Unlocking the Virtual Realm: Exploring Consumer Motivations in Embracing Virtual Reality and Augmented Reality for Modern Home Shopping in Thailand

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Abstract

Purpose: This study aims to investigate factors affecting consumers' behavioral intention to use virtual reality and augmented reality in online shopping for modern household products in Thailand. The conceptual framework is constructed with perceived usefulness, perceived ease of use has, attitude toward using, social influence, perceived enjoyment, innovativeness, and behavioral intention. **Research design, data, and methodology:** The population is based on 450 customers who are 18 years old and above, eligible to use credit card and mobile banking (according to Thai laws), living in Thailand and have experience in buying modern household products on top four online shopping platform by market share in Thailand. The sample techniques are purposive, quota and convenience sampling. The data analysis involved the utilization of Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). **Results:** The findings indicate that innovativeness, attitude toward using, social influence, perceived enjoyment, and innovativeness significantly impact consumers' behavioral intention to adopt VR and AR technology in online shopping contexts. Nevertheless, Perceived usefulness and percived ease of use have no significant effect on behavioral intention. **Conclusions:** The findings can contribute to the modern household companies. Decision makers in household product companies can consider to invest into VR/AR technology for better customers' experience and purchase intention.

Keywords: Virtual Reality, Social Influence, Perceived Enjoyment, Innovativeness, Behavioral Intention

JEL Classification Code: E44, F31, F37, G15

1. Introduction

A significant use of virtual reality (VR) and augmented reality (AR) in the retail sector involves establishing virtual showrooms and facilitating product visualization. Through VR and AR, retailers can present their products within a virtual setting, enabling customers to engage in exploration and interaction. This technological approach serves to narrow the divide between traditional in-person shopping and online experiences by offering customers a lifelike and immersive preview before finalizing a purchase choice (Xue et al., 2019). In a virtual environment, retailers have the ability to showcase an extensive array of products, spanning from furniture and apparel to electronics and appliances. This allows customers to perceive the scale, design, and functionality of the items in a realistic manner.

VR and AR in retail shopping enhances customer engagement by enabling shoppers to actively participate in the shopping experience. As an example, retailers can develop virtual fitting rooms enabling customers to virtually try on clothing, eliminating the need for an in-person visit to a physical store (Boardman et al., 2020). This not only saves time but also "provides customers with the convenience of trying multiple outfits without the hassle of changing clothes." VR and AR can also simulate real-world scenarios, such as home decor or test driving a car, enabling customers to visualize products in their intended environment and make more informed purchase decisions (Bonetti et al., 2017).

VR and AR technology enable retailers to offer

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personalized shopping experiences by tailoring virtual environments and product recommendations to individual customer preferences. By analyzing customer data and behavior, retailers can create customized virtual shopping experiences that align with customer preferences, increasing customer satisfaction and loyalty (Wang, 2023).

Retail commerce has swiftly embraced the cutting-edge technologies of "Augmented Reality" (AR) and "Virtual Reality" (VR). In the current retail landscape, staying abreast of innovative trends is essential for a successful online marketing strategy. Given the intense competition within the retail industry, AR and VR have the potential to significantly impact business outcomes. These technologies offer a technologically enriched approach that can augment the overall shopping experience in brick-and-mortar stores, providing added value to customers (Vodovatova, 2020).

"Virtual reality" (VR) and "Augmented Reality" (AR) are gaining traction as a popular shopping method, signifying potential transformative changes in the retail industry. As per the Global Consumer Insights Pulse Survey by PwC, around one-third of consumers have employed a virtual reality (VR) platform for shopping in the last half-year, as shown in Figure 1.2. While half of these VR users engaged with the technology for gaming, movies, and TV shows, a significant portion (32%) utilized VR for shopping and subsequently made purchases through the platform (World Economic Forum, 2022).

The home and décor sector are experiencing an increasing interest in incorporating "virtual reality" (VR) and "augmented reality" (AR) technologies. These technologies present promising opportunities elevating overall customers' experience as well as boost sales. Nevertheless, there exists a gap in comprehensive research examining the effectiveness and impact of VR and AR within this particular industry. The problem at hand is the limited understanding of how VR and AR can be effectively utilized to address the unique challenges of the home and décor sector, such as product visualization, customization, and personalization, as well as the influence of these technologies on customer decision-making processes and post-purchase behavior. Additionally, there is a need to explore the practical implications and potential barriers faced by retailers in implementing "VR and AR technology" in the aspect of home and décor products. Hence, there exists a research void that requires attention to offer valuable insights and guidance for industry practitioners aiming to utilize VR and AR for improving customer experiences, boosting sales, and addressing challenges within the home and décor market.

The research gap concerning VR and AR technology in home and décor products centers on the necessity for a more profound comprehension of how these technologies specifically impact and enhance the customer experience, as well as their effectiveness in driving sales within this domain. While there is existing research on the applications and benefits of VR and AR in various industries, such as retail, gaming, and healthcare, there is a relative scarcity of studies focused specifically on the home and décor sector.

By bridging these research gaps, scholars and industry practitioners can develop a thorough understanding of the potential advantages, limitations, and optimal practices related to VR and AR technology in the domain of home and décor products. This, in turn, can foster innovation and enhance customer satisfaction within this sector. Consequently, the research objectives and questions are designed to examine the significant connections among perceived usefulness, perceived ease of use, attitude toward usage, social influence, perceived enjoyment, innovativeness, and behavioral intention.

2. Literature Review

2.1 Innovativeness

Song et al. (2012) conceptualized that innovativeness is "the degree to which individuals are willing to try and adopt new technologies, such as VR and AR, and their openness to novel and advanced features and functionalities of these technologies." According to Park and Kim (2003), innovativeness in using VR/AR for online shopping represents consumers' inclination or readiness to explore and utilize virtual reality and augmented reality technologies in the online shopping environment, reflecting their tendency to embrace technological advancements and novel shopping experiences.

According to Saprikis et al. (2020), the relationship between innovativeness and perceived enjoyment was measured in the model of technology adoption. Innovativeness refers to an individual's inclination to adopt new technologies and embrace novel experiences. Understanding the connection between innovativeness and perceived enjoyment is crucial for predicting users' acceptance and enjoyment of innovative technologies. Lu et al. (2005) examined the implementation of wireless Internet services through mobile technology. Their study revealed that personal innovativeness positively influences perceived enjoyment, suggesting that individuals with a higher level of innovativeness are more likely to find enjoyment in using wireless Internet services.

According to Hu et al. (2003), in their longitudinal study examining technology acceptance among school teachers, innovativeness significantly influences teachers' behavioral intention to adopt technology. The findings suggest that more innovative teachers are more likely to exhibit a higher intention to use technology in educational settings. Lu et al.

(2005) explored the adoption of wireless Internet services through mobile technology, revealing that personal innovativeness has a positive impact on users' behavioral intention to adopt mobile Internet services. This indicates that more innovative individuals are more likely to express an intention to use these services. Therefore, the following hypotheses are proposed to further explore this relationship:

H1: Innovativeness has a significant effect on perceived enjoyment.

H7: Innovativeness has a significant effect on behavioral intention.

2.2 Perceived Usefulness

In general, "perceived usefulness" is "an individual's subjective perception or belief about the extent to which a particular technology or system enhances their performance, productivity, and effectiveness in achieving specific goals or tasks" (Davis, 1989). It represents "the extent to which an individual believes that adopting a specific technology would enhance their performance and productivity, facilitating the accomplishment of tasks and achieving desired outcomes" (Venkatesh & Davis, 2000).

The role of perceived usefulness is pivotal in the acceptance and adoption of virtual reality (VR) and augmented reality (AR) technology, particularly within the realm of online shopping. Numerous studies have delved into the connection between perceived usefulness and consumers' attitudes and intentions regarding the use of VR and AR for online shopping (Hassoune, 2021).

Recent studies have expanded the understanding of this relationship within the context of specific technologies. For example, in the domain of mobile applications, Liébana-Cabanillas et al. (2014) studied the factors influencing users' intention to adopt mobile apps for shopping. Their findings revealed that perceived usefulness significantly impacts users' intention to adopt mobile shopping apps. Thus, the researcher makes a following hypothesis:

H2: Perceived usefulness has a significant effect on behavioral intention.

2.3 Perceived Ease of Use

Venkatesh and Davis (2000) indicated that "perceived ease of use" reflects "the extent to which an individual believes that using a specific technology would be effortless, uncomplicated, and require minimal cognitive effort and technical skills." According to Al Amin et al. (2023), "Perceived ease of use" in using VR/AR for online shopping reflects "consumers' subjective evaluation of the level of ease, simplicity, and intuitiveness in navigating and interacting with virtual reality and augmented reality technologies during the online shopping process." For example, Huang et al. (2013) revealed that users' perception of the ease of use significantly impacted their intention to adopt VR in educational contexts. Those who found VR easy to use were more inclined to embrace the technology and participate in educational activities.

Liu et al. (2010) investigated "the factors influencing consumers' intention to adopt online shopping." Their findings revealed that "perceived ease of use significantly influences consumers' behavioral intention to adopt online shopping platforms." In conclusion, the current literature consistently supports a favorable connection between perceived ease of use and behavioral intention. Perceived ease of use holds a pivotal role in users' acceptance and adoption of technology, impacting their attitude toward using the technology and, consequently, molding their behavioral intention. Therefore, the subsequent hypothesis is posited:

H3: Perceived ease of use has a significant effect on behavioral intention.

2.4 Attitude Toward Using

Davis (1989) defined "attitude towards using" as "a person's overall positive or negative feelings and evaluations toward the use of a particular technology or system." Venkatesh et al. (2003) reflected that "attitude towards using" explains "an individual's favorable or unfavorable disposition towards using a particular technology or system." Attitude towards using VR and AR technologies is a "key determinant of users' acceptance and adoption of these immersive technologies." The objective of previous research is to examine the research conducted on the attitude towards using VR and AR technology, focusing on its antecedents, measurement, and impact on users' behaviors and intentions (Chatsirichai et al., 2022).

Comprehending the influence of one's attitude toward using a technology on their behavioral intention is crucial for forecasting users' acceptance and adoption of that technology (Mailizar & Johar, 2021). Yi et al. (2006) delves into the interconnections among attitude toward using, perceived usefulness, perceived ease of use, and behavioral intention. Zhao et al. (2010) examined users' intention to continue using social networking sites. Their findings revealed that attitude toward using social networking sites significantly influences users' behavioral intention to continue using them. This research introduces another hypothesis based on these considerations:

H4: Attitude toward using has a significant effect on behavioral intention.

2.5 Social Influence

The influence of social represents "the extent to which individuals perceive that people who are important to them believe they should use VR and AR technologies. It includes subjective norms, social pressure, and the influence of significant others on users' intentions and behaviors" (Venkatesh et al., 2012). Social influence within the domain of VR and AR technology is subject to various factors. A significant precursor to this influence is subjective norms, denoting individuals' perceptions of the societal pressure either to adopt or refrain from using these technologies (Yoo, 2023).

Zhou (2012) explored the relationship between social influence, trust, and behavioral intention in the context of mobile banking adoption. This literature finds that social influence, both from close acquaintances and influential figures, significantly influences users' behavior to apply mobile banking services. Building on this, Cheung and Lee (2010) introduced a theoretical model that incorporates social influence, trust, and perceived usefulness to explain individuals' behavioral intention in online social networks. Their work highlights the considerable part of social influence in shaping users' willingness to engage in social actions within the network. Accordingly, the below hypothesis is proposed:

H5: Social influence using has a significant effect on behavioral intention.

2.6 Perceived Enjoyment

Moon and Kim (2001) explicated that percived enjoyment refers "to the extent to which individuals find using VR and AR technologies to be enjoyable, entertaining, and stimulating. It captures the affective and hedonic aspects of the user experience." Perceived enjoyment is "the degree to which individuals experience pleasure, fun, and enjoyment when using VR and AR technologies." It reflects the subjective experience of positive affect and satisfaction derived from engaging with these technologies (Papakostas et al., 2022).

Recognizing the influence of perceived enjoyment on behavioral intention is crucial for anticipating users' acceptance and adoption of technology (Saprikis et al., 2020). Gefen et al. (2003) emphasized the importance of perceived enjoyment as an antecedent to users' trust and behavioral intention in the online shopping context. Drawing from these studies, the following hypothesis has been derived: van der Heijden (2004) revealed that perceived enjoyment significantly influences users' behavioral intention to adopt and use technology in a hedonic context. Wu and Wang (2006) re-examined DeLone and McLean's model of information systems success in the context of knowledge management systems, incorporating perceived enjoyment as a critical factor influencing users' intention to use knowledge management systems. Drawing upon evidence from prior studies, this research affirms the existence of a causal relationship as presented below:

H6: Perceived enjoyment has a significant effect on behavioral intention.
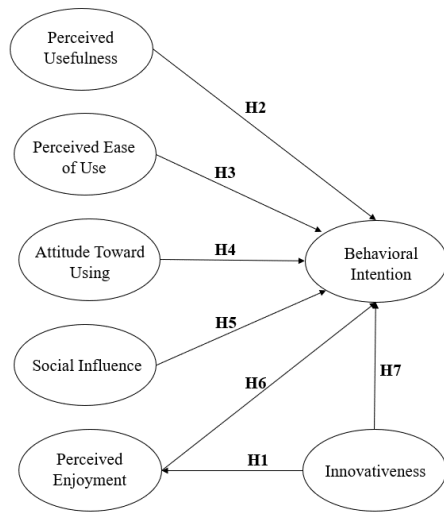
2.7 Behavioral Intention

According to Wang et al. (2022), behavioral intention means "an individual's planned or anticipated behavior related to the adoption and usage of virtual reality (VR) and augmented reality (AR) technologies in the context of online shopping. To use VR/AR for online shopping, behavioral intention reflects consumers planned or expected usage of virtual reality and augmented reality technologies when engaging in online shopping experiences." Moreover, behavioral intention to use VR and AR technologies in e-learning refers to "individuals' anticipated actions and plans to adopt and use these technologies within a specific context or setting, influenced by their attitudes, beliefs, and evaluations of the potential benefits and advantages offered by the technologies" (Cheung & Vogel, 2013). Qian et al. (2020) highlighted the role of positive experiential factors, such as enjoyment, in driving willingness of people to adopt and engage with VR system for fitness purposes. Aldhmour and Sarayrah (2016) examined the importance of various factors in shaping individuals' intentions to adopt and utilize AR technology for online shopping activities.

3. Conceptual Framework

The researcher integrated the research model from established theoretical frameworks, delineating the essential constructs of perceived usefulness, perceived ease of use, attitude toward using, social influence, perceived enjoyment, innovativeness, and behavioral intention. The conceptual framework was formulated by drawing upon the research models proposed by Hassoune (2021), Mailizar and Johar (2021), and Saprikis et al. (2020), incorporating their valuable insights and contributions to comprehend the factors influencing the adoption and usage of VR and AR technologies. Figure 1 and seven hypotheses are indicated as follows:

Figure 1: Conceptual Framework
Source: Created by the author.

H1: Innovativeness has a significant effect on perceived enjoyment.

H2: Perceived usefulness has a significant effect on behavioral intention.

H3: Perceived ease of use has a significant effect on behavioral intention.

H4: Attitude toward using has a significant effect on behavioral intention.

H5: Social influence using has a significant effect on behavioral intention.

H6: Perceived enjoyment has a significant effect on behavioral intention.

H7: Innovativeness has a significant effect on behavioral intention.

4. Research Methods and Materials

4.1 Research Methodology

The focus population comprises individuals aged 18 and above, eligible to use credit cards and mobile banking as per Thai laws, residing in Thailand, and having experience in purchasing modern household products from the top four online shopping platforms based on market share in Thailand. The sampling methods include purposive, quota, and convenience sampling. Prior to data collection, validation procedures involved the "Item Objective Congruence (IOC) Index," and a "pilot test" with a sample size of 50, assessed using "Cronbach's Alpha." Data analysis includes "Confirmatory Factor Analysis (CFA)" and "Structural Equation Modeling (SEM)." CFA is employed in the methods of "Construct Validity, Convergent Validity, Factor Loading, Composite Reliability (CR), Average Variance Extracted (AVE), Discriminant Validity, and Goodness of Fit." SEM is then applied to detect the structural model's fit indices and approved or disapproved hypotheses.

Item-Objective Congruence (IOC) index is used for expert judgment and ensures that the items cover the full range of the construct (DeVellis, 2017). The range of IOC values in this study varied from -1 to +1, where positive values indicated a positive relationship between the item and the overall measure. This validation process involved three experts who held Ph.D. degrees or had extensive experience in high-level management positions. The IOC results are provided, with a pass score set at 0.6 and above, based on guidelines proposed by Cohen and Swerdlik (2017).

The pilot test involved 50 participants for calculating Cronbach's alpha, a measure of internal consistency ranging from 0 to 1, where values closer to 1 indicate higher internal consistency (George & Mallery, 2003). The pilot test results, indicate that a Cronbach's Alpha value of 0.60 or higher is considered acceptable in exploratory research, while a value of 0.70 or higher is generally accepted in confirmatory research (George & Mallery, 2003). The results are perceived usefulness (0.726). perceived ease of use (0.822), attitude toward using (0.884), social influence (0.734), perceived enjoyment (0.896), innovativeness (0.785), and behavioral intention (0.813).

4.2 Population and Sample Size

In this study, the target population aims to people who are 18 years old and above, eligible to use credit card and mobile banking (according to Thai laws), living in Thailand and have experience in buying modern household products on top four online shopping platform by market share in Thailand; Index Living Mall, SB Furniture, IKEA and Modernform. According to Soper (2023), latent and observed variables were summarized. Subsequently, the research input parameters, which includes "latent variables (7), observed variables (24), anticipated effect size (0.2), desired statistical power level (0.8), and the probability level (0.05)." Consequently, the minimum required size of sample is 425. However, the investigator plans to gather 450 samples to ensure efficient data analysis for SEM.

4.3 Sampling Techniques

This study applied nonprobability sampling to determine a proper research procedure, including purposive, quota and convenience sampling. The purposive sampling is to select people who are 18 years old and above, eligible to use credit card and mobile banking (according to Thai laws), living in

Thailand and have experience in buying modern household products on top four online shopping platform by market share in Thailand; Index Living Mall, SB Furniture, IKEA and Modernform. Researchers then select participants who meet these quotas until they have reached the desired sample size (Bryman, 2016). To proportionate the sample size in this study, quota sampling is demonstrated in Table 1. Online questionnaire distribution is used per convenience sampling method in this study. The survey is distributed via social media and text application such as Facebook and Line Application.

Table 1: Proportionate Sample Size

Furniture Market Online Platform	Approximate Population Size (Profit Income)	Sample Size	%
Index Living Mall	9,903	155	35%
SB Furniture	9,461	148	33%
IKEA	6,154	96	21%
Modernform	3,182	50	11%
Total	28,700	450	100%

Source: Created by the author.

5. Results and Discussion

5.1 Demographic Information

The demographic data, outlined in Table 2, offers valuable insights into the characteristics of the 450 respondents in the study. Gender distribution reveals a slight female majority, comprising 56.0% of the sample, indicating a balanced representation with females slightly more prevalent. Age-wise, respondents span diverse age groups, with the largest cohorts falling in the 31-40 and 41-50 brackets, highlighting a broad age range. Occupation diversity is evident, with company employees forming the largest group, followed by government employees, self-employed individuals, students, retirees, and others, showcasing varied professional backgrounds. In terms of online shopping frequency for modern household products, a majority of respondents shop 2-5 times per month, indicating high engagement in online shopping. Income-wise, respondents come from diverse economic backgrounds, with the largest group earning between 30,000-50,000 THB per month, reflecting a wide range of income levels among participants.

Table 2: Demophraphic Results

Demographic Data (n=450)		Frequency	Percentage
Gender	Male	198	44.0%
	Female	252	56.0%
Age	18-20 years old	56	12.4%
	21-30 years old	89	19.8%
	31-40 years old	132	29.3%
	41-50 years old	110	24.5%
	More than 50 years old	63	14.0%
Occupation	Student	46	10.2%
	Government employee	112	24.9%
	Company employee	135	30.0%
	Self-employment	90	20.0%
	Retiree/Unemployed	34	7.6%
	Others	33	7.3%
Frequency online shopping for modern household products	One time/Month	111	24.7%
	2-5 times/month	147	32.7%
	6-10 times/month	126	28.0%
	Above 10 times/month	66	14.6%
Monthly Income	Below 30,000 THB	99	22.0%
	30,000-50,000 THB	161	35.8%
	50,001-80,000 THB	122	27.1%
	Above 80,000 THB	68	15.1%

Source: Created by the author.

5.2 Confirmatory Factor Analysis (CFA)

In accordance with Stevens (1992), a satisfactory item loading is typically considered when it surpasses the threshold of 0.40, accompanied by a p-value lower than 0.05. This criterion ensures that the items effectively capture the underlying construct they are intended to measure, thereby reinforcing the validity of the measurement model.

Furthermore, adhering to the guidelines outlined by Fornell and Larcker (1981), the assessment of convergent validity involves evaluating the Average Variance Extracted (AVE) and Composite Reliability (CR) of each construct. If the AVE exceeds 0.5 and the CR surpasses 0.6, it suggests that the construct possesses adequate convergent validity. AVE represents the amount of variance captured by the construct's indicators relative to measurement error, while CR indicates the internal consistency reliability of the construct. Therefore, even if the AVE falls below 0.5, as long as the CR remains above 0.6, the convergent validity of the construct is considered acceptable.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
1. Perceived Usefulness	Zhuang et al. (2021)	3	0.766	0.711-0.745	0.767	0.523
2. Perceived Ease of Use	Zhuang et al. (2021)	4	0.816	0.688-0.792	0.817	0.528
3. Attitude Toward Using	Reyna et al. (2018), Teo (2019)	4	0.790	0.631-0.762	0.794	0.492
4. Social Influence	Saprikis et al. (2020)	3	0.717	0.656-0.715	0.721	0.463
5. Perceived Enjoyment	Saprikis et al. (2020)	3	0.888	0.834-0.880	0.888	0.726
6. Innovativeness	Saprikis et al. (2020)	4	0.817	0.660-0.802	0.819	0.532
7. Behavioral Intention	Cruz et al. (2014)	4	0.775	0.575-0.744	0.780	0.472

Source: Created by the author.

The results of the goodness-of-fit assessment for the measurement model, as presented in Table 4, indicate a high degree of congruence between the hypothesized model and the observed data. The Chi-Square/degrees of freedom ratio (CMIN/DF) stands at 1.437, well below the threshold of 5.00 suggested by Marsh et al. (2004), signifying a reasonable fit between the model and the data.

Furthermore, the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Normed Fit Index (NFI), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) all exceed the recommended threshold of 0.80, as proposed by Nayir (2013), Wu and Wang (2006), and Sharma et al. (2005) respectively. Specifically, the GFI, AGFI, NFI, CFI, and TLI are reported as 0.939, 0.922, 0.924, 0.975, and 0.971 respectively, indicating a robust fit of the model to the observed data.

Moreover, the Root Mean Square Error of Approximation (RMSEA) is calculated at 0.031, well below the threshold of 0.08 recommended by Pedroso et al. (2016). This suggests that the model provides a good fit with reasonable errors, further supporting its validity.

Table 4: Goodness of Fit for Measurement Model

Index	Acceptable Values	Statistical Values
CMIN/DF	≤ 5.00 (Marsh et al., 2004)	365.106/254 = 1.437
GFI	≥ 0.80 (Nayir, 2013)	0.939
AGFI	≥ 0.80 (Nayir, 2013)	0.922
NFI	≥ 0.80 (Wu & Wang, 2006)	0.924
CFI	≥ 0.80 (Nayir, 2013)	0.975
TLI	≥ 0.80 (Sharma et al., 2005)	0.971
RMSEA	≤ 0.08 (Pedroso et al., 2016)	0.031
Model Summary		**Acceptable Model Fit**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI, normalized fit index, CFI = comparative fit index, TLI = Tucker-Lewis index, and RMSEA = root mean square error of approximation.
Source: Created by the author.

Fornell and Larcker (1981) proposed a method for assessing discriminant validity by computing the square root of each Average Variance Extracted (AVE). In line with their study, when comparing these values to the inter-construct or inter-factor correlations, discriminant validity is affirmed if the AVE values exceed these correlations. This approach confirms the distinctiveness of the constructs being measured. As a result, both convergent and discriminant validity are established, thereby providing sufficient evidence to support the overall construct validity.

Table 5: Discriminant Validity

	IN	PU	PEOU	AT	SOC	PN	BI
IN	**0.729**						
PU	0.148	**0.723**					
PEOU	0.101	0.241	**0.726**				
AT	0.395	0.566	0.187	**0.702**			
SOC	0.285	0.681	0.290	0.674	**0.680**		
PN	0.310	0.548	0.313	0.554	0.602	**0.852**	
BI	0.455	0.528	0.267	0.679	0.625	0.602	**0.687**

Source: Created by the author.

5.4 Structural Equation Model (SEM)

The results presented in Table 6 indicate that the structural model demonstrates a satisfactory level of fit to the observed data. The goodness-of-fit indices, including CMIN/DF ratio, GFI, AGFI, NFI, CFI, TLI, and RMSEA, collectively provide strong evidence for the validity and reliability of the model. These findings underscore the importance of rigorous model evaluation in SEM, ensuring that theoretical models accurately represent the underlying relationships among variable.

Table 6: Goodness of Fit for Structural Model

Index	Acceptable Values	Statistical Values
CMIN/DF	≤ 5.00 (Marsh et al., 2004)	943.385/268 = 3.520
GFI	≥ 0.80 (Nayir, 2013)	0.835
AGFI	≥ 0.80 (Nayir, 2013)	0.800
NFI	≥ 0.80 (Wu & Wang, 2006)	0.804
CFI	≥ 0.80 (Nayir, 2013)	0.851
TLI	≥ 0.80 (Sharma et al., 2005)	0.833
RMSEA	≤ 0.08 (Pedroso et al., 2016)	0.075
Model Summary		**Acceptable Model Fit**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI, normalized fit index, CFI = comparative fit index, TLI = Tucker-Lewis index, and RMSEA = root mean square error of approximation.
Source: Created by the author.

5.5 Research Hypothesis Testing Result

Hypothesis testing plays a crucial role in research, enabling researchers to evaluate the relationships between variables and test theoretical predictions. In this study, the results of hypothesis testing are presented in the table, which assess the standardized path coefficients, t-values, and test results for each hypothesis. The outcomes of the evaluation, as detailed in Table 7, affirm the hypotheses with a significant level established at $p<0.05$. This criterion denotes that for a hypothesis to be considered supported, the probability of obtaining the observed results by chance alone must be less than 5%. In accordance with this threshold, the evaluation of each hypothesis reveals statistically significant findings, underscoring the robustness of the relationships between the variables under investigation.

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: IN → PE	0.310	5.635*	Supported
H2: PU → BI	0.089	1.681	Not Supported
H3: PEOU → BI	0.053	1.041	Not Supported
H4: AT → BI	0.325	5.390*	Supported
H5: SI → BI	0.308	4.989*	Supported
H6: PE → BI	0.427	7.051*	Supported
H7: IN → BI	0.240	4.189*	Supported

Note: * $p<0.05$
Source: Created by the author.

Based on Table 7, the following interpretations are indicated:
H1: Innovativeness -> Perceived Enjoyment
The hypothesis that innovativeness has a significant effect on perceived enjoyment is supported, with a standardized path coefficient (β) of 0.310 and a t-value of 5.635*. This indicates a strong positive relationship between innovativeness and perceived enjoyment, providing empirical evidence for the hypothesis.
H2: Perceived Usefulness -> Behavioral Intention
The hypothesis that perceived usefulness has a significant effect on behavioral intention is not supported, as indicated by a low standardized path coefficient (β) of 0.089 and a t-value of 1.681. This suggests that perceived usefulness may not have a substantial impact on behavioral intention in the context of the study.
H3: Perceived Ease of Use -> Behavioral Intention
Similarly, the hypothesis that perceived ease of use has a significant effect on behavioral intention is not supported,

with a standardized path coefficient (β) of 0.053 and a t-value of 1.041. This indicates a weak relationship between perceived ease of use and behavioral intention in the study.
H4: Attitude toward Using -> Behavioral Intention
The hypothesis that attitude toward using has a significant effect on behavioral intention is supported, with a standardized path coefficient (β) of 0.325 and a t-value of 5.390*. This suggests a strong positive relationship between attitude toward using and behavioral intention.
H5: Social Influence -> Behavioral Intention
The hypothesis that social influence has a significant effect on behavioral intention is supported, with a standardized path coefficient (β) of 0.308 and a t-value of 4.989*. This indicates a positive relationship between social influence and behavioral intention.
H6: Perceived Enjoyment -> Behavioral Intention
The hypothesis that perceived enjoyment has a significant effect on behavioral intention is supported, with a standardized path coefficient (β) of 0.427 and a t-value of 7.051*. This suggests a strong positive relationship between perceived enjoyment and behavioral intention.
H7: Innovativeness -> Behavioral Intention
Lastly, the hypothesis that innovativeness has a significant effect on behavioral intention is supported, with a standardized path coefficient (β) of 0.240 and a t-value of 4.189*. This indicates a positive relationship between innovativeness and behavioral intention.

In summary, the results of hypothesis testing provide valuable insights into the relationships between variables in the study. While some hypotheses are supported, others are not, highlighting the nuanced nature of these relationships. These findings contribute to the overall understanding of the research domain and inform future studies in the field.

6. Conclusions and Recommendation

6.1 Conclusion

The results of hypothesis testing provide valuable insights into the factors influencing consumers' behavioral intention to use virtual reality (VR) and augmented reality (AR) in online shopping for modern household products in Thailand. The conceptual framework, comprising perceived usefulness, perceived ease of use, attitude toward using, social influence, perceived enjoyment, innovativeness, and behavioral intention, serves as a robust foundation for understanding consumer behavior in this context.
The findings support Hypothesis 1, indicating that innovativeness significantly influences perceived enjoyment. This suggests that consumers who exhibit a greater propensity for innovativeness are more likely to derive enjoyment from using VR and AR technology in online

shopping for modern household products. This underscores the importance of technological innovation in enhancing the shopping experience and fostering consumer engagement.

However, Hypotheses 2 and 3, which propose that perceived usefulness and perceived ease of use have significant effects on behavioral intention, respectively, are not supported by the findings. This suggests that while perceived usefulness and ease of use may be important factors in consumer decision-making, they may not be the primary drivers of behavioral intention in the context of VR and AR usage in online shopping for modern household products.

Conversely, Hypotheses 4 and 5, which posit that attitude toward using and social influence significantly affect behavioral intention, are supported by the results. This implies that consumers' positive attitudes toward using VR and AR technology, as well as the influence of social factors, play pivotal roles in shaping their intention to engage in online shopping for modern household products using these technologies.

Furthermore, Hypotheses 6 and 7, which suggest that perceived enjoyment and innovativeness have significant effects on behavioral intention, respectively, are supported by the findings. This indicates that consumers who perceive enjoyment from using VR and AR technology and exhibit a propensity for innovativeness are more likely to intend to use these technologies in their online shopping endeavors for modern household products.

These findings carry significant implications for both theoretical understanding and practical application. They highlight the importance of factors such as attitude, social influence, enjoyment, and innovativeness in shaping consumers' behavioral intention in adopting VR and AR technology for online shopping. For practitioners, understanding these factors can inform the design of immersive and engaging online shopping experiences that resonate with consumers' preferences and motivations. Additionally, it is recommended that future research further explores the interplay between these factors and investigates additional variables that may influence consumers' adoption of VR and AR technology in online shopping contexts.

In conclusion, the results of hypothesis testing shed light on the complex dynamics underlying consumers' behavioral intention to use VR and AR in online shopping for modern household products in Thailand. By elucidating the role of various factors in shaping consumer behavior, this study contributes to a deeper understanding of the adoption of immersive technologies in e-commerce settings.

6.2 Recommendation

Further Investigation into Perceived Usefulness and Perceived Ease of Use: While perceived usefulness and perceived ease of use did not emerge as significant predictors of behavioral intention in this study, further research could explore the nuanced relationships between these variables and consumer behavior in the context of VR and AR technology. This may involve conducting qualitative research to understand consumers' perceptions and experiences with these technologies, as well as experimental studies to test the impact of usability improvements on adoption rates.

Exploration of Moderating Factors: Future research could examine potential moderating factors that may influence the relationships between the key variables identified in the study. For example, demographic variables such as age, gender, and technological proficiency may moderate the effects of innovativeness, social influence, and perceived enjoyment on behavioral intention. Understanding these moderating factors can provide valuable insights for targeted marketing and product development strategies.

Longitudinal Studies: Longitudinal studies tracking consumers' adoption and usage of VR and AR technology over time can provide valuable insights into the dynamics of technology adoption and the factors influencing sustained usage. By following consumers from initial awareness and adoption through to usage and post-purchase experiences, researchers can identify key touchpoints and opportunities for intervention to enhance adoption rates and user satisfaction.

Cross-Cultural Studies: Given the cultural diversity of consumer behavior, conducting cross-cultural studies to compare the adoption of VR and AR technology in online shopping across different countries and regions could yield valuable insights. By exploring cultural differences in attitudes, perceptions, and behaviors, researchers can develop more nuanced models of technology adoption and identify cultural-specific factors that influence consumer behavior.

Practical Implementation and Experimentation: Practitioners can leverage the findings of the study to experiment with different strategies for integrating VR and AR technology into their online shopping platforms. This may involve A/B testing different user interfaces, promotional campaigns, and interactive features to identify the most effective approaches for driving adoption and engagement among their target audience.

Investment in Training and Education: As VR and AR technology continues to evolve, investing in training and education programs for both consumers and employees can help bridge the gap between awareness and adoption. By

providing resources and support for learning about and using these technologies, organizations can empower consumers to make informed decisions and maximize the value they derive from VR and AR experiences.

Overall, these recommendations aim to build upon the findings of the study and contribute to a deeper understanding of the factors influencing consumers' adoption of VR and AR technology in online shopping. By addressing key research gaps and exploring new avenues for investigation, researchers and practitioners can drive innovation and enhance the effectiveness of VR and AR initiatives in the digital marketplace.

6.3 Limitations and Further Studies

While this research study provides valuable insights into the factors influencing consumers' behavioral intention to use virtual reality (VR) and augmented reality (AR) technology in online shopping for modern household products in Thailand, it is important to acknowledge several limitations.

First, the study's findings are based on a sample of consumers who are 18 years old and above, eligible to use credit card and mobile banking, living in Thailand, and have experience in buying modern household products online. This may limit the generalizability of the findings to other demographic groups or geographic regions.

Second, the study's findings may be influenced by external factors such as technological advancements, market trends, and cultural differences. While efforts were made to control for these factors, it is important to recognize that the findings may not fully capture the complexity of consumer behavior in dynamic and evolving online shopping environments.

Last, the study focuses specifically on consumers' behavioral intention to use VR and AR technology in online shopping for modern household products in Thailand. As such, the findings may not be generalizable to other types of products or industries, or to offline shopping contexts.

Despite these limitations, the research provides valuable insights into the factors influencing VR and AR adoption in online shopping and lays the groundwork for future research in this emerging field. By addressing these limitations and building upon the findings of this study, researchers can continue to advance our understanding of technology adoption and create meaningful experiences for consumers in the digital marketplace

References

Al Amin, M., Muzareba, A. M., Chowdhury, I., & Khondkar, M. (2023). Understanding e-satisfaction, continuance intention, and e-loyalty toward mobile payment application during COVID-19: an investigation using the electronic technology continuance model. *Journal of Financial Services Marketing*, *29*, 318-340. https://doi.org/10.1057/s41264-022-00197-2

Aldhmour, F., & Sarayrah, I. (2016). An investigation of factors influencing consumers? intention to use online shopping: An empirical study in south of Jordan. *Journal of Internet Banking and Commerce, 21*(2), 1-46.

Boardman, R., Henninger, C. E., & Zhu, A. (2020). Augmented Reality and Virtual Reality: New Drivers for Fashion Retail?. In G. Vignali, L. F. Reid, D. Ryding, & C. E. Henninger (Eds.), *Technology-Driven Sustainability* (pp.155-172). Springer. https://doi.org/10.1007/978-3-030-15483-7_9

Bonetti, F., Wamaby, G., & Quinn, L. (2017). Augmented Reality and Virtual Reality in Physical and Online Retailing: A Review, Synthesis and Research Agenda. *International Augmented Reality and Virtual Reality Conference 2017,* 119-132 https://doi.org/10.1007/978-3-319-64027-3_9

Bryman, A. (2016). *Social Research Methods* (5th ed.). Oxford University Press.

Chatsirichai, C., Vongurai, R., & Jaruwanakul, T. (2022). A Study of Behavioral Intention to Use Augmented Reality for Apparel Products Shopping on E-Commerce Platforms in Thailand. *Journal of Suvarnabhumi Institute of Technology (Humanities and Social Sciences, 8*(2), 336-348.

Cheung, C. M., & Lee, M. K. (2010). A theoretical model of intentional social action in online social networks. *Decision Support Systems, 49*(1), 24-30.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education, 63*(1), 160-175.

Cohen, R. J., & Swerdlik, M. E. (2017). *Psychological testing and assessment: An introduction to tests and measurement* (9th ed.). McGraw-Hill Education.

Cruz, C., Larraza–Kintana, M., Garcés–Galdeano, L., & Berrone, P. (2014). Are Family Firms Really More Socially Responsible? *Entrepreneurship Theory and Practice*, *38*(6), 1295–1316. https://doi.org/10.1111/etap.12125

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Sage Publications.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly, 27*(1), 51-90.

George, D., & Mallery, P. (2003). *SPSS for Windows Step by Step: A Simple Guide and Reference, 11.0 Update* (4th ed.). Allyn & Bacon.

Hassoune, A. (2021). *SMART TOURISM: Tourism apps usage on Virtual Reality* [Master's Thesis]. University of Trento.

Hu, P. J., Clark, T. H., & Ma, W. W. (2003). Examining technology acceptance by school teachers: A longitudinal study. *Information & Management, 41*(2), 227-241.

Huang, H.-M., Liaw, S.-S., & Lai, C.-M. (2013). Exploring learner acceptance of the use of virtual reality in medical education: a case study of desktop and projection-based display systems. *Interactive Learning Environments, 24*(1), 1-17. https://doi.org/10.1080/10494820.2013.817436

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Munoz-Leiva, F. (2014). The Moderating Effect of Experience in the Adoption of Mobile Payment Tools in Virtual Social Networks: The m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN). *International Journal of Information Management, 34,* 151-166. http://dx.doi.org/10.1016/j.ijinfomgt.2013.12.006

Liu, Y., Han, S., & Li, H. (2010). Understanding the Factors Driving M-Learning Adoption: A Literature Review. *Campus-Wide Information Systems, 27*(4), 210-226.

Lu, J., Yao, J. E., & Yu, C.-S. (2005). Personal Innovativeness, Social Influences and Adoption of Wireless Internet Services via Mobile Technology. *Journal of Strategic Information Systems, 14*(3), 245-268. http://dx.doi.org/10.1016/j.jsis.2005.07.003

Mailizar, M., & Johar, R. (2021). Examining Students' Intention to Use Augmented Reality in a Project-Based Geometry Learning Environment. *International Journal of Instruction, 14*(2), 773-790. https://doi.org/10.29333/iji.2021.14243a

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplinary Journal, 11*(3), 320-341.

Moon, J. W., & Kim, Y. G. (2001). Extending the TAM for a World-Wide-Web context. *Information & Management, 38*(4), 217-230.

Nayir, F. (2013). "Algılanan örgütsel destek ölçeğinin" kısa form geçerlik güvenirlik çalışması["Perceived Organizational Support Scale"- Short Form Validity-Reliability Study]. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 28*, 89-106

Papakostas, C., Troussas, C., Krouska, A., & Sgouropoulou, C. (2022). Exploring Users' Behavioral Intention to Adopt Mobile Augmented Reality in Education through an Extended Technology Acceptance Model. *International Journal of Human-Computer Interaction, 39*(6), 1294-1302. https://doi.org/10.1080/10447318.2022.2062551

Park, C. H., & Kim, Y. G. (2003). Identifying Key Factors Effecting Consumer Purchase Behavior in an Online Shopping Context. *International Journal of Retail & Distribution Management, 31*(1), 16-29.

Pedroso, R., Zanetello, L., Guimaraes, L., Pettenon, M., Goncalves, V., Scherer, J., Kessler, F., & Pechansky, F. (2016). Confirmatory factor analysis (CFA) of the crack use relapse scale (CURS). *Archives of Clinical Psychiatry, 43*(3), 37-40.

Qian, J., McDonough, D. J., & Gao, Z. (2020). The Effectiveness of Virtual Reality Exercise on Individual's Physiological, Psychological and Rehabilitative Outcomes: A Systematic Review. *International journal of environmental research and public health*, *17*(11), 4133. https://doi.org/10.3390/ijerph17114133

Reyna, J., Hanham, J., & Meier, P. C. (2018). A framework for digital media literacies for teaching and learning in higher education. *E-Learning and Digital Media*, *15*(4), 176-190. https://doi.org/10.1177/2042753018784952

Saprikis, V., Avlogiaris, G., & Katarachia, A. (2020). Determinants of the Intention to Adopt Mobile Augmented Reality Apps in Shopping Malls among University Students. *Journal of Theoretical and Applied Electronic Commerce Research, 16*(3), 491-512. http://dx.doi.org/10.3390/jtaer16030030

Sharma, G. P., Verma, R. C., & Pathare, P. (2005). Mathematical modeling of infrared radiation thin layer drying of onion slices. *Journal of Food Engineering, 71*(3), 282-286.

Song, J., Drennan, J. C., & Andrews, L. M. (2012). Exploring Regional Differences in Chinese Consumer Acceptance of New Mobile Technology: A Qualitative Study. *Australasian Marketing Journal*, *20*(1), 80-88. https://doi.org/10.1016/j.ausmj.2011.08.002

Soper, D. S. (2023). *A-priori Sample Size Calculator for Structural Equation Models*. www.danielsoper.com/statcalc/default.aspx

Stevens, J. P. (1992). *Applied multivariate statistics for the social sciences* (2nd ed). Erlbaum.

Teo, T. (2019). Students and Teachers' Intention to Use Technology: Assessing Their Measurement Equivalence and Structural Invariance. *Journal of Educational Computing Research*, *57*(1), 201-225. https://doi.org/10.1177/0735633117749430

van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly, 28*(4), 695-704.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425-478.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly, 36*(1), 157-178.

Vodovatova, E. (2020). *Augmented Reality Retail Applications & Vr Store Solutions.* The App Solutions. https://theappsolutions.com/blog/development/ar-vr-retail-store/

Wang, M. (2023). The Impact of Virtual Reality on the Customer Experience in the Luxury Industry. *BCP Business & Management, 42,* 197-204. https://doi.org/10.54691/bcpbm.v42i.4582

Wang, W., Cao, D., & Ameen, N. (2022). Understanding customer satisfaction of augmented reality in retail: a human value orientation and consumption value perspective. *Information Technology & People, 36*(6), 2211-2233. https://doi.org/10.1108/ITP-04-2021-0293

World Economic Forum. (2022, August 23). *How many consumers are shopping in virtual reality and what can it offer them?.* https://www.weforum.org/agenda/2022/08/virtual-reality-shopping-retail/

Wu, J. H., & Wang, Y. M. (2006). Measuring KMS success: A respecification of the DeLone and McLean's model. *Information and Management, 43*(6), 728-739. https://doi.org/10.1016/j.im.2006.05.002

Xue, L., Parker, C., & Mccormick, H. (2019). A Virtual Reality and Retailing Literature Review: Current Focus, Underlying Themes and Future Directions. In M. C. tom Dieck, & T. Jung (Eds.), *Augmented Reality and Virtual Reality: The Power of AR and VR for Business* (pp.27-41). Springer. https://doi.org/10.17028/rd.lboro.6177005

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management, 43*(3), 350-363.

Yoo, J. (2023). The effects of augmented reality on consumer responses in mobile shopping: The moderating role of task complexity. *Heliyon, 9*(3), e13775. https://doi.org/10.1016/j.heliyon.2023.e13775

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research, 37*(2), 197-206.

Zhou, T. (2012). Examining mobile banking user adoption from the perspectives of trust and social influence. *Information Technology and Management, 13*(1), 27-37.

Zhuang, W., Luo, X., & Riaz, M. U. (2021). On the Factors Influencing Green Purchase Intention: A Meta-Analysis Approach. *Frontiers in psychology*, *12*, 644020. https://doi.org/10.3389/fpsyg.2021.644020