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Drivers of augmented reality shopping adoption for high-involvement products in South Africa

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Background: Online shopping has revolutionised the way we buy products, providing convenience and accessibility. However, one of the challenges of online shopping has been the inability to physically try products before making a purchase. This limitation led to the emergence of online augmented reality (AR) shopping, a technology-driven solution that has transformed the online retail experience, especially for expensive products that require extensive search. Despite the potential that AR technology has exhibited, the retail sector has not yet fully embraced it and research on its impact on consumer behaviour is still in its early stages.

Objectives: The study sought to establish the driving factors influencing consumers' adoption of online AR shopping for high-involvement products.

Method: A quantitative method was used to analyse specific relationships between variables, to address knowledge gaps in this context.

Results: According to the results, perceived usefulness, optimism and trialability are significant driving factors that influence consumers' adoption of AR shopping when purchasing high-involvement products.

Conclusion: Gaining a greater understanding of consumers' perception of online AR in the retail industry is critical for business success to create an enhanced and immersive retail experience.

Contribution: These results make an important academic contribution by increasing the theoretical understanding of consumer adoption. The findings of this study may assist marketing practitioners in overcoming the challenges faced when migrating consumers from purchasing high-involvement products at traditional brick-and-mortar stores to online shopping platforms.

Keywords: augmented reality shopping; adoption; perceived ease of use; perceived usefulness; optimism; innovativeness; trialability; social influence.

Introduction

Technological innovations such as augmented reality (AR) shopping – a technology-driven solution that enables consumers to visualise and interact with virtual products in their real-world environment (Bonetti, Warnaby & Quinn 2018:120), allow online retailers to enhance their online shopping experience and increase revenue by making online shopping more interactive, convenient and customised. The introduction of AR is one of the many technological advancements that have yet again taken the retail industry to unimaginable heights. By bridging the gap between the virtual and online environment, AR technology improves digital efficiency by helping consumers overcome the inability to visualise and physically try on products before making a purchase (Khalid 2023:2718).

Online retailers and e-commerce platforms are constantly looking for innovative methods to enhance consumer engagement and boost sales. However, most retailers face issues such as high return rates, online shopping cart abandonment (Rausch, Derra & Wolf 2022:89), and situations where consumers browse products online and then shop for those products offline (Flavián, Gurrea & Orús 2020:1). All these online shopping issues are attributed to the absence of direct product experience including product presentations and the sensory information that consumers are used to when shopping offline (Farhana, Khan & Noor 2017:225).

By leveraging AR technology, online shopping platforms can provide a more immersive shopping experience; especially for high-involvement products (Khalid 2023:2719). For example, consumers would be able to virtually try on clothes using their smartphone cameras, providing a realistic

representation of what the item would look like on them (Hilken et al. 2018:510). Similarly, furniture retailers can enable customers to visualise how a piece of furniture would fit and complement their living space before making a purchase (Sihi 2018:453). This innovative approach to online shopping is transforming the retail landscape, providing customers with a more engaging and personalised experience while empowering retailers to showcase their products in a dynamic and interactive manner (Bonetti et al. 2018:119).

Research gap and problem statement

Despite the potential benefits of AR in enhancing consumers' online decision-making process and the projected market revenue growth in the retail industry (Chandra & Kumar 2018:237), AR is a relatively novel idea. Because of its recent emergence, it is still in the early stages of adoption and has not drawn much research attention. Even in developed and technologically advanced countries, the adoption and usage of AR technology to improve the consumer experience in e-commerce is still quite limited (Bonnin 2020:1). This view is supported by a systematic and synthesis study on the adoption of AR that has shown that the majority of AR research is concerned with its technological components, with little attention given to behavioural aspects, such as the adoption of AR technology (Chandra & Kumar 2018:238). Further investigation is required to properly comprehend the effects of AR technology and how online retailers may use it to improve consumer satisfaction and online sales (Khalid 2023:2729).

Moreover, Chandra and Kumar (2018:238) state that there is a need to appropriately examine AR technology in research using progressive models that are able to anticipate behavioural intention. Thus, it is important to bridge the research gap in advanced technology adoption research by identifying the factors that drive consumer adoption of AR shopping. According to Roy et al. (2018:156), there is a need for more studies to determine the various factors that influence the adoption and intention to use smart retail technologies such as AR apps in developing countries, because of specific technology characteristics and different consumer lifestyles. Research is also needed to investigate whether particular consumer segments, demographics, genders or cultures would be more receptive to innovative technologies such as AR, and how they contribute to an omnichannel shopping experience (Boardman, Henninger & Zhu 2020:11). Pentz, Du Preez and Swiegers (2020:21) have also underlined the necessity to evaluate product categories and go beyond technological characteristics in order to comprehend the experiences of South African online buyers. Therefore, the main aim of the study is to determine the driving factors that influence consumer's adoption of online AR shopping for high-involvement products. Identifying these factors is critical for the country's economy, as further delays in the acceleration of e-commerce growth and delays in technology adoption, will have a negative influence on the country's capacity to compete globally (Pentz et al. 2020:21; Van Rooyen & Amoah 2021:26). The retail industry will also continue to face challenges such as high online purchase returns, low consumer retention, channel switching, low online buying conversion rates and forgettable shopping experiences (Rausch et al. 2022:89). As a result, the study intends to accomplish the following objective:

- To determine the factors that influence consumers' adoption of online AR shopping for high-involvement products in South Africa

Literature review

Online shopping and augmented reality adoption in South Africa for high-involvement products

South Africa's online retail industry currently faces a number of challenges, despite its strong revenue and projected growth rates. According to statistics from 2022, online shopping in South Africa is hovering at around 4% of the total retail sector (Kernes 2022). Moreover, high-involvement products, compared to low-involvement products, account for the least-purchased items on online shopping platforms in South Africa (Payflex 2022). The issues facing the online retail industry in South Africa include, among others, an increase in online risks (Pentz et al. 2020) and factors pertaining to website quality (Joubert & Erdis 2019). In South Africa, the adoption of AR shopping is still in its infancy. However, there has also been a noticeable increase in smaller companies' interest in artificial intelligence (AI), AR and virtual reality (VR) (SME South Africa 2017). The coronavirus disease 2019 (COVID-19) pandemic also spurred the growth of online shopping and compelled businesses to invest in novel concepts to improve consumers' shopping experiences in the comfort and safety of their homes. The slow adoption of technical breakthroughs in South Africa is not unusual; however, the ubiquity of low-cost Android mobile devices has made technological advancements more feasible (SME South Africa 2017).

Woolworths, Zara, and H&M, among other prominent companies, are spending substantial sums of capital on AR technology to help consumers improve their online shopping experience by connecting with them both electronically and physically to give them more confidence before making a purchase (Francis 2023; Woolworths Holdings 2021). This means that companies in South Africa are slowly recognising the impact of AR as essential in improving the sales process, especially for high-involvement purchases. Thus, it is important to determine the factors that will positively influence consumers to increase their inclination to buy on these platforms.

Theoretical grounding for the study

The Technology Acceptance Model (TAM) is a widely used theoretical framework that explains and predicts users' acceptance and adoption of new technologies. Originally proposed by Fred D. Davis in 1989, TAM postulates that users are more likely to adopt a technology if they perceive it to be useful and easy to use. Numerous studies have applied

TAM to understand users' technology adoption behaviours in various contexts; and it is a robust model in explaining users' behavioural intentions, especially in AR shopping (Perannagari & Chakrabarti 2020:21). However, the perception of the technical features of innovation may not be sufficient to cover all aspects that would potentially affect users' intention to use technology; and as such, a more thorough understanding of acceptance and adoption needs to take additional factors into account. In this regard, the Technology Readiness Index (TRI) is a useful conceptual model that assesses individuals' readiness and propensity to embrace new technologies. Developed by A. Parasuraman in 2000, TRI incorporates four dimensions: optimism, innovativeness, discomfort and insecurity. These dimensions capture individuals' psychological characteristics and attitudes towards technology adoption. Technology Readiness Index has been widely used to examine consumers' readiness and attitudes towards various technologies. It provides valuable insights into understanding consumers' technology adoption behaviours from a psychological perspective (Ali et al. 2019:4), beyond the traditional demographic and socio-economic factors.

Both TAM and TRI have contributed significantly to understanding technology adoption behaviours, but they focus on different aspects. While TAM emphasises the cognitive perceptions of usefulness and ease of use, TRI delves into the psychological and attitudinal aspects of consumers' readiness. Researchers have recognised the complementary nature of these two models and have integrated them to gain a comprehensive understanding of technology adoption (Rauschnabel & Ro 2016; Roy et al. 2018). This study proposes to combine TAM and TRI to serve as a foundation for investigating the consumer's behaviour towards acceptance of AR shopping for high-involvement products.

Driving factors influencing the adoption of augmented reality shopping for high-involvement products

To influence consumer adoption of online AR shopping, it is important to first identify the factors that influence consumers' behavioural intention in the online shopping environment. Identifying these factors is critical for online retailers to design appropriate technologies in order to capitalise and take advantage of the opportunities available, especially in emerging consumer markets, where there is a need to tailor marketing strategies differently to fulfil the consumer's needs (Pentz et al. 2020:21; Roy et al. 2018:156). As a result, insight is required to determine how online retailers can reach consumers and influence their adoption of AR shopping.

Consumers who find online shopping to be simple to use and useful are more likely to use it (Rese et al. 2017). Other factors that have been identified as having a significant impact on consumers' online AR shopping behaviour include trialability (Moeti, Mokwena & Malebana 2021), social influence (Rauschnabel & Ro 2016), optimism and innovativeness (Chakraborty & Gupta 2017). However, scholars in emerging consumer markets, particularly in South Africa, have paid little attention to these concepts. As a result, it is critical to gain a better understanding of these factors from the perspective of consumers in emerging consumer markets. Therefore, this study seeks to gain a better understanding of online shopping adoption by extending the TAM and TRI with two additional factors, namely social influence and trialability, both of which have been shown to have a positive influence on consumers' intentions to adopt online AR shopping.

Conceptual model

Perceived ease of use

It is important for online retailers to design shopping platform interfaces that are user-friendly and intuitive to enhance consumers' perception of ease of use and influence their adoption behaviours. Perceived ease of use refers to the extent to which consumers expect a system to be effortless and user-friendly (Selamat & Windasari 2021:5). Perceived ease of use is an important determinant of consumers' acceptance of new technology (Selamat & Windasari 2021:5). In the context of AR shopping, several studies have also emphasised that technologies perceived as easy to use are more likely to garner positive intentions and higher adoption rates. A study conducted by Saleem et al. (2022:20), for example, investigated the factors influencing consumers' intention to use mobile AR shopping in Pakistan. The findings revealed that here too perceived ease of use positively affected consumers' intention to use AR technology. Alam et al. (2021:13) identified the factors influencing consumers' intention to adopt AR shopping in the Malaysian retail industry. The findings revealed that perceived ease of use positively affected consumers' intention to use AR technology. Similarly, a study by Rese et al. (2017:313–315) examined the influence of consumer technology readiness on consumers' intention to use AR in the online retail industry. The results indicated that perceived ease of use positively and significantly influenced consumers' intention to use AR shopping platforms. This general finding supports the hypothesis that perceived ease of use plays a pivotal role in driving behavioural intentions and adoption in various technological contexts. Considering the above findings, it can be argued that perceived ease of use is an essential factor influencing consumers' behavioural intentions and adoption of online AR shopping for high-involvement products. When consumers perceive AR shopping as easy to use, they are more likely to engage with the technology and explore its benefits for purchasing high-involvement products. Therefore, the following hypothesis was formulated:

> **H1:** Perceived ease of use positively influences consumers' behavioural intention to adopt online AR shopping for high-involvement products.

Perceived usefulness

Perceived usefulness has been identified as having a significant influence on behavioural intention in online shopping (Selamat & Windasari 2021:5). Perceived usefulness is the extent to which individuals think adopting a certain technology will enhance their ability to accomplish a certain task (Ugwuanyi, Uduji & Oraedu 2021:6). For instance, the breadth and depth of the product catalogue offered by online shopping platforms are crucial. The recent launch of Amazon in South Africa provides a useful case study. Despite high expectations from consumers eager to access the platform in South Africa, initial feedback suggests a significant gap in meeting expectations related to product variety and availability. The catalogue offered by the platform not only fell short when compared to its international competitors but also lagged behind local competitors such as Takealot (Ndlovu 2024). This discrepancy had a detrimental impact on Amazon's ability to compete in the South African market, which in turn lowered consumers' intention to shop.

Alam et al. (2021:13) identified the factors influencing consumers' intention to adopt AR shopping in the Malaysian retail industry. The findings revealed that perceived usefulness also positively affected consumers' intention to use AR technology. Similarly, in a study aimed to investigate the influence of AR mobile apps on consumers' behavioural intentions in Pakistan's retail industry, perceived usefulness was found to have had a positive and significant influence on consumers behavioural intentions (Saleem et al. 2022:20). These studies highlighted the potential of AR technology to enhance consumers' shopping experiences by providing useful information and facilitating informed decision-making for high-involvement products. Considering the above-stated findings, it can be argued that perceived usefulness is a crucial factor influencing consumers' behavioural intentions and adoption of online AR shopping for high-involvement products. When consumers perceive AR shopping as a useful tool for gathering information, evaluating products and making informed purchase decisions, they are more likely to adopt the technology for their high-involvement product purchases. Therefore, the following hypothesis was formulated:

> **H2:** Perceived usefulness positively influences consumers' behavioural intention to adopt online AR shopping for high-involvement products.

Innovativeness

Innovativeness refers to an individual's predisposition or willingness to try out, learn and talk about technological innovations (Lopez-Perez, Ramirez-Correa & Grandon 2019:169). This means that consumers who are innovative are more inclined to accept new technologies. Previous research on interactive technology indicates that the degree of consumer innovativeness influences their adoption of innovative interactive technology (Humbani & Wiese 2019:23; Shankar & Datta 2018:72). In the context of AR, recent scholarly research has explored the role of innovativeness; although not specifically in the context of AR shopping. For example, a study by Tom Dieck and Jung (2018:160) investigated the factors influencing consumers' intention to adopt AR applications in tourism. The findings revealed that innovativeness significantly influenced consumers' intention to adopt AR applications in tourism.

Another study by Schapsis, Chiagouris and Pham (2021:26) examined consumers' intention to shop for footwear on online AR shopping platforms and found that innovativeness positively influenced consumers' intention to do so. In fact, this study suggests that consumers with higher levels of innovativeness are more open to adopting technologies that offer innovative shopping experiences.

In an online shopping context, previous studies have revealed that innovativeness has a significant positive influence on consumers' behavioural intention to adopt online food delivery services (Ali et al. 2020:12) and online AR shopping (Chakraborty & Gupta 2017:1529). This suggests that individuals who are more inclined to adopt new and innovative technologies are more likely to embrace new forms of shopping experiences, such as AR shopping.

While there is a scarcity of research specifically focussing on the relationship between innovativeness and the adoption of AR shopping for high-involvement products, the aforementioned studies support the hypothesis that consumers with higher levels of innovativeness are more likely to exhibit positive behavioural intentions and adopt innovative technologies in the realm of shopping experiences. Therefore, the following hypothesis was formulated:

> **H3:** Innovativeness positively influences consumers' behavioural intention to adopt online AR shopping for high-involvement products.

Optimism

Optimism is defined as the positive belief about technology, which offers people an improvement of control, flexibility and efficiency in their lives (Lopez-Perez et al. 2019:169). Optimism, as a psychological trait, is associated with positive expectations and a favourable outlook on future outcomes. Optimistic individuals tend to be more open to new experiences and technologies, which in turn can influence their intention to adopt innovative shopping methods such as AR.

Recent scholarly studies have found optimism to have a positive influence on consumers intention to adopt new technologies in education (Mupfunya, Roodt & Mwapwele 2018:6) and the online retail industry (Ali et al. 2020:12). Moreover, Chakraborty and Gupta (2017:1529) study investigated the attributes that drive online AR shopping adoption in India, and revealed that optimism as a personality trait has a substantial impact on consumers' behavioural intention to adopt online AR shopping. The abovementioned findings suggest that individuals with a more optimistic outlook are more likely to exhibit positive behavioural intentions and adopt new technologies in various contexts, including online AR shopping. Thus, these studies provide support for the following hypothesis:

H4: Optimism positively influences consumers behavioural intention to adopt online AR shopping for high-involvement products.

Social influence

Consumers tend to rely on the experiences, opinions and recommendations of others to make informed decisions, particularly when it comes to costly and consequential purchases. Social influence refers to the impact that other people such as families and friends have on an individual's thoughts, feelings, attitudes and beliefs when it comes to adopting new technology (Singh, Sinha & Liébana-Cabanillas 2020:194). Thus, consumers are more likely to adopt a behaviour if they observe others engaging in that behaviour.

When it comes to AR adoption, social influence plays a crucial role in shaping consumers' behavioural intentions. Several studies have demonstrated the positive effect of social influence on consumers' intention to adopt AR applications. For instance, many studies have found social influence to have a positive and significant impact on AR adoption in tourism (Jung et al. 2018:24) and in education sector in developing countries (Abed 2021:409). Moreover, social influence has been found to positively influence consumers' intention to adopt AR technology in an online shopping context (Rauschnabel & Ro 2016:138). Thus, it can be said that consumers who perceived strong social pressure from their peers or reference groups to adopt AR shoppings were more likely to form positive behavioural intentions towards the technology. This suggests that social influence can shape consumers' inclination to engage in online AR shopping for high-involvement products. Thus, the following hypothesis is supported by the aforementioned scholarly research:

H5: Social influence positively influences consumers behavioural intention to adopt online AR shopping for high-involvement products.

Trialability

Trialability refers to the extent to which individuals perceive an opportunity to try out a new technology or innovation before making a commitment (Chang, Fu & Jain 2016:1759). In the context of online AR shopping, trialability can have a significant impact on consumers' behavioural intentions. The ability to first try the technology allows consumers to evaluate if it will be useful, and overall fit with their shopping needs. By experiencing the benefits of online AR shopping firsthand, consumers are more likely to adopt the technology.

Several studies in different contexts have confirmed the positive influence that trialability has on consumers' behavioural intentions to adopt online shopping (Moeti et al. 2021:7), and AR in entertainment (Tiwari & Damle 2020:4830). Moreover, consumers who had the opportunity to try online AR shopping have been found to have significantly higher behavioural intentions to adopt the technology (Alam et al. 2021:10). A study by Rani and Kumar (2023:16) conducted in India found that trialability has a positive and significant influence on behavioural intention for males and a negative but insignificant influence on females. These studies suggest that trialability provides consumers with firsthand experience, reducing uncertainties and increasing confidence in the value and usability of online shopping. Therefore, trialability positively influences consumers' intention to engage in online AR shopping for high-involvement products. The following hypothesis is thus supported by the abovementioned scholarly research:

H6: Trialability positively influences consumers' behavioural intention to adopt online AR shopping for high-involvement products.

Figure 1 illustrates a conceptual model outlining the factors influencing the adoption of AR shopping for high-involvement products.

Methodology

Study design

This study employed a quantitative research design to examine the relationships between the dependent variable and several independent variables. A quantitative approach was the most appropriate approach to use for this study. It enabled the researcher to find patterns in order to objectively establish the relationship between the variables using statistical analyses.

Sampling and respondents

The respondents in this study were selected through a simple random sampling technique. A total of 664 respondents were included in the analysis. The sample included South African consumers listed in the Springvale Online database, aged 18 years to 65 years, who shop in-store or online for high-involvement products.

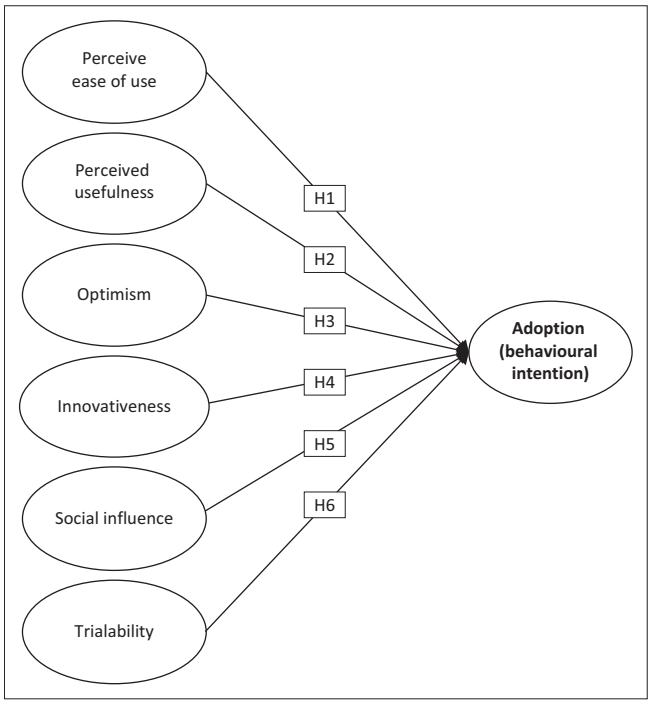

FIGURE 1: Driving factors of AR shopping adoption for high involvement products.

Data collection and measuring instrument

Data were collected through online self-administered questionnaires. An online, self-administered survey strategy was also chosen as it enabled researchers to gather data quickly, flexibly, with a broader reach, in a cost-effective way. Another consideration in choosing the technique was the research topic, which is linked to the online environment. Moreover, for respondents who were not familiar with online AR shopping platforms because of the novelty of the technology, particularly in South Africa, a link needed to be provided so that their opinions would be validated by actual experience.

The research constructs were operationalised in accordance with previous research; however, modifications were made to ensure alignment with the current research context. To measure *Perceived ease of use*, a four-item scale was adopted from Venkatesh and Davis (2000), and to measure *Perceived usefulness*, a four-item scale was adapted from Venkatesh and Davis (2000). To measure *Innovativeness*, *Optimism*, *Discomfort* and *Insecurity*, a 16-item scale, with four-items for each construct, was adopted from Parasuraman and Colby (2015). *Social influence* was measured on a four-item scale adapted from Venkatesh et al. (2003). *Trialability* was measured on a five-item scale adapted from Chang et al. (2016). *Behavioural intention* (*adoption intention*) was measured using a five-item scale adapted from Johnson et al. (2018). All scale items were measured on a five-point Likert scale, with scale points ranging from *1* ('Strongly disagree') to *5* ('Strongly agree').

The respondents were chosen at random from the Springvale Online database, which contains over 45 000 consumers. The following procedures were used to choose potential respondents: Members of the database were randomly assigned counting numbers ranging from 1 to 45 000; members of the database were then arranged in numerical order of the random numbers assigned to them; and finally, the first 1000 members were selected and invited to participate in the study by completing the online survey. Emailing software was used to send invitations to respondents. More emails were sent out to respondents as the number of respondents invited to participate in a study is often increased beyond the required number, to account for non-response and missing data. A total of 664 completed questionnaires were received.

Ethical considerations

Ethical clearance to conduct this study was obtained from the Ethics Review Committee for Marketing and Retail Management at the University of South Africa, under reference number 2020_MRM_007, valid for 5 years. Participants voluntarily consented to take part in the study. To ensure anonymity, respondents' answers were assigned code numbers and referred to as such in the data analysis.

Results and findings

This next section will discuss the profile of the respondents.

Demographics of the respondents

The statistics indicated that 373 (56.2%) of the consumers were female and 291 (43.8%) were male. Most of the respondents (53.2%; n = 353) were aged 21-30 years. This was followed by those in the age group 31-40 years, representing 28.3% (n = 188) of the total number of respondents. The smallest group was those aged 51-60 years, who represented 3.2% (n = 21) of the total sample. The majority of respondents were African people (72.1%; n = 479), followed by mixed race people (12.5%; n = 83), white people (at 10.0%; n = 67), Indian people (4.3%; n = 29), Asian people (0.5%; n = 3), those who 'Prefer not to say' (0.3%; n = 2) and those who indicated 'Other' (0.1%; n = 1). The majority of the respondents (47.4%; n = 315) had an income of R15 000.00 or less, 25.6% (n = 170) had an income ranging from R16 000.00 to R25 000.00, followed by those with an income in the category R26 000.00–R35 000.00 (11.2%). The next group (6.0%) indicated 'Prefer not to say', followed by the income category of R36 000.00–R45 000.00, indicated by 4.2% of respondents, while 3.2% of respondents selected the income category R56 000.00 and above. The last group, 2.4% of the respondents, were in the income category of R46 000.00–R55 000.00. Results regarding level of education demonstrated that a total of 32.3% (n = 30) of the respondents had matric (Grade 12), and 25.9% (n = 172) had a degree. The rest of the respondents had a diploma (16.1%; n = 107), a higher education certificate (15.5%; n = 103), a postgraduate qualification (5.7%; n = 38), or did not complete matric (4.5%; n = 30).

Analysis of data

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 28 (SPSS: IBM Corp. Released 2021, IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY) and SmartPLS 4.0 (SmartPLS: SmartPLS GmbH, D-25474, Bönningstedt, Germany). Analyses included descriptive, factor analysis, and multiple regression, which were used to achieve the study's objectives.

Discriminant validity

To confirm that the reflective construct exhibits stronger relationships with its indicators than with those of any other construct, discriminant validity was assessed. Discriminant validity was established as the heterotrait-monotrait ratio (HTMT) values were less than 0.90 (Franke & Sarstedt 2019). Table 1 summarises the HTMT values for each construct.

Construct validity and reliability

Cronbach's alpha, composite reliability (CR), and average value extracted (AVE) were used to assess reliability in this study. Table 2 shows Cronbach's alpha, CR and AVE scores. According to Zikmund and Babin (2013:257), Cronbach's alpha coefficient values should range from 0.71 to 0.89. Hair et al. (2014) argue that a composite reliability index greater than 0.6 is acceptable. Malhotra (2010) suggests a minimum acceptable value of 0.70. Fornell and Larcker (1981) suggest that the AVE should be greater than 0.5.

Convergent validity indicates the extent to which a construct's indicators converge by explaining item variation. Convergent validity is determined primarily through factor loadings and item-total correlations (Hair et al. 2016). Hair, Ringle and Sarstedt (2011) set a cut-off for factor loadings of 0.40. Hair et al. (2010) proposed a 0.30 threshold. The factor loading values are also summarised in Table 2.

Model fit

Model fit can be assessed using the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI). A good fit is indicated by an SRMR value less than 0.05 and an NFI value greater than 0.8 (Schumacker & Lomax 2010:76). The model is considered well-fit when the SRMR value is less than 0.08. The results of the fit model in this study can be seen in Table 3, which shows that this model has a good fit and meets the recommended fit model criteria. The model produced an *R*-squared value of 0.388, indicating that the predictor variables included in the model collectively account for 39% of the variance observed in behavioural intention to adopt online AR shopping for high-involvement products.

TABLE 1: Heterotrait-monotrait ratio – Matrix.

Factor name	BI	INV	OPT	PEOU	PU	SI	TRL
BI	-	-	-	-	-	-	-
INV	0.540	-	-	-	-	-	-
OPT	0.652	0.812	-	-	-	-	-
PEOU	0.534	0.708	0.781	-	-	-	-
PU	0.616	0.742	0.861	0.869	-	-	-
SI	0.467	0.758	0.736	0.621	0.671	-	-
TRL	0.574	0.757	0.772	0.755	0.743	0.645	-

BI, Behavioural intention; INV, Innovativeness; OPT, Optimism; PEOU, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability.

Path coefficient

Table 4 indicates the path-co-efficiency results and the *T*-statistics for the research constructs. Causal linkages among latent variables were examined using path analysis. The 95% confidence intervals were used for significance testing (Hair et al. 2022). The beta coefficients for H2, H4, and H6 were all positive and significant at a level of $p < 0.005$, as shown in Table 4, thus the hypotheses were accepted. Although not significant, the H3 beta coefficient was positive. Unexpectedly, the beta coefficients of H1 and H5 were negative but not statistically significant. Hence, H1, H3, and H5 were rejected. The results that have been stated will be discussed in the next section.

Discussion

Perceived ease of use was found to have had a negative (β = –0.021) yet insignificant (p = 0.754) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. This contradicts earlier findings

TABLE 2: Measurement instrument assessment.

Factor name	Factor	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)	Factor loading
BI	BI1	0.913	0.914	0.935	0.743	0.847
	BI2					0.844
	BI3					0.885
	BI4					0.889
	BI5					0.843
INV	INV1	0.827	0.833	0.885	0.658	0.763
	INV2					0.830
	INV3					0.791
	INV4					0.859
OPT	OPT1	0.873	0.875	0.913	0.724	0.840
	OPT2					0.856
	OPT3					0.872
	OPT4					0.835
PEOU	PEOU1	0.892	0.902	0.925	0.756	0.890
	PEOU2					0.788
	PEOU3					0.909
	PEOU4					0.886
PU	PU1	0.906	0.906	0.934	0.780	0.888
	PU2					0.895
	PU3					0.883
	PU4					0.865
SI	SI1	0.890	0.907	0.923	0.751	0.817
	SI2					0.901
	SI3					0.871
	SI4					0.874
TRL	TRL1	0.840	0.848	0.885	0.607	0.819
	TRL2					0.781
	TRL3					0.756
	TRL4					0.762
	TRL5					0.778

BI, Behavioural intention; INV, Innovativeness; OPT, Optimism; PEOU, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability.

suggesting that perceived ease of use positively influences consumers' adoption of AR technology in retail (Pillai, Sivathanu & Dwivedi 2020:9; Rese et al. 2017:315). Nevertheless, these results align with another prior study conducted on online AR shopping (Schapsis et al. 2021:26). Based on the results, it can be inferred that respondents have at least some level of technological literacy because the platform used to recruit respondents is online, and because the majority of respondents (n = 353; 53.2%) were relatively young (aged 20–30 years), they might quickly grasp how to use online AR shopping, making ease of use less influential in their adoption decision.

Perceived usefulness was found to have had a positive (β = 0.222) and significant (p = 0.003) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. This suggests that consumers perceive online AR shopping as a technology that enhances their online shopping and provides benefits that they might not have in VR stores. The findings corroborate those found in a study by Pillai et al. (2020:9).

Optimism was found to have had a positive (β = 0.301) and significant (p = 0.000) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. This suggests that consumers who are optimistic about new technologies will be more inclined than those who are less optimistic to adopt technologies such as online AR shopping for purchasing high-involvement products. Literature on AR adoption often notes that optimism has a significant positive influence on consumers' behavioural intention to adopt AR technology (Seol, Ko & Yeo 2017:4172), and do online AR shopping (Chakraborty & Gupta 2017:1529).

Innovativeness was found to have had a positive (β = 0.032) and insignificant (p = 0.578) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. The study's findings corroborate previous adoption research on digital mobile payment systems (Humbani & Wiese 2019:23). However, the result contradicts previous research investigating the intention to adopt AR technology (Seol et al. 2017:4172).

Social influence was found to have had a negative (β = -0.002) and insignificant (p = 0.971) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. This finding is in line with the research by Lwoga and Lwoga (2017:14), which found that social influence had a negative impact on consumers' behavioural intention to adopt new technologies. However, this contradicts a study by Jung et al. (2018:24), which found social influence to have had a positive and significant influence on AR adoption.

Trialability was found to have had a positive (β = 0.161) and significant (p = 0.008) influence on consumers' behavioural intention to adopt online AR shopping for high-involvement products. The result is consistent with previous studies that have found trialability to have had a positive and significant influence on consumers' behavioural intention to adopt new and innovative technologies (Al-Adwan & Sammour 2020:576; Wang 2014: 319).

TABLE 3: Model fit.

Measure	Saturated model	Estimated model
SRMR	0.046	0.046
d_ULS	0.987	0.987
d_G	0.419	0.419
Chi-square	1650.560	1650.560
NFI	0.885	0.885

Note: R-Square = 0.388 (39%).

SRMR, Standardized Root Mean Square Residual; NFI, Normed Fit Index; d_ULS, the squared Euclidean distance; d_G, the geodesic distance.

*, $p \leq 0.05$.

TABLE 4: Path coefficients.

Hypothesised paths	Standardised estimate (β)	T-statistics (|O/STDEV|)	p	Decision
INV -> BI	0.032	0.556	0.578	Rejected
OPT -> BI	0.301	4.754	0.000	Supported
PEOU -> BI	-0.021	0.313	0.754	Rejected
PU -> BI	0.222	2.974	0.003	Supported
SI -> BI	-0.002	0.037	0.971	Rejected
TRL -> BI	0.161	2.662	0.008	Supported

BI, Behavioural intention; INV, Innovativeness; OPT, Optimism; PEOU, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability; O, Original; STDEV, standard deviation.

*, $p \leq 0.05$

Practical and theoretical implications of the study

The study aligns with TAM and TRI 2.0, indicating that perceived usefulness, optimism and trialability significantly influence consumers' adoption intention of online AR shopping for high-involvement products. Innovativeness and social influence also positively influence adoption intention, although insignificantly. However, contrary to TAM, perceived ease of use negatively impacts adoption intention. This suggests that South African consumers' optimism and the advantages of using online AR shopping outweigh their prior apprehension towards virtual shopping. Thus, AR retailers should prioritise these factors for success.

Theoretical and practical contribution of the study

This study integrates two technology acceptance frameworks, offering a thorough examination of factors influencing consumers' adoption intention for online AR shopping of high-involvement products. Key findings from this study hold significant value for online retailers, marketers and scholars alike.

The research outcomes can assist marketing practitioners in overcoming challenges related to shifting consumer behaviour from physical stores to online platforms, and in crafting effective online shopping environments. Moreover, retailers can utilise these findings to better segment markets, target appropriate customer demographics and optimise online AR experiences to drive conversions and enhance customer relationships, ultimately boosting sales. This research

also appeals to advertising professionals seeking to understand consumer attitudes towards AR technology in retail. Furthermore, this study contributes to the understanding of technology adoption in developing countries such as South Africa, offering insights that can guide marketers in devising effective strategies and resource allocation within this context.

Limitations and future recommendations

The study's model achieved a good fit; however, it indicates that the predictor variables included in the model collectively account for 38% (r = 0.388) of the variance observed in behavioural intention to adopt online AR shopping for high-involvement products. This suggests that while the model provides a reasonable explanation for behavioural intention, adoption is complex thus there are other factors outside the model contributing to the remaining variance. Future research should enhance the model by incorporating additional predictors such as facilitating conditions, value, trust or variables from other technology acceptance frameworks to bolster its predictive capability.

Limitations include data collection solely within South Africa and testing exclusively in a specific socio-economic group (medium to high income), which restricts the generalisability of findings and application of recommendations across different geographical, cultural and economic contexts. Further research is needed in other developing countries to validate these results, employing more diverse samples in terms of socio-demographic variables to enhance study applicability.

The study utilised quantitative data gathered through online surveys, potentially biased by sampling limitations related to internet access and technology usage. Future studies could augment value by employing quantitative methods such as print self-administered surveys in suburban and township stores that sell high-involvement products. Adopting mixed-method approaches could also facilitate data triangulation for more robust interpretations.

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Authors' contributions

K.M.N. wrote the literature, methodology, and empirical part of the article, while K.M.M. supervised the study and assisted in its conceptualisation.

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Data availability

The data that support the findings of this study are available from the corresponding author, K.M.N., upon reasonable request.

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