Educational Administration: Theory and Practice
2024, 30(11), 3289-3301
ISSN: 2148-2403
https://kuey.net/

Research Article

"Decoding User Acceptance of AR in Retail: A Field Study Across Gujarat's Metropolitan Hubs"

Tinkle Shukla[1*], Dr Priyanka Shah[2]

[1*]Research Scholar, Department of Management, Gujarat Technological University, Gujarat, India Email ID: twinkleshukla027@gmail.com
[2]PhD Supervisor, Department of Management, Gujarat Technological University, Gujarat, India Email ID: priyanka@hotmail.com

Citation: Tinkle Shukla, et.al (2024). "Decoding User Acceptance of AR in Retail: A Field Study Across Gujarat's Metropolitan Hubs", *Educational Administration: Theory and Practice*, 30(11) 3289-3301
Doi: 10.53555/kuey.v30i11.11430

ARTICLE INFO

ABSTRACT

Augmented Reality (AR) is one of the most important information layers of digital transformation. AR is the superimposition of digital information, audio, visual or graphic, over the physical environment using smartphones, tablets and AR glasses. The use of AR technology in retail has created engaging experiences for the consumer, including virtual product trials and interactive stores, leading to completely new ways of interacting with the brand. This study attempts to analyse the factors influencing the adoption of AR technology in the retail trade of the four major metropolitan cities of Gujarat: Ahmedabad, Surat, Vadodara and Rajkot. The study developed a model with the constructs of self-efficacy, personal innovativeness, perceived usefulness, perceived ease of use and external pressure and analysed data from 233 retail companies through Smart-PLS-3. Key statistical results reveal that customer pressure and competitive pressure Are the strongest external drivers for adopting AR. Additionally, perceived usefulness and attitude significantly positively impact adoption intentions Conversely, perceived cost serves as a significant deterrent. Notably, self-efficacy was found to be the most influential predictor of perceived ease of use. The implications of these findings suggest that while market demand and competition push retailers toward AR, high operating costs remain a primary barrier. To foster adoption, administrators and manufacturers should focus on providing financial incentives and simplifying the technical installation process to enhance user-friendliness.

Keywords: Adoption in retail, Augmented Reality, Gujarat, Retail Industry, Technology acceptance

Introduction

The retail sector is rapidly growing online with the help of technological advancements particularly with the help of Augmented Reality (AR). AR improves the shopping experience by creating a digital content into the physical world. AR offers customers an interactive way to engage with products/services. AR not only improves customer engagement but also provides retailers with new avenues for brand differentiation (Pantano and Naccarato,2016)

The potential of AR to transform retail experiences has been widely recognized. According to Yim et al. (2017), AR can facilitate personalized shopping experiences, thereby increasing customer satisfaction and loyalty. However, despite its promising advantages, the adoption of AR technology remains inconsistent across different markets. Factors such as technological readiness, perceived usefulness, and user experience play critical roles in determining how retailers integrate AR into their operations (Scholz & Steinmetz, 2019). In Gujarat, a region characterized by a rapidly evolving retail landscape and diverse consumer demographics, understanding these factors is essential. Previous studies have highlighted regional variations in technology adoption, emphasizing the need for localized research to tailor strategies effectively (Rao et al., 2020). By focusing on the unique characteristics of Ahmedabad, Surat, Vadodara, and Rajkot, this study aims to provide insights into the barriers and facilitators of AR adoption in the retail sector.

Augmented Reality in India

Advanced technologies have rapidly gained traction post-pandemic, with Indian companies adopting tools like Mixed Reality, AI, AR, VR, and Big Data to boost productivity. AR technology requires smart devices or

cameras for use. In 2021, the global AR market was valued at $28 billion, projected to reach $250 billion by 2028. In India, AR adoption increased significantly, rising from $0.34 billion in 2017 to $1.83 billion in 2020, reflecting a compounded annual growth rate (CAGR) of 75%.

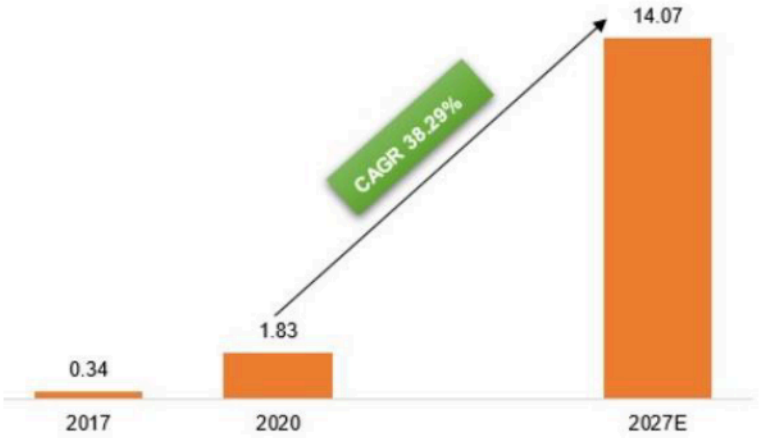

Figure 1 *Source: Indian Brand Equity Foundation (IBEF)*
https://www.ibef.org/blogs/india-s-ar-vr-market

Research and Markets projects India's augmented reality (AR) market will grow at a CAGR of 38.29%, reaching US$ 14.07 billion by 2027. This growth is fueled by increasing smartphone adoption and internet connectivity. In 2021, India had 1.2 billion mobile subscribers, with 750 million smartphones, particularly among the tech-savvy youth in Tier 2 and Tier 3 cities. AR technology is increasingly integrated into sectors like retail, education, gaming, and healthcare.

Theoretical Background

The acceptance of augmented reality is analysed through various technology adoption theories, with a focus on the Technology Acceptance Model (TAM), which is based on the Theory of Reasoned Action (TRA). TAM includes constructs like perceived ease of use (PEU) and perceived usefulness (PU), shaping user motivation towards technology adoption. It accounts for a significant portion (30-40%) of system usage, with PU often cited as the most influential factor. However, TAM has limitations, including restrictive factors that hinder its ability to adapt to new technologies and inconsistent empirical results. Researchers suggest that incorporating additional context-specific constructs could enhance TAM's explanatory power, indicating a need for model extension.

The standard Technology Acceptance Model (TAM) focuses on how a system performs, but it often misses the "human" element—the psychological traits and external pressures that move a person from seeing a tool to actually using it. This study extends TAM to include these vital layers. The "I Can Do It" Factor (Self-Efficacy): Based on Albert Bandura's Social Cognitive Theory, self-efficacy is a person's belief in their ability to master a task. If a retailer lacks confidence in their technical skills, even the most user-friendly AR tool will seem difficult. The study confirms this, finding self-efficacy to be the strongest driver of perceived ease of use. The "Early Adopter" Spirit (Personal Innovativeness): This identifies individuals naturally inclined to try new things. "Innovators" have a higher tolerance for the learning curves of new tech. Theoretically; this trait helps retailers see the perceived usefulness and value of AR much faster than others. The Neighbourhood Effect (External Pressures): No business operates in a vacuum. Drawing from Institutional Theory, companies adopt tools like AR to maintain legitimacy and keep up with market standards. The results show that Customer Pressure and Competitive Pressure are the main reasons Gujarat retailers feel compelled to change.

Conceptual Model & Construct development

The conceptual framework of this study is based on the Technology Acceptance Model (TAM) with the inclusion of additional factors. These factors include self-efficacy, personal innovativeness, perceived cost, technological knowledge, customer pressure, competitive pressure, trade partner pressure, external support, and competitor pressure, as depicted in Figure 1.In the conceptual framework, as illustrated in Figure 1, personal innovativeness, trading partner pressure, and competitive pressure are associated with user open innovation; perceived usefulness, perceived ease of use, and customer pressure are linked to customer open innovation; and external support and technological knowledge are connected to engineer open innovation.

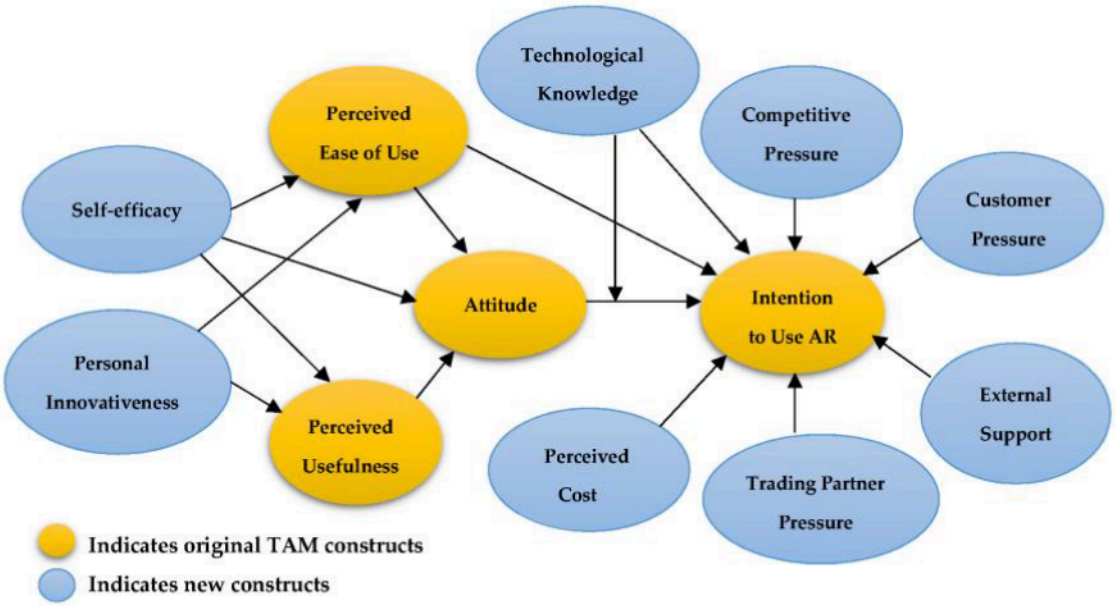

Figure 1. Conceptual model

Self-efficacy

Self-efficacy refers to an individual's belief in their ability to succeed in specific situations or complete a task. It affects the way people approach goals, tasks and challenges. Higher self-efficacy can lead to greater motivation, resilience, and persistence, while lower self-efficacy can lead to avoidance of challenges and lack of effort. This concept was developed by the psychologist Albert Bandura and plays an important role in many fields, including education, psychology and health behavior. Numerous studies have confirmed the impact of self-efficacy on behavioral intention, while others have identified its relationship with attitude, perceived ease of use, and perceived usefulness.

Hypothesis 1 (H1). There is a significant association between self-efficacy and perceived ease of use.
Hypothesis 2 (H2). There is a significant association between self-efficacy and perceived usefulness.
Hypothesis 3 (H3). There is a significant association between self-efficacy and attitude

Personal Innovativeness

Personal innovation refers to the individual's willingness to adopt new technologies or innovations, reflecting their propensity to experiment and adopt new ideas. It is often influenced by factors such as self-efficacy, openness to experience and previous experiences with technology. (Agarwal, R., & Prasad, J 1998). Therefore, the following hypotheses are proposed.

Hypothesis 4 (H4). Personal innovativeness has a significant effect on perceived ease of use.
Hypothesis 5 (H5). Personal innovativeness has a significant effect on perceived usefulness

Perceived Ease of Use

Perceived ease of use is the extent to which an individual feels that utilizing a specific system or technology demands little effort. This idea is fundamental to the Technology Acceptance Model (TAM) introduced by Davis in 1989, as it plays a critical role in shaping user acceptance and intention to adopt technology. Based on these observations, the following hypotheses are proposed.

Hypothesis 6 (H6). There is a significant relationship between perceived ease of use and perceived usefulness.
Hypothesis 7 (H7). There is a significant relationship between perceived ease of use and attitude.
Hypothesis 8 (H8). There is a significant relationship between perceived ease of use and behavioral intention.

Perceived Usefulness

Perceived usefulness is the extent to which an individual believes that using a system or technology will improve their job performance or effectiveness. This concept is a key element of the Technology Acceptance Model (TAM), developed by Davis in 1989, and significantly influences users' intentions to adopt new technologies. Based on these findings, the following hypotheses are put forward.

Hypothesis 9 (H9). There is a significant relationship between perceived usefulness and attitude.
Hypothesis 10 (H10). There is a significant relationship between perceived usefulness and behavioral intention.

Attitude

According to Ajzen, attitude plays a crucial role in shaping behavioral intention. In a study conducted by Yadav and Pathak in India, it was found that attitude has a positive impact on behavioral intention. Several other

studies have also demonstrated a strong positive correlation between attitude and buying intention. When consumers possess strong intentions to utilize technology, they tend to develop a favorable attitude towards the system. Based on these findings, the hypothesis presented is as follows.
Hypothesis 11 (H11). There is a significant relationship between attitude and behavioural intention

Perceived Cost
Perceived cost significantly influences technology acceptance and adoption. High perceived costs can deter users from utilizing new systems despite substantial perceived benefits. Recognizing the importance of perceived cost is vital for developers and marketers to improve user adoption and satisfaction. Hence, the following hypothesis is put forward.
Hypothesis 12 (H12). Perceived cost has a significant negative effect on AR technology adoption intention

Competitors, Trading partners & Customer Pressure
External factors such as competitors, trading partners, and customer pressure significantly impact business decisions related to innovation, technology adoption, and strategic planning. Competitors shape market dynamics, pushing firms to innovate and enhance their offerings. Trading partners, such as suppliers and distributors, influence an organization's resource access and market reach, with strong relationships fostering innovation and efficiency. Additionally, customer pressure drives businesses to innovate and improve quality in response to demands and market changes.
Hypothesis 13 (H13). Pressure from competitors significantly affects the AR adoption intention.
Hypothesis 14 (H14). Pressure from customers significantly affects AR adoption intention.
Hypothesis 15 (H15). Pressure from trading partners has a significant effect on AR adoption intention.

External Support
External support in business encompasses resources, services, or assistance from outside the organization aimed at achieving objectives and enhancing competitiveness. It is particularly vital for startups and SMEs, supplying necessary resources that may not be available internally. This support helps to mitigate risks, accelerate growth, and improve organizational capabilities, while also fostering innovation and adaptability in a dynamic business landscape. Consequently, researcher put forth the following hypothesis.
Hypothesis 16 (H16). External support has a significant positive effect on AR adoption intention

Technological Knowledge
Technological knowledge involves understanding and expertise in developing, applying, and managing technologies, including technical skills and effective use of tech tools. It is essential for individuals and organizations to stay competitive in a fast-evolving landscape, as it supports innovation, efficiency, and market adaptability. For individuals, strong technological knowledge boosts employability and career opportunities, while also facilitating collaboration in interdisciplinary teams on tech projects. Based on this, the following hypothesis is proposed.
Hypothesis 17 (H17). There is a significant relationship between technological knowledge and behavioural intention of AR technology usage.

The Moderating Role of Technological Knowledge
Researchers have found that a lack of primary expertise can impede the adoption and diffusion of information technology. Typically, companies employ knowledge gain approaches to gather information and explore alternatives before making final decisions on adopting new technology. Berg and Lingen emphasize the importance of knowledge discovery in creating awareness of opportunities, as well as the barriers and challenges that may arise during the adoption process. Once decision-makers have acquired knowledge about the new technology, they can effectively contribute to its adoption, thereby adding value. Consequently, it can be concluded that technological knowledge plays a significant role in the adoption of innovative technology. Based on this, the following hypothesis is proposed.
Hypothesis 18 (H18). Technological knowledge moderates the relationship between attitude towards AR usage and behavioural intention.

Mediating Effect of Attitude
Venkatesh and colleagues (1991) put forth the argument that attitude plays a mediating role in the connection between perceived usefulness and behavioral intention. This relationship was further supported by Schaper and Pervan (1992) in their study on the healthcare field within the technology acceptance literature. Gajanayake et al. (1993) discovered that attitude partially mediates the relationship between perceived usefulness and behavioral intention. Additionally, Krishnan et al. (1994) suggested that attitude acts as a mediator between perceived ease of use, perceived usefulness, and behavioral intention. Based on these findings, the following hypotheses are proposed.
Hypothesis 19 (H19). Attitude mediates the relationship between perceived ease of use and behavioral intention.

Hypothesis 20 (H20). Attitude mediates the relationship between perceived usefulness and behavioral intention.
Hypothesis 21 (H21). Attitude mediates the relationship between self-efficacy and behavioral intention.

Research Design, Sample and Measurement

A study was conducted on 233 retail businesses in four major cities of Gujarat (Ahmedabad, Vadodara, Surat, and Rajkot) using a cross-sectional survey. The survey targeted owners and managers through an online format to ensure anonymity and increase response rates. The questionnaire required complete answers to minimize missing data. The sample size adequacy was assessed using the G* power program, recommending a sample of 178 based on Cohen's parameters. The study's variables were measured using a 5-point Likert scale, with all constructs defined as reflective.

Sampling Procedure

To get a clear picture of why retailers in Gujarat are choosing Augmented Reality, we reached out directly to the people making the big decisions—store owners and managers. We focused our efforts on the state's four busiest commercial hubs: Ahmedabad, Vadodara, Surat, and Rajkot.
To make sure our findings weren't just based on a few random opinions, we used a specialized tool called G*Power to calculate exactly how many people we needed to hear from. While the software suggested we needed at least 178 responses for the data to be statistically solid, we went a step further and gathered insights from 233 retail businesses.
We chose to conduct the survey online for two main reasons Firstly, respecting their time: We know retail managers are incredibly busy, so an online link let them respond whenever they had a spare moment. Secondly Total Privacy: It ensured their identities remained anonymous, encouraging more honest and open feedback.

Instrument Development and Validation

The research instrument was constructed using a 5-point Likert scale, with all study constructs designed as reflective measures. To ensure that the findings were both accurate and repeatable, the measurement model underwent a rigorous two-step validation process: Reliability Testing: The internal consistency of the survey was confirmed using two key metrics: Cronbach's Alpha and Composite Reliability (CR). All constructs achieved scores ranging from 0.706 to 0.946, comfortably exceeding the standard 0.70 benchmark for reliability. Validity Assessment: * Convergent Validity: This was established by examining factor loadings and the Average Variance Extracted (AVE). All individual item loadings (0.720 to 0.957) and AVE values (0.597 to 0.898) surpassed the recommended thresholds of 0.70 and 0.50, respectively, confirming that the items effectively measured their intended constructs. Discriminant Validity: To ensure each construct was distinct from the others, the study applied the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The square root of the AVE for each factor was higher than its correlation with any other factor, and HTMT ratios remained below the conservative 0.85 limit, proving the uniqueness of each variable.

Objective of the study

The study investigates factors affecting behavioral intentions toward Augmented Reality (AR) in retail within four major cities in Gujarat. It analyzes the roles of cognitive, technology-specific, and external situational influences on AR adoption. A model is proposed to examine moderating effects of technology knowledge alongside relationships between perceived usability, usefulness, self-efficacy, and intentions to use AR. The goal is to improve understanding of behavioral intentions to support AR adoption in the retail sector.

Analysis of the data

The study utilized Smart-PLS-3 software to test its proposed model using variance-based PLS-SEM. This technique, praised by Ringle et al. for its effectiveness in demonstrating causal relationships, is particularly advantageous for handling interactional variables in complex models with moderate sample sizes. PLS-SEM has gained popularity across various fields such as marketing and management. The testing process involved a two-step approach: assessing the measurement model for construct reliability and validity, followed by evaluating the structural model to determine path coefficients and their significance.

Measurement Model Analysis

The measurement model was examined prior to testing the proposed hypotheses. The measurement model for this study is illustrated in Figure 2. The outer loading, Cronbach's alpha, composite reliability values, and average variance extracted (AVE) are presented in Table 1.

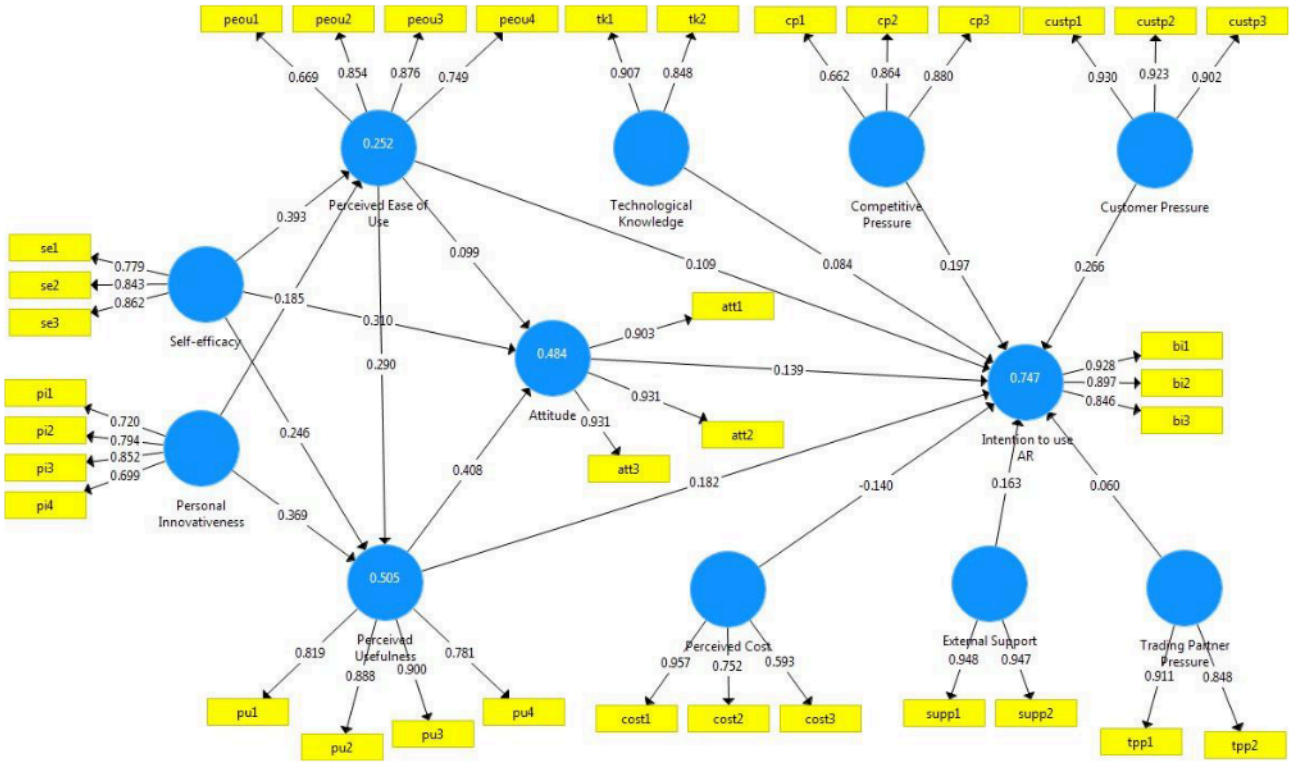

Figure 1. *Measurement model*

Constructs	Items	Loadings	AVE	Composite Reliability	Cronbach's Alpha	Rho_A
	att1	0.903				
Attitude	att2	0.931	0.850	0.944	0.911	**0.912**
	att3	0.931				
	bi1	0.928				
Behavioral Intention	bi2	0.897	0.794	0.920	0.869	**0.873**
	bi3	0.846				
	cp1	0.762				
Competitor Pressure	cp2	0.864	0.653	0.848	0.738	**0.804**
	cp3	0.880				
	custp1	0.930				
Customer Pressure	custp2	0.923	0.844	0.942	0.907	**0.909**
	custp3	0.902				
	pc1	0.957				
Perceived Cost	pc2	0.752	0.611	0.820	0.761	**1.129**
	pc3	0.793				
	peou1	0.769				
Perceived Ease of Use	peou2	0.854	0.626	0.869	0.799	**0.830**
	peou3	0.876				
	peou4	0.749				
	pi1	0.720				
Personal Innovativeness	pi2	0.794	0.590	0.851	0.774	**0.790**
	pi3	0.852				
	pi4	0.799				
	pu1	0.819				
Perceived Usefulness	pu2	0.888	0.720	0.911	0.870	**0.879**
	pu3	0.900				
	pu4	0.781				

	se1	0.779				
Self-efficacy	se2	0.843	0.687	0.868	0.774	**0.795**
	se3	0.862				
	es1	0.948				
External Support	es2	0.947	0.898	0.946	0.886	**0.886**
	tp1	0.911				
Trading Partner Pressure	tp2	0.848	0.774	0.873	0.713	**0.744**
	tk1	0.907				
Technological Knowledge	tk2	0.848	0.771	0.870	0.706	**0.732**

Table 1. *Factor loadings and reliability statistics.*

Convergent Validity

In this study, factor loadings for measured items ranged from 0.720 to 0.957, exceeding the recommended threshold of 0.70, indicating strong convergence validity. Additionally, the Average Variance Extracted (AVE) values ranged from 0.597 to 0.898, surpassing the 0.50 threshold, further confirming the scale's convergent validity.

Reliability

The study's reliability was assessed using Cronbach's alpha and composite reliability values. Cronbach's alpha ranged from 0.706 to 0.911, and composite reliability ranged from 0.820 to 0.946, both exceeding the 0.7 threshold, indicating satisfactory reliability.

Discriminant Validity

This study evaluates the discriminant validity using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT) approach. For the Fornell-Larcker method, the square root of each construct's AVE must be higher than its highest correlation with other constructs, which was confirmed. Additionally, the HTMT results indicate that values exceeding 0.90 (or 0.85 conservatively) suggest a lack of discriminant validity.

	ATT	**BI**	**CP**	**CUSP**	**ES**	**PC**	**PEOU**	**PI**	**PU**	**SE**	**TK**	**TP**
ATT	0.922											
BI	0.640	0.891										
CP	0.448	0.607	0.808									
CUSP	0.587	0.774	0.532	0.919								
ES	0.521	0.718	0.481	0.881	0.948							
PC	0.479	0.350	0.399	0.368	0.351	0.782						
PEOU	0.466	0.528	0.361	0.430	0.368	0.304	0.791					
PI	0.493	0.570	0.382	0.478	0.486	0.501	0.358	0.768				
PU	0.631	0.709	0.471	0.625	0.567	0.461	0.539	0.581	0.849			
SE	0.580	0.662	0.442	0.626	0.606	0.366	0.474	0.441	0.547	0.829		
TK	0.499	0.538	0.423	0.490	0.397	0.448	0.370	0.337	0.553	0.478	0.878	
TP	0.506	0.527	0.369	0.436	0.421	0.570	0.354	0.517	0.774	0.443	0.460	0.880

Table 2. *Fornell–Larcker correlation matrix.*

Note: ATT = Attitude, BI = Behavioral Intention, CP = Competitive Pressure, CUST = Customer Pressure, ES = External Support, PC = Perceived Cost, PEOU = Perceived Ease of Use, PI = Personal Innovativeness, PU = Perceived Usefulness, SE = Self-efficacy, TK = Technology Knowledge, TP = Trading Partner Pressure.

	Att	**BI**	**CP**	**Custp**	**ES**	**PC**	**PEOU**	**PI**	**PU**	**SE**	**TK** **TP**
Att											
BI	0.717										
CP	0.530	0.727									
Custp	0.645	0.872	0.621								
ES	0.579	0.820	0.573	0.780							
PC	0.489	0.281	0.418	0.346	0.360						
PEOU	0.548	0.623	0.450	0.494	0.426	0.295					
PI	0.546	0.664	0.460	0.539	0.561	0.586	0.411				

PU	0.705	0.809	0.558	0.698	0.641	0.417	0.621	0.672			
SE	0.682	0.806	0.559	0.742	0.728	0.398	0.581	0.544	0.653		
TK	0.615	0.679	0.550	0.601	0.487	0.458	0.480	0.398	0.706	0.641	
TP	0.627	0.655	0.496	0.534	0.525	0.657	0.462	0.673	0.788	0.598	0.656

Table 3. *Heterotrait-Monotrait ratio (HTMT) approach.*

Testing Multicollinearity

Kleinbaum et al. assessed multicollinearity among independent variables using the Variance Inflation Factor (VIF). The regression analysis showed VIF values between 1.107 and 1.682, indicating that multicollinearity was not a concern in the study.

Coefficient of Determination

Kleinbaum et al. assessed multicollinearity in their study using the Variance Inflation Factor (VIF), which ranged from 1.107 to 1.682, indicating no multicollinearity issues. Researchers suggest R2 values of 0.26 for significant, 0.13 for moderate, and 0.02 for weak constructs. In this study, R2 estimates for all endogenous variables surpassed these thresholds, confirming the model's acceptability per Falk and Miller's recommendations.

Constructs	VIF				R^2 (Endogenous Variables)	Q^2 (Endogenous Variables)
	Att	BI	PEOU	PU		
Attitude		2.051			0.484	0.313
Behavioral Intention					0.747	0.501
Competitor Pressure		1.563				
Customer pressure		5.614				
External Support		4.589				
Perceived Cost		1.740				
Perceived Ease of Use	1.507	1.518		1.337	0.252	0.126
Personal Innovativeness			1.242	1.287		
Perceived Usefulness	1.666	4.156			0.505	0.411
Self-efficacy	1.525		1.242	1.448		
Technological Knowledge		1.679				
Trading Partner Pressure		3.061				

Table 4. *VIF value, R^2, and Q^2.*

Structural Model Analysis

The research assessed a structural model using path coefficients and effect size statistics through a bootstrap analysis of 233 cases. With a 5% significance level, the model's relationships were tested using confidence intervals, t-values, and p-values. The predictive relevance was evaluated via Stone-Geisser's Q2, confirming the model's validity with all targeted variables exceeding zero. Key findings revealed that self-efficacy positively influences perceived ease of use, perceived usefulness, and attitude, while personal innovativeness also impacts perceived ease of use and usefulness. Perceived ease of use affects both perceived usefulness and behavioral intention, and perceived usefulness relates significantly to attitude. However, the connection between perceived ease of use and attitude was not significant, leading to the acceptance of most hypotheses except H7.

Hypothesis	**STD Beta**	**STD Error**	***t*-Values**	***p*-Values**	**2.5%**	**97.5%**	**Significance ($p < 0.05$)**	f^2
H1: SE -> PEOU	0.393	0.058	6.728	0.000	0.273	0.501	Supported	0.166
H2: SE -> PU	0.246	0.052	4.744	0.000	0.142	0.344	Supported	0.085
H3: SE -> ATT	0.310	0.065	4.764	0.000	0.182	0.436	Supported	0.122
H4: PI -> PEOU	0.185	0.065	2.852	0.004	0.068	0.325	Supported	0.037
H5: PI -> PU	0.369	0.059	6.243	0.000	0.253	0.485	Supported	0.214
H6: PEOU -> PU	0.290	0.050	5.802	0.000	0.192	0.387	Supported	0.127
H7: PEOU -> ATT	0.099	0.064	1.557	0.119	−0.027	0.223	NS	0.013
H8: PEOU -> BI	0.109	0.047	2.330	0.020	0.022	0.207	Supported	0.033
H9: PU -> ATT	0.408	0.071	5.778	0.000	0.262	0.536	Supported	0.194

H10: PU -> BI	0.182	0.076	2.415	0.016	0.035	0.336	Supported	0.032
H11: ATT -> BI	0.139	0.050	2.794	0.005	0.042	0.239	Supported	0.037
H12: PC -> BI	−0.140	0.043	3.290	0.001	−0.217	−0.049	Supported	0.044
H13: CP-> BI	0.197	0.037	5.301	0.000	0.121	0.267	Supported	0.098
H14: CUSTP -> BI	0.266	0.110	2.412	0.016	0.046	0.484	Supported	0.050
H15: TP -> BI	0.060	0.061	0.996	0.319	−0.065	0.176	NS	0.005
H16: ES -> BI	0.163	0.093	1.749	0.080	−0.016	0.354	NS	0.023
H17: TK -> BI	0.084	0.038	2.206	0.027	0.008	0.158	Supported	0.016

Table 5. *Structural model and hypothesis testing result*

Note: SE = Self-efficacy, PEOU = Perceived Ease of Use, PU = Perceived Usefulness, ATT = Attitude, TP = Trading Partner Pressure, PI = Personal Innovativeness, CP = Competitive Pressure, CUSTP = Customer Pressure, PC = Perceived Cost, TK = Technological Knowledge, ES = External Support, BI = Behavioral Intention.

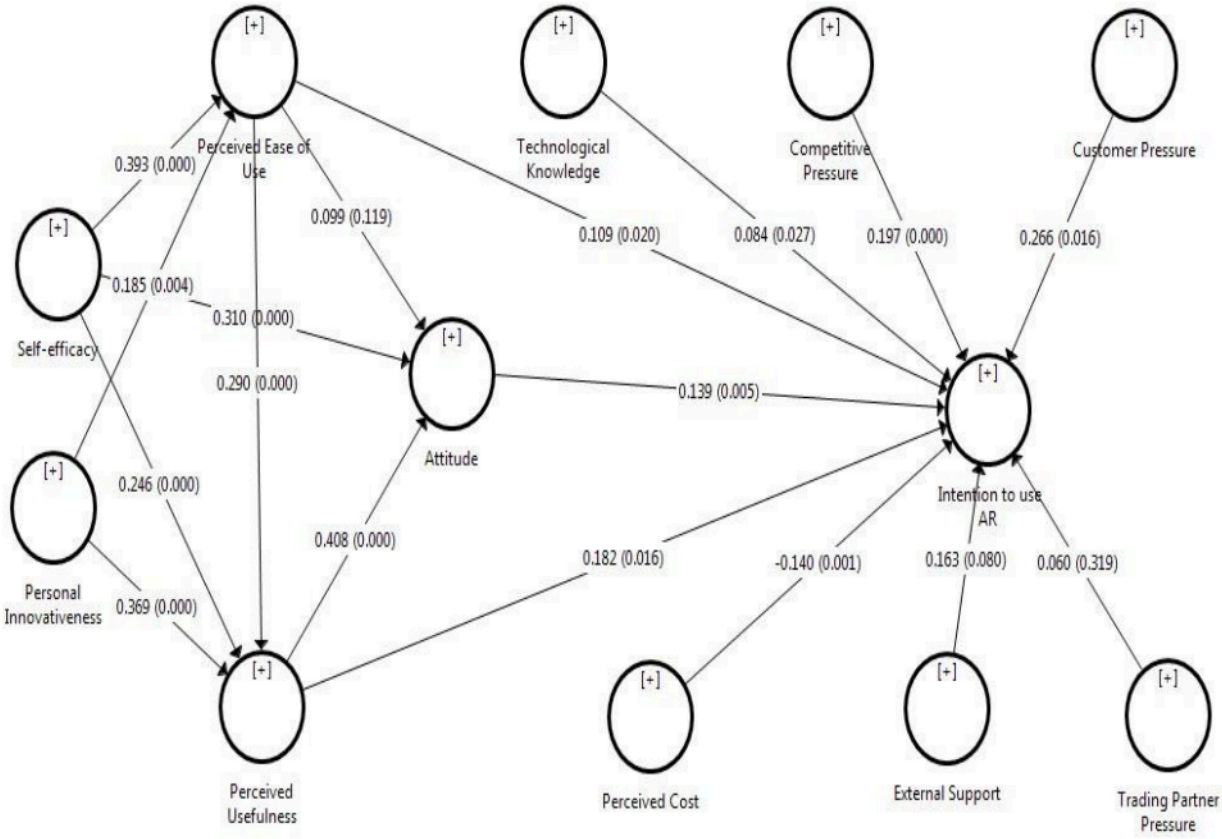

Figure 3. *Structural model*

The PLS regression analysis reveals that several factors significantly influence the behavioral intention to use AR: perceived usefulness (Beta = 0.182), attitude (Beta = 0.139), competitive pressure (Beta = 0.197), customer pressure (Beta = 0.266), and technological knowledge (Beta = 0.084). Conversely, trading partner pressure (Beta = 0.060) and external support (Beta = 0.164) were not significant. Additionally, perceived cost (Beta = −0.140) negatively impacts behavioral intention. Hypotheses 10–14 and 17 are supported, while hypotheses 15 and 16 are not.

Moderating Effect of Technology Knowledge

The study revealed a weaker correlation than anticipated between attitude and behavioral intentions, leading to an analysis of technological knowledge as a moderating variable. Findings showed that technological knowledge does not affect this relationship (Beta = 0.041; t = 1.059; p > 0.05), indicated by consistent slopes in behavioral intention and attitude regardless of technological knowledge levels. As a result, hypothesis 18 was rejected, opposing the conclusions of Matikiti et al.

Hypothesis	STD Beta	Standard Error	*t*-Values	*p*-Values	Significance ($p < 0.05$)
Moderation					
H18: TK*ATT -> BI	0.041		1.059	>0.05	Not Supported
Mediation					
H19: PEOU -> ATT -> BI	0.014	0.010	1.325	0.185	Not Supported
H20: PU -> ATT-> BI	0.057	0.022	2.621	0.009	Supported
H21: SE -> ATT-> BI	0.043	0.020	2.212	0.027	Supported

Table 6. *Testing results of moderation and mediation*

This study examined the mediating role of attitude in the relationships among perceived ease of use, perceived usefulness, self-efficacy, and behavioral intention, using a bootstrapping approach with Smart PLS 3.0 on a sample of 233 cases. Findings revealed that attitude mediated the effects of perceived usefulness (Beta = 0.057, p = 0.009) and self-efficacy (Beta = 0.043, p = 0.027) on behavioral intention, while it did not mediate the effect of perceived ease of use (Beta = 0.014, p = 0.185). Consequently, hypotheses 20 and 21 were accepted, while hypothesis 19 was rejected.

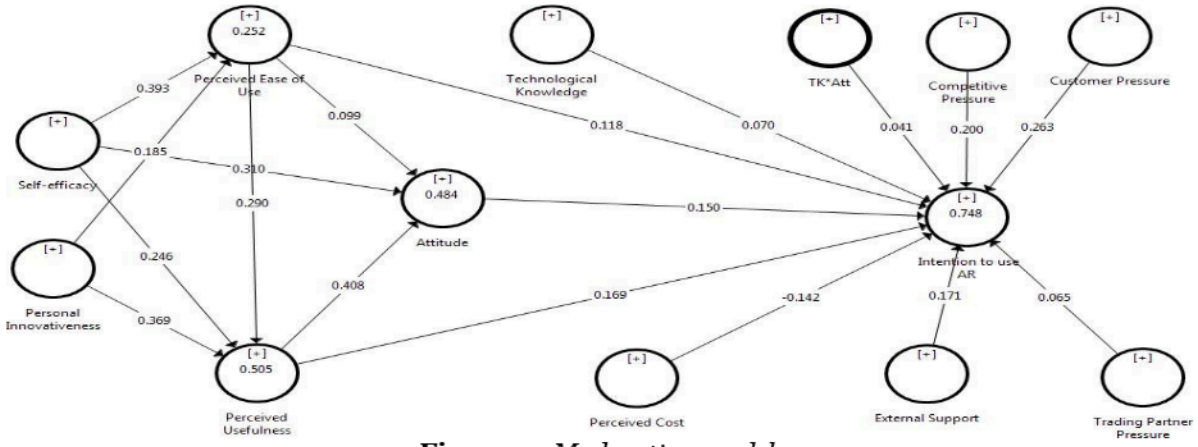

Figure 4. *Moderation model.*

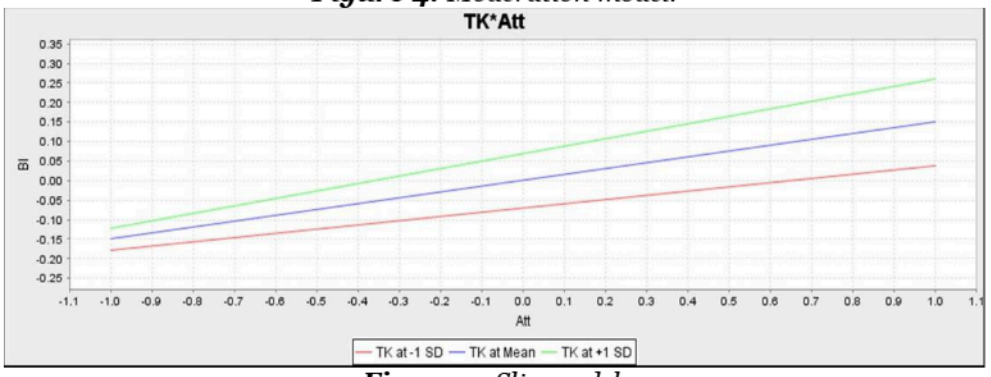

Figure 5. *Slip model.*

Findings

This research highlights the significant impact of self-efficacy on perceived ease of use, confirming it as the most influential predictor of this perception. The study also found that self-efficacy positively affects perceived usefulness and attitude, consistent with prior research. Additionally, a notable correlation was identified between personal innovativeness and both perceived ease of use and perceived usefulness. However, the study revealed that trading partners and external pressure did not significantly influence behavioral intention, likely due to the diverse supplier base among retailers in four major cities of Gujarat and the lack of widespread technology integration. Furthermore, external support did not significantly impact behavioral intention, possibly due to the absence of government support for AR technology implementation in the region, contradicting findings from

earlier studies.

Conclusion

The study's findings indicate that operating cost is the primary factor affecting the acceptance of AR technology. Administrators should implement incentives to reduce service charges or create service bundles to engage entrepreneurs. Managers can promote the adoption of AR through diverse after-sales service packages and free installation. Additionally, the perceived ease of use significantly influences the intention to adopt the technology, suggesting that AR manufacturers should focus on simplifying application installation.

Theoretical Implication: Evolving the Adoption Model

The Power of the Individual: While traditional TAM focuses heavily on the system's utility, this study proves that Self-Efficacy is actually the "anchor" of the entire experience. By showing that self-confidence in using technology is the strongest predictor of Perceived Ease of Use (beta = 0.393), the research suggests that adoption models for immersive tech like AR must prioritize user psychology alongside technical features. The "Innovation Spirit" as a Value-Creator: The significant link between Personal Innovativeness and Perceived Usefulness (beta = 0.369) highlights that innovative individuals don't just find tech "easier"—they actually perceive it as more valuable and effective for their business. This adds a new layer to how we categorize "early adopters" in retail.

Contextualizing External Pressure: The finding that Customer Pressure (beta = 0.266) and Competitive Pressure (beta = 0.197) drive adoption—while trading partner pressure does not—challenges the idea that all external influences are equal[5]. In Gujarat's fragmented retail market, the push for AR is "pull-driven" by the consumer, rather than "push-driven" by the supply chain.

Managerial Implication

Since self-efficacy is so critical, AR manufacturers should not just sell "software"—they should sell "confidence". Providing hands-on training, simplified "no-code" interfaces, and robust localized support can reduce the technical fear that currently holds many retailers back. Focus on the "Why" (Value Over Novelty): Because Perceived Usefulness significantly impacts Attitude (beta = 0.408), marketing for AR should move away from the "cool factor" and focus on tangible business outcomes, such as reduced product returns via virtual try-ons or increased foot traffic through interactive window displays. Tackling the Cost Hurdle: With Perceived Cost acting as a significant deterrent (beta =-0.140), there is a clear opportunity for "AR-as-a-Service" models or government-backed digital transformation grants to make these tools financially accessible for SMEs in Tier 2 and Tier 3 cities.

Limitations of the study

The study is restricted to four major metropolitan hubs in Gujarat (Ahmedabad, Vadodara, Surat, and Rajkot), which may limit the generalizability of the results to other regions or rural contexts. The survey was conducted among 233 retail businesses, targeting specifically owners and managers, which excludes the perspectives of the end-consumers who actually use the AR technology. The findings suggest that a lack of widespread technology integration among retailers currently hinders the influence of trading partners on adoption intentions. A lack of government support or specific incentives for AR implementation in the Gujarat region was identified as a potential barrier to adoption.

Future research.

Future research could expand the geographic scope to include other states in India or focus on Tier 2 and Tier 3 cities to see if adoption factors differ. Future studies could investigate the behavioural intentions of customers rather than just retail managers to provide a more holistic view of AR acceptance. Research could further explore how specific government incentives, reduced service charges, or free installation packages might directly impact the rate of AR adoption. Since this was a cross-sectional survey, future longitudinal research could track how adoption intentions change as AR technology becomes more simplified and accessible.

References

1. Agarwal, R.; Prasad, J. A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Inf. Syst. Res.* **1998**, *9*, 204–215. [CrossRef]
2. Ajzen, I. The Theory of Planned Behavior. *Org. Behav. Hum. Decis. Proc.* **1991**, *50*, 179–211. [CrossRef]
3. Alam, S.S.; Ali, M.Y.; Jani, M.F.M. An Empirical Study of Factors Affecting Electronic Commerce Adoption among SMEs in Four Major cities of Gujarat. *J. Bus. Econ. Manag.* **2011**, *12*, 375–399. [CrossRef]
4. Aldás-Manzano, J.; Ruiz-Mafé, C.; Sanz-Blas, S. Exploring Individual Personality Factors as Drivers of M-shopping Acceptance.

5. Bailey, J.E.; Pearson, S.W. Development of a Tool for Measuring and Analyzing Computer User Satisfaction. *Manag. Sci.* **1983**,
6. Bandura, A. *Self-Efficacy in Changing Societies*; Cambridge University Press: New York, NY, USA, 1995.
7. Bandura, A. Self-efficacy: Toward a Unifying Theory of Behavioral Change. *Psychol. Rev.* **1977**, *84*, 191–215. [CrossRef]
8. Broom, D.R.; Lee, K.Y.; Lam, M.H.S.; Flint, S.W. Gotta Catch 'em All or Not Enough Time: Users Motivations for Playing Pokémon Go—and Non-users' Reasons for Not Installing. *Health Psychol. Res.* **2019**, *7*, 1–9. [CrossRef] [PubMed]
9. Budu, K.W.A.; Yinping, M.; Mireku, K.K. Investigating the Effect of Behavioral Intention on E-learning Systems Usage: Empirical Study on Tertiary Education Institutions in Ghana. *Med. J. Soc. Sci.* **2018**, *9*, 201–216. [CrossRef]
10. Cabero-Almenara, J.; Fernández-Batanero, J.M.; Barroso-Osuna, J. Adoption of Augmented Reality Technology by University Students. *Heliyon* **2019**, *5*, e01597. [CrossRef]
11. Chang, H.H.; Wang, I.C. An Investigation of User Communication Behavior in Computer Mediated Environment. *Comput. Hum. Behav.* **2008**, *24*, 2336–2356. [CrossRef]
12. Chuah, S.H.W.; Rauschnabel, P.A.; Krey, N.; Nguyen, B.; Ramayah, T.; Lade, S. Wearable Technologies: The Role of Usefulness and Visibility in Smart Watch Adoption. *Comput. Hum. Behav.* **2016**, *65*, 276–284. [CrossRef]
13. Compeau, D.R.; Higgins, C.A. Application of Social Cognitive Theory to Training for Computer Skills. *Inf. Syst. Res.* **1995**,
14. Crook, C.W.; Kumar, R.L. Electronic Data Interchange: A Multi-Industry Investigation Using Grounded Theory. *Inf. Manag.* **1998**,
15. Davis, F.D. Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. Doctoral Dissertation, The Sloan School of Management, MIT, Cambridge, MA, USA, 1986
16. Luarn, P.; Lin, H.H. Toward an Understanding of the Behavioral Intention to Use Mobile Banking. *Comput. Hum. Behav.* **2005**,
17. Luo, X.; Li, H.; Zhang, J.; Shim, J.P. Examining Multi-dimensional Trust and Multi-faceted Risk in Initial Acceptance of Emerging Technologies: An Empirical Study of Mobile Banking Services. *Decis. Support Syst.* **2010**, *49*, 222–234. [CrossRef]
18. Maduku, D.K.; Mpinganjira, M.; Duh, H. Understanding Mobile Marketing Adoption Intention by South African SMEs: A Multi-Perspective Framework. *Int. J. Inf. Manag.* **2016**, *36*, 711–723. [CrossRef]
19. Malliari, A. IT Self-efficacy and Computer Competence of LIS Students. *Elec. Lib.* **2012**, *30*, 608–622. [CrossRef]*Manag. Sci.* **1989**, *35*, 982–1003. [CrossRef]
20. Pantano, E., & Naccarato, C. (2016). *Augmented Reality in Retail: A Review of Current Research*. Journal of Retailing and Consumer Services, 31, 233-241.
21. Perannagari, K.T.; Chakrabarti, S. Factors Influencing Acceptance of Augmented Reality in Retail: Insights from Thematic Analysis. *Int. J. Retail. Distrib. Manag.* **2019**, *48*, 18–34. [CrossRef]
22. Pramana, E. Determinants of the Adoption of Mobile Learning Systems among University Students in Indonesia. *J. Inf. Technol. Edu. Res.* **2018**, *17*, 365–398. [CrossRef]
23. Rao, R. R., Patil, A., & Dhananjay, K. (2020). *Technology Adoption in Emerging Markets: Insights from India*. International Journal of Retail & Distribution Management, 48(1), 123-142.
24. Scholz, M., & Steinmetz, M. (2019). *Augmented Reality in Retail: The Key to Enhancing Customer Experience?* Business Horizons, 62(5), 679-688.
25. Van den Berg, J.; Van der LIngen, E. An Empirical Study of the Factors Affecting the Adoption of Mobile Enterprise Applications.
26. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* **2003**, *27*, 425–478. [CrossRef]
27. Yaqub, J.; Bello, H.T.; Adenuga, I.A.; Ogundeji, M.O. The cashless policy in Nigeria: Prospects and challenges. *Int. J. Hum. Soc. Sci.* **2013**, *3*, 200–212.
28. Yi, M.Y.; Fiedler, K.D.; Park, J.S. Understanding the Role of Individual Innovativeness in the Acceptance of IT-based Innovations: Comparative Analyses of Models and Measures. *Decis. Sci.* **2006**, *37*, 393–426. [CrossRef]
29. Yim, M. Y. C., Chan, H. C. S., & Lam, L. W. (2017). *The Impact of Augmented Reality on Customer Engagement and Brand Loyalty in the Retail Sector*. Journal of Retailing, 93(4), 481-495.
30. Yim, M.Y.C.; Park, S.Y. I Am Not Satisfied with My Body, so I Like Augmented Reality (AR): Consumer Responses to AR-based Product Presentations. *J. Bus. Res.* **2019**, *100*, 581–589. [CrossRef]
31. Yulihasri, E.; Islam, M.A.; Daud, K.A.K. Factors that Influence Customers' Buying Intention on Shopping Online. *Int. J. Mark. Stud.* **2010**, *3*, 128–139.
32. Yun, J.J.; Yang, J.; Park, K. Open Innovation to Business Model: New Perspective to Connect between Technology and Market. *Sci. Technol. Soc.* **2016**, *21*, 1–25. [CrossRef]
33. Zarmpou, T.; Saprikis, V.; Markos, A.; Vlachopoulou, M. Modeling Users' Acceptance of Mobile

Services. *Ind. Manag. Data Syst.***2012**, *12*, 225–248. [CrossRef]
34. Zulkifli, A.N.; Alnagrat, A.J.A.; Mat, R.C. Development and Evaluation of i-Brochure: A Mobile Augmented Reality Application.