The Mediating Role of Trialability in Consumer Adoption of Augmented Reality Shopping for High-Involvement Products in South Africa

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Abstract

South Africa's retail sector is driven by innovation; and the integration of augmented reality (AR) technology into the online shopping experience offers numerous possibilities. However, despite AR's potential to transform the online shopping experience, particularly for high-involvement products, its adoption remains limited. Furthermore, there has been limited research on AR adoption in developing economies, such as South Africa. This study explored the factors that influence consumer adoption of AR shopping for high-involvement products, with specific focus on the mediating role of trialability. Employing a positivist approach and a descriptive research design, an online self-administered questionnaire was distributed to 664 respondents. The data was analysed using structural equation modelling with the statistical program Smart PLS. The results showed that perceived usefulness and trialability significantly and positively influence behavioural intention. Trialability was found to fully mediate the relationship between perceived ease of use, social influence, and behavioural intention. Trialability fully mediates the relationship between perceived usefulness and behavioural intention. By highlighting the importance of trialability, the study offers valuable insights for retailers and AR shopping developers aiming to improve consumers' online experiences and boost adoption in emerging markets. These findings contribute significantly to theoretical advancements by closing a critical gap in the literature concerning consumer adoption of online AR shopping, particularly in emerging markets, like South Africa. The theoretical and managerial implications discussed pave the way for strategies to foster acceptance and utilisation of AR technologies in shopping for high-involvement products.

1. Introduction

The retail industry in South Africa has significantly improved consumers' shopping experiences largely due to the construction of modern shopping malls and the adoption of innovative technologies (Mlambo, 2024). Despite its increasing revenue and anticipated growth rates, South Africa's online retail sector faces several challenges (Van Rooyen & Amoah, 2021). In 2023, online shopping accounted for about 6% of the country's total retail industry (IT News Africa, 2025). The COVID-19 pandemic accelerated the shift to online shopping, prompting businesses to explore innovative ways to improve customer experiences. However, many retailers grapple with challenges such as high return rates (Wagaine, 2022), webrooming (Flavián et al., 2020), and abandoned online shopping carts (Rausch et al., 2022). These issues arise from the lack of direct product interaction such as inadequate sensory product presentations, which is typical in offline shopping (Farhana et al., 2017). Furthermore, high-involvement products are the least purchased on South African e-commerce platforms compared to low-involvement products (Payflex, 2022).

In the retail industry, AR is particularly useful for improving the online shopping experience by helping consumers overcome their inability to visualise and try products physically before making a purchase, especially for high-involvement products (Khalid, 2023). For example, consumers can now virtually try on clothing, using their smartphone cameras to give them a realistic idea of how the items will look on them (Hilken et al., 2018). Similarly, furniture retailers can help customers see how pieces would look in their homes (Sihi, 2018).   Therefore, AR applications have the potential to transform the traditional online retail sector by providing more engaging, informative and personalised experiences.

Integrating AR applications into online retail platforms has the potential to revolutionise the online shopping experience. In South Africa, smaller businesses have shown a noticeable increase in interest in artificial intelligence in South Africa

(SME South Africa, 2017). Despite the clear benefits of implementing AR in retail, its adoption remains limited even in affluent and technologically advanced countries (Bonnin, 2020). There is a lack of understanding how this technology affects consumer behaviour and the overall shopping experience, especially in developing countries (Mlambo, 2024). Additionally, seamlessly integrating AR into existing systems and measuring its return on investment pose are significant challenges for retailers (Mlambo, 2024). Therefore, comprehensive research is urgently needed to evaluate how AR applications can effectively enhance the in-store shopping experience and offer actionable insights for retailers, particularly in developing nations characterised by diverse consumer segments, demographics, genders and cultures (Boardman et al., 2020). Therefore, the study aims to achieve the following objectives:

- To identify the factors that affect consumers' willingness to adopt online AR shopping for high-involvement products in South Africa.
- To determine the mediating influence of trialability on factors that influence consumers' adoption of online AR shopping for high-involvement products in South Africa.

1.2 Theoretical Grounding for the Study

The Technology Acceptance Model (TAM) proposed by Venkatesh and Davis (1996) employs causal links to better understand and explain information technology acceptance behaviour. TAM suggests that individuals are more inclined to adopt a technology when they believe it is beneficial and simple to use. TAM has been proven effective in explaining users' behavioural intentions, particularly in AR shopping (Perannagari & Chakrabarti, 2020; Rese et al., 2017). Therefore, TAM's simplicity and direct causative links align well with our research objectives to understand user acceptance behaviours of AR shopping platforms. The model's reliability and versatility have effectively allowed previous researchers to extend and successfully apply it in various contexts. Additionally, researchers propose that the model be expanded to include more variables to better understand adoption behaviour, especially AR adoption (Leue et al., 2014). Trialability is a well-known characteristic in the context of augmented reality, because it allows consumers to try products before the actual purchase. Therefore, trialability is a crucial part of the adoption of online AR shopping platforms. Simply perceiving the technical characteristics of an innovation may not fully capture all aspects that could potentially influence users' willingness to adopt the technology; as such, a more comprehensive understanding of acceptance and adoption must consider additional factors. Based on these recommendations, social influence was added as a factor that attracts users to adopt the technology, and trialability was included as a mediating variable to strengthen the relationship between perceived ease of use, perceived usefulness, social influence and behavioural intention (adoption).

1.3 Hypotheses Development

Perceived ease of use

Retailers need user-friendly online platform interfaces to make online shopping seem easy and encourage consumers to try it, especially to purchase high-involvement products. Ease of use describes how effortless and intuitive a system feels (Selamat & Windasari, 2021). Perceived ease of use plays a crucial role in the adoption of emerging technologies, especially within the context of developing countries (Rani & Kumar, 2023). Studies on AR shopping support this: consumers are more likely to try AR shopping if it appears to be easy to use. For instance, a study in Pakistan found that consumers were more likely to use mobile AR shopping if they thought it was easy to use (Saleem et al., 2022). Similar studies in Malaysia (Alam et al., 2021) and other countries (Rese et al., 2017) also found that perceived ease of use increased consumers' willingness to try AR shopping. This suggests that ease of use is generally important for getting consumers to adopt new technologies, like AR shopping platforms, for encouraging consumers to adopt new technologies like AR shopping platforms.

This indicates that making AR shopping easy to use is critical for getting consumer adoption, especially for high-involvement products that require more careful consideration before purchasing. If consumers perceive AR shopping as easy to use, they are more likely to try it and recognise its benefits. Therefore, ease of use is a key factor in determining whether people will use AR shopping for high-involvement purchases. Based on this evidence, the following hypothesis is proposed:

H_1: Consumer's behavioural intention to adopt online AR shopping for high-involvement products is positively influenced by perceived ease of use.

Perceived usefulness

Consumers are more likely to adopt new technologies they find valuable. This trend is evident in various fields such as online learning (Al-Rahmi et al., 2019), fintech (Rani & Kumar, 2023), and even online shopping (Selamat & Windasari, 2021). Perceived usefulness refers to how beneficial consumers believe a new technology will be in helping them achieve their tasks (Ugwuanyi et al., 2021). Research on adopting AR shopping in developing countries supports this idea, showing a positive link between perceived usefulness and behavioural intention (adoption) in Malaysia (Alam et al.,

2021); and Pakistan (Saleem et al., 2022). These studies highlight AR technology's potential to enhance consumers' shopping experiences by providing valuable information and simplifying the decision-making process especially for high-involvement products.

Based on the previously mentioned findings, it can be argued that consumers' behavioural inclinations and adoption of online augmented reality shopping for high-involvement products are significantly influenced by perceived usefulness. Consumers are more likely to adopt AR shopping technology for their high-commitment product purchases if they perceive it as a valuable tool for obtaining information, thoroughly examining products, and making well-informed decisions. Therefore, the following hypothesis was developed:

H_2: Consumer's behavioural intention to adopt online AR shopping for high-involvement products is positively influenced by perceived usefulness.

Social influence

To make well-informed decisions, especially for expensive and significant purchases, consumers frequently rely on the advice, views and expertise of others. The term "social influence" refers to how other people, such as friends and family, affect a person's attitudes, beliefs, thoughts and feelings regarding embracing new technology (Singh et al., 2020). In other words, if customers see others exhibiting a behaviour, they are more likely to follow suit.

Social influence plays a significant role in shaping consumers' intentions when it comes to adopting AR. Numerous research studies have shown that social influence positively impacts the adoption of new technologies such as cloud computing (Jaradat et al., 2020); and tourism (Siang et al., 2019). In the context of online shopping, social influence has been found to positively affect consumers' intentions to adopt AR technology (Erdmann et al., 2021). This research suggests that social influence can encourage consumers to shop for high-involvement products on online AR shopping platforms. Additionally, consumers who trust their reference groups are more likely to experiment with new innovations that help them perform tasks effectively and efficiently. Therefore, the research mentioned above supports the following hypothesis:

H_3: Consumer's behavioural intention to adopt online AR shopping for high-involvement products is positively influenced by social influence.

Trialability

Trialability refers to the extent to which consumers feel they can test an innovative product or technology before making a decision (Chang et al., 2016). It has been shown to positively and significantly influence behavioural intention in the adoption of AR in entertainment (Tiwari & Damle, 2020). The findings are supported by studies conducted in developing countries and various contexts that confirm that trialability positively impacts consumers' intentions to adopt online AR shopping (Alam et al., 2021), and fintech (Rani & Kumar, 2023).

Past studies have identified a positive and significant relationship between trialability, perceived ease of use, and perceived usefulness. For example, Al-Rahmi et al., (2019) found that triability positively and significantly influenced a study that investigated the potential factors influencing students' behavioural intentions to use the e-learning system. Al-Rahmi et al., (2019) found a positive and significant influence between trialability and perceived usefulness of students' intention to use new technological innovations in higher education institutions. However, a positive yet insignificant influence was found between trialability and perceived ease of use. A positive and significant influence was found between trialability, perceived ease of use, and perceived usefulness of students' intention to use new technological innovations in higher education institutions (Teo et al., 2019). Additionally, a study on mobile banking adoption found that trust positively and significantly influences trialability. It is important because trust and social influence are interconnected (Changchun et al., 2017). Individuals are often influenced by those they trust, such as family members, peers, or online communities, especially when deciding whether to engage with new or unfamiliar technologies. In this context, trust serves as a foundational element for social influence, suggesting that individuals are most likely to try new technologies when these influences come from trusted sources.

Perceived ease of use has been proven to fully mediate the relationship between trial and intention to adopt various new technological innovations, such as smartwatches (Choe & Noh, 2018) and mobile TVs (Soscia et al., 2011), and partially mediates the relationship between trial and intention to adopt traveling apps. (Tiwari et al., 2024). A study that aimed to investigate the key factors influencing the trialability of mHealth apps/services and behavioural intention to adopt mobile health applications, found that relative advantage, compatibility, complexity and trialability were found to have a positive and significant influence on behavioural intention. Furthermore, trialability fully mediated the relationship between relative advantage, compatibility, complexity and behavioural intention (Jilani et al., 2022). Trialability also mediated the relationship between trust and intention in the adoption of mobile banking (Changchun et al., 2017). Additionally, trialability was found to mediate the relationship between task technology fit (TTF) and intention (Changchun et al.,

2017). According to Oliveira et al. (2014), "TTF is the rational perspective of what a new technology can do to optimize a job". Therefore, TTF is similar to perceived usefulness and ease of use. The results of the studies mentioned above suggest that trialability enables consumers to assess if new technologies are compatible, lowers their uncertainty, and strengthens their trust in the usefulness and value of the technology which might increase their likelihood of adoption. Based on the findings, the following hypotheses were formulated:

H_4: Consumer's behavioural intention to adopt online AR shopping for high-involvement products is positively influenced by trialability.

H_5: Trialability to adopt online AR shopping for high-involvement products is positively influenced by perceived ease of use.

H_6: Trialability to adopt online AR shopping for high-involvement products is positively influenced by perceived usefulness.

H_7: Trialability to adopt online AR shopping for high-involvement products is positively influenced by social influence.

H_8: Trialability mediates the relationship between perceived ease of use and behavioural intention to adopt online AR shopping for high-involvement products.

H_9: Trialability mediates the relationship between perceived usefulness and behavioural intention to adopt online AR shopping for high-involvement products.

H_{10}: Trialability mediates the relationship between social influence and behavioural intention to adopt online AR shopping for high-involvement products.
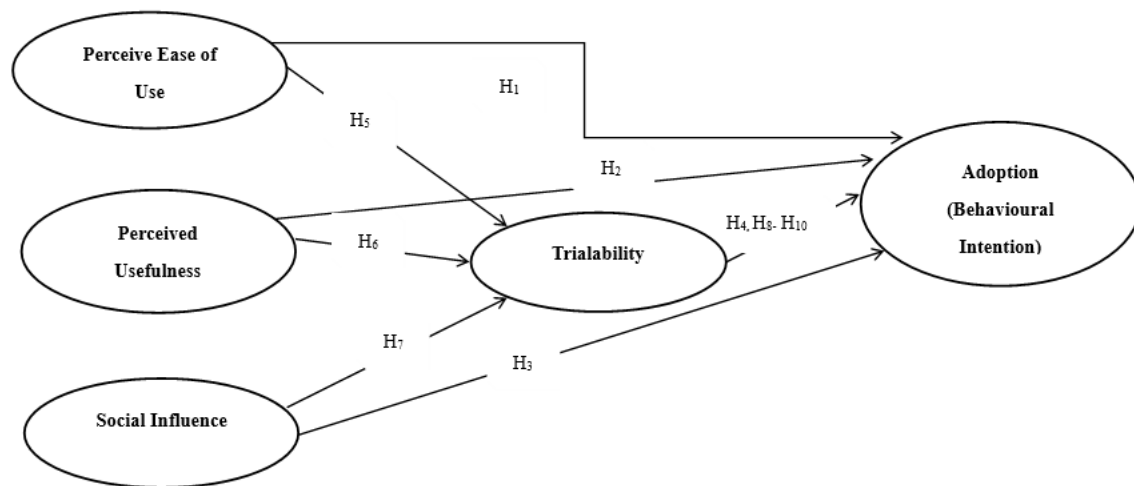

Figure 1. Conceptual model

2. Method

This study employed a quantitative research design. Statistical analyses were used to determine the relationships between the variables.

2.1 Sampling and Respondents

A simple random sampling method was used to choose the study's respondents. The analysis comprised a total of 664 responders. Consumers from South Africa, aged 18 to 65, who shop in-person or online for high-involvement products were included in the sample. An independent research company known as Springvale Online collected the data.

2.2 Data Collection and Measuring Instrument

Online self-administered questionnaires were used to collect data. Given the research's online focus, this approach was particularly fitting. Additionally, to ensure inclusivity for respondents unfamiliar with online AR shopping platforms, a link was provided for firsthand experience, especially in regions like South Africa where such technology is still new.

The research operationalised constructs based on previous studies, with adjustments made to fit the current research context. Perceived ease of use and perceived usefulness were measured, using four-question scales from Venkatesh and Davis (2000). Innovativeness, optimism, discomfort, insecurity and social influence were assessed, using a 16-question scale adapted from Parasuraman and Colby (2015) and Venkatesh et al., (2003). Trialability, risk barrier, tradition barrier and image barrier were measured using scales adapted from various sources (Chang et al., 2016; Rammile & Nel, 2012; Khanra et al., 2021).

Behavioural intention was gauged using a five-question scale from Johnson et al., (2018). All items were rated on a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree." Respondents were randomly selected from the Springvale Online database, which consists of over 45,000 consumers. In total, 664 completed questionnaires were collected.

2.3 Ethical Considerations

The University of South Africa's Ethics Review Committee approved the research with reference number 2020_MRM_007. The respondents gave their voluntary written consent to participate in the research; and their answers were coded and referred to as such in the data analysis to protect their identity.

3. Results

3.1 Analysis of Data

Data analysis was conducted using SmartPLS 4.0 and the Statistical Package for Social Sciences (SSPS) version 28. Descriptive analyses were performed and structural equation modelling was used to achieve the study's objectives.

The study examined the demographic characteristics and socio-economic profiles of the respondents. The data, summarised in the table below, provides key insights into gender distribution, age demographics, ethnic composition, income brackets and levels of education levels among respondents.

Demographics of the respondents

Table 1. Demographics

Category	Percentage (%)	Count (n)
Gender		
Female	56.2%	373
Male	43.8%	291
Age Group		
21–30 years	53.2%	353
31–40 years	28.3%	188
41–50 years	15.3%	102
51–60 years	3.2%	21
Ethnicity		
African	72.1%	479
Coloured	12.5%	83
White	10.0%	67
Indian	4.3%	29
Asian	0.5%	3
Prefer not to say	0.3%	2
Other	0.1%	1
Income		
R15 000 or less	47.4%	315
R16 000–R25 000	25.6%	170
R26 000–R35 000	11.2%	74
R36 000–R45 000	4.2%	28
R46 000–R55 000	2.4%	16
R56 000 and above	3.2%	21
Prefer not to say	6.0%	40
Level of Education		
Matric (Grade 12)	32.3%	215
Degree	25.9%	172
Diploma	16.1%	107
Higher Certificate	15.5%	103
Postgraduate Qualification	5.7%	38
Did not complete Matric	4.5%	30

Table 1 shows that most respondents were female (56.2%), with the largest age group being between 21 to 30 years old (53.2%). Most respondents (72.1%) identified as African, followed by Coloured people (12.5%) and White people (10.0%) In terms of income, nearly half of the participants earned R15,000 or less (47.4%). There was also a notable variation in educational qualifications, with 32.3%having a Matric (32.3%) and (25.9%) holding a degree.

3.2 Discriminant and Convergent Validity

Discriminant and convergent validity were evaluated to ensure that the reflective construct had stronger relationships with its indicators than with any other constructs. Discriminant validity was confirmed since the HTMT values were below 0.90, (Rönkkö & Cho, 2022). The HTMT values for each construct are summarised in table 2.

Table 2. Heterotrait-monotrait ratio (HTMT) – Matrix

Factor Name	BI	PEOU	PU	SI	TRL
BI					
PEOU	0,534				
PU	0,616	0,869			
SI	0,467	0,621	0,671		
TRL	0,574	0,755	0,743	0,645	

BI, Behavioural intention; PEO, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability

Convergent validity, as defined by Zelkowitz and Cole (2016), refers to the extent to which item variation explains the convergence of a construct's indicators. Factor loadings and item-total correlations are the main methods used to assess convergent validity. Hair et al. (2011) established a threshold of 0.40 for factor loadings. As a result, convergent validity was confirmed. The factor loading values are summarised in table 3.

Table 3. Outer-loading matrix

Factor	BI	PEOU	PU	SI	TRL
BI1	0,848				
BI2	0,845				
BI3	0,885				
BI4	0,888				
BI5	0,842				
PEOU1		0,889			
PEOU2		0,794			
PEOU3		0,907			
PEOU4		0,883			
PU1			0,891		
PU2			0,896		
PU3			0,883		
PU4			0,862		
SI1				0,826	
SI2				0,899	
SI3				0,874	
SI4				0,867	
TRL1					0,816
TRL2					0,790
TRL3					0,769
TRL4					0,756
TRL5					0,769

BI, Behavioural intention; PEO, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability

Construct Validity and reliability

In the study, construct validity and reliability were evaluated using Cronbach's alpha, composite reliability, and average value extracted (AVE). The scores are displayed in table 4. According to Zikmund and Babin (2013) the acceptable range for Cronbach alpha coefficient values is 0.71 to 0.89. Hair et al., (2014), suggest that a composite reliability (CR) index above 0.6 is appropriate. Malhotra (2010) recommends a minimum value of 0.70. Fornell and Larcker (1981), state that the AVE should be above 0.5. Since all measures met the requirements, construct validity and reliability were confirmed.

Table 4. Measurement instrument assessment

Factor name	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
BI	0,913	0,914	0,935	0,743
PEOU	0,892	0,898	0,925	0,756
PU	0,906	0,906	0,934	0,780
SI	0,890	0,897	0,924	0,751
TRL	0,840	0,844	0,886	0,609

BI, Behavioural intention; PEO, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability

3.3 Model Fit

Model fit can be assessed using the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI). According to Schumacker and Lomax (2010), a desirable fit is indicated by an SRMR value below 0.05 and an NFI value above 0.8. Additionally, Hu and Bentler (1998) suggest that a model is adequately fitted when the SRMR value is less than 0.08. The fit indices for the model in this study are presented in table 5, demonstrating that the model exhibits a strong fit and meets the recommended criteria.

Table 5. Model fit

Measure	Saturated model	Estimated model
SRMR	0,048	0,048
d_ULS	0,591	0,591
d_G	0,250	0,250
Chi-square	981,423	981,423
NFI	0,905	0,905

*$P \leq 0.05$

3.4 Path Coefficient

Path analysis, as described by Henseler et al. (2016), was used to examinee causal relationships among latent variables. Significance testing was conducted, using 95% confidence intervals. (Hair et al., 2022). The results of the model analysis and hypothesis testing are shown in table 6 and figure 2. The beta coefficients for H_2, H_4, and H_5, H_6, H_7 were all positively significant at a level of $p<0.05$, leading to the acceptance of these hypotheses. However, although the beta coefficients for H_1 and H_3 were positive, they did not reach significance, resulting in the rejection of these hypotheses.

Table 6. Path coefficients (direct effect)

Hypothesized Paths	Standardized Estimate (β)	T statistics (|O/STDEV|)	P values
PEOU -> BI	0,016	0,235	0,814
PEOU -> TRL	0,331	6,017	0,000
PU -> BI	0,357	5,002	0,000
PU -> TRL	0,259	4,425	0,000
SI -> BI	0,076	1,671	0,095
SI -> TRL	0,221	5,248	0,000
TRL -> BI	0,223	3,901	0,000
Model R-Square			
BI= 0,354 (35%); TRL=0,511 (51%)			

BI, Behavioural intention; PEO, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability
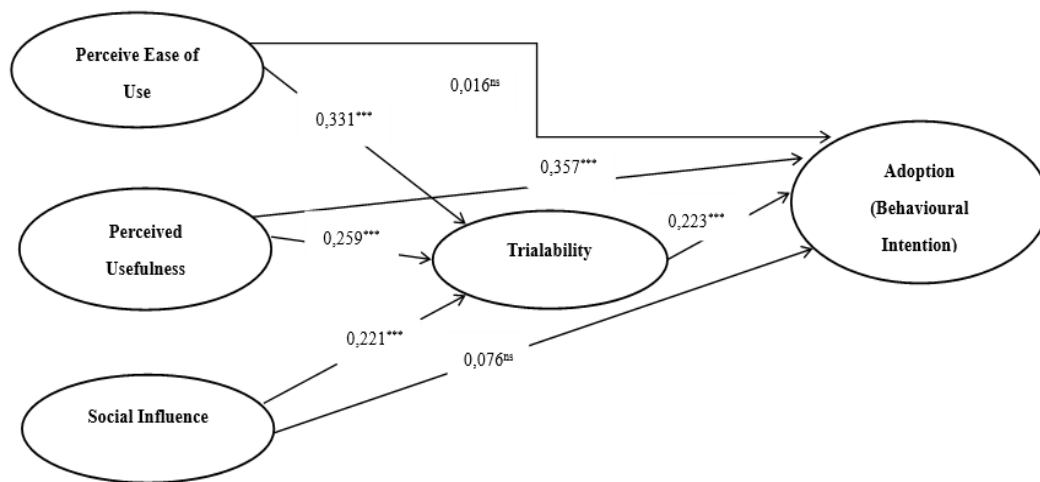
*$P \leq 0.05$

Figure 2. Structural model with path coefficients

Table 7 shows the results of indirect effects, indicating mediation. Mediation was assessed using Baron and Kenny's (1986) criteria. Trialability fully mediated the association between perceived ease of use and behavioural intention, as well as between social influence and behavioural intention. Additionally, trialability partially mediated the relationship between perceived usefulness and behavioural intention. Therefore, the findings support hypotheses H_8, H_9, and H_{10}.

Table 7. Mediation (indirect effect)

Hypothesised Paths	Standardized Estimate (β)	T statistics (|O/STDEV|)	P values
PEOU -> TRL -> BI	0,074	3,470	0,001
PU -> TRL -> BI	0,058	2,844	0,004
SI -> TRL -> BI	0,049	2,951	0,003

BI, Behavioural intention; PEO, Perceived ease of use; PU, Perceived usefulness; SI, Social influence; TRL, Trialability

$P \leq 0.05$

4. Discussion

In the study, perceived ease of use had a positive (β = 0.016) but statistically insignificant (p = 0.814) impact on consumers' willingness to adopt online AR shopping for high-involvement products. This aligns with prior research indicating that ease of use may not always significantly influence AR technology adoption in retail contexts (Pillai et al., 2020; Rese et al., 2017). Advances in AR technology and user interface design have made many applications more intuitive and user-friendly, reducing the importance of ease of use, especially for users already exposed to similar technologies. Similarly, social influence had a positive (β = 0.076) but statistically insignificant (p = 0.095) impact on consumers' intention to adopt online AR shopping for high-involvement products. The finding supports earlier research indicating that social factors are crucial in consumer acceptance of AR applications across various contexts (Jung et al., 2018). On the other hand, perceived usefulness had a significantly positive influence (β = 0.357, p = 0.000) on consumers' behavioural intention to adopt online AR shopping for high-involvement products. This suggests that consumers view online AR as enhancing their shopping experience with benefits not available in virtual reality or traditional in-store settings, which is consistent with previous findings (Kim et al., 2017; Pillai et al., 2020).

Trialability was found to significantly influence consumers' behavioural intention to adopt online AR shopping for high-involvement products, with a positive β coefficient of 0.223 and a p-value of 0.000. It is also positively influenced by perceived ease of use, perceived usefulness and social influence, aligning with prior research on technology adoption behaviours (Al-Adwan & Sammour, 2020). Furthermore, trialability plays a mediating role: it partially mediates the relationship between perceived usefulness and behavioural intention, and fully mediated the relationships between perceived ease of use, social influence and behavioural intention. This reinforces the importance of trialability as a critical mediating factor in the process of adopting online AR shopping.

4.1 Practical and Theoretical Implications of the Study

The findings of this study carry important theoretical and practical implications.

This study theoretically extends the TAM by adding social influence as an independent variable and trialability as a mediating variable. This responds to previous calls to include social and contextual factors, such as hedonic technology characteristics, to enhance TAM's explanatory power in emerging technological contexts (Davis & Granić, 2024; Rahimi & Oh, 2024). The study shows that trialability significantly mediates the relationship between perceived ease of use, perceived usefulness, and social influence and consumers' behavioural intention to adopt online AR shopping. This nuanced role of trialability provides deeper insights into how and why consumers adopt AR technologies for high-involvement purchases. The findings align with and extend prior research that has highlighted trialability's role in increasing user confidence and reducing uncertainty with technology use (Mansoor et al., 2024; Thongboonma & Kerdvibulvech, 2023). Additionally, the study reports a higher R-squared value for trialability (r = 0.51) compared to behavioural intention (r = 0.35), the study empirically supports the claim that trialability plays a critical mediating role in technology adoption, which prior literature has underexplored in the context of AR shopping (Mansoor et al., 2024).

The practical insights from this study are valuable for online retailers, marketers and technology developers. Online retailers should recognise that trialability can significantly shape consumers' adoption intentions highlighting the importance of interactive and risk-free trial experiences with AR features on their platforms. For marketers, emphasising trialability in promotional strategies can increase user engagement and trust, especially when promoting high-involvement products. Strategically, these findings offer actionable guidance on designing AR shopping environments that reduce user uncertainty, enhance experiential value, and ultimately drive adoption.

4.2 Limitations and Future Recommendations

The study has several limitations that should be considered. Firstly, the data collection was limited to South Africa and focused exclusively on a socio-economic group of medium to high-income individuals. This restricts the generalisability of the findings to other geographical, cultural and economic contexts. Additionally, the sample was skewed towards younger respondents, with over 50% respondents falling within the younger age brackets. As a result, age may also limit the generalisability of the findings, particularly in understanding the adoption behaviour of older consumers who may have different levels of digital literacy, trust, or comfort with online AR technologies. Future research should aim to validate these findings in other developing countries using a more demographically balanced sample across age groups and a broader range of socio-demographic variables. This also presents an opportunity for future research to explore how consumer characteristics, such as gender and age, interact with product category to influence the adoption of AR technologies. By conducting multi-group analyses, future studies could generate more targeted insights for different consumer groups and product categories, ultimately enhancing the practical value of AR adoption models for diverse retail contexts.

Secondly, the study used quantitative data gathered through online surveys, which may introduce biases related to

sampling, particularly concerning internet access and technology usage. To enhance the study's value, future research could complement these methods by incorporating quantitative approaches, such as self-administered surveys distributed in suburban and township stores catering to high-involvement products. Adopting mixed-methods approaches could also strengthen findings through data triangulation, leading to more robust interpretations.

Thirdly, although the study's model demonstrated a good fit, it explained 35% of the variance in behavioural intention and 51% of the variance in trialability. This indicates that while the model effectively captures factors influencing trialability, it provides a moderate explanation for behavioural intention, suggesting potential for improvement. Future studies could enhance the model by incorporating additional predictors such as facilitating conditions, perceived value, trust, or variables from other technology acceptance frameworks to enhance its predictive accuracy and comprehensiveness.

Finally, this study opens avenues for exploring mixed reality (MR) technologies, which combine augmented and virtual elements to create more immersive and dynamic shopping experiences. Platforms such as WeChat and Tridge are already developing MR interfaces to blend digital commerce with real-world interaction, indicating a convergence of AR with broader MR environments. These platforms demonstrate how advanced digital ecosystems are moving beyond standalone AR tools towards fully integrated, socially driven, and context-aware shopping platforms. Future research could examine how trialability functions within MR environments, where users interact with products in more complex multisensory and social contexts, potentially enhancing the construct's impact on consumer adoption.

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