانت وجدانية أو معرفية، لها علاقة دالة مع نوايا الشراء. بالإضافة إلى ذلك، وجد أن هناك عاملين ديموغرافيين، وهما العمر والجنس، يؤثران بشكل كبير على نية الشراء. تساهم نتائج الدراسة في سد الفجوة في الأدبيات المتعلقة باستخدام تطبيقات الواقع المعزز في أنشطة التسوق عبر الإنترنت داخل المملكة العربية السعودية من خلال استكشاف تأثير العوامل المختلفة المشتقة من استخدام تطبيقات الواقع المعزز على نوايا الشراء لدى المتسوقين عبر الإنترنت.

الكلمات المفتاحية: التسوق عبر الإنترنت، تجربة العميل السعودي، التجربة الوجدانية والمعرفية.

