

Augmented Reality Virtual Try-on Technology, Trust and Purchase Intention in Thailand's Cosmetics Industry: A Moderated Mediation Analysis

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Abstract

This study examined the effects of consumer attitudes toward Augmented Reality Virtual Try-On (AR VTO) technology on online purchase intention for makeup products among Thai non-users, with particular emphasis on the mediating role of trust and the moderating influence of demographic factors. Data were collected from 400 Thai consumers aged 18 to 79 years, equally distributed across four generational cohorts, and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with 5,000 bootstrap resamples. The findings revealed that only perceived usefulness ($\beta = -.215$, $p = .017$) and cybersecurity ($\beta = -.154$, $p = .016$) significantly influenced online purchase intention, both demonstrating negative effects, thereby challenging traditional assumptions of the Technology Acceptance Model (TAM). Trust exhibited a strong effect size ($f^2 = .223$) and partially mediated multiple relationships, effectively transforming negative perceptions into positive behavioral intentions. Furthermore, years of schooling (Index = .034, $p < .05$) and estimated income (Index = .042, $p < .05$) significantly moderated the trust-mediated relationship, while age showed no significant moderating effect (Index = .006, $p = .412$). Notably, LGBTQ+ consumers demonstrated higher levels of purchase intention compared to cisgender groups. The study concludes that trust, rather than technological sophistication, is the primary driver of AR VTO adoption among non-users in emerging markets. Practical implications suggest that retailers should prioritize trust-building strategies, inclusive marketing, and risk-reduction mechanisms to enhance adoption.

Keywords: Augmented reality, cosmetics e-commerce, online purchase intention, trust, virtual try-on

1. Introduction

The digital transformation of consumer behavior has accelerated the shift from traditional shopping to online platforms, reshaping how consumers evaluate, select, and purchase products (Yadav et al., 2024). E-commerce has become an essential part of global retail, driven by the widespread adoption of the internet and ongoing digitalization. With nearly six billion internet users worldwide, online purchasing continues to grow, and global retail e-commerce sales were projected to exceed 3.6 trillion U.S. dollars in 2025, with further growth expected (Statista, 2025). Technologies such as Augmented Reality (AR) and Virtual Try-On (VTO) have emerged as key drivers of this shift, providing immersive and interactive experiences that reduce uncertainty and increase purchase confidence (Verhulst et al., 2020). AR integrates computer-generated content with real-world environments, while VTO allows consumers to

visualize products—such as makeup—on themselves in real time (Yim et al., 2017). Despite the rapid growth of the Thai cosmetics market, projected at USD 6.3 billion in 2024 (Statista, 2024), adoption of AR VTO remains limited due to technical challenges, privacy concerns, and high implementation costs. Research indicates that augmented reality technologies influence user adoption across various contexts, including privacy-related issues in 3D virtual try-on experiences (Youn et al., 2023) and adoption patterns in online retailing (Kumar, 2021). Despite the growth of online shopping, a major challenge remains the inability to try products, which limits product understanding and increases purchase risk (Zhang et al., 2019; Heller et al., 2019; Oyman et al., 2022; Plotkina & Saurel, 2019). Virtual Try-On (VTO) offers a promising solution by enhancing product evaluation and shopping enjoyment (Nayak et al., 2022; Grewal et al., 2021; Cho & Schwarz, 2012; Lee et al., 2022; Yim et al., 2017). However, prior research has largely examined AR and VTO separately, focused on Western markets, and overlooked non-users and demographic factors influencing adoption in emerging markets like Thailand (Eru et al., 2022; Lavoye et al., 2023; Nguyen et al., 2025).

2. Research objectives

Accordingly, this study aims to examine the effects of consumer attitudes toward AR VTO on online purchase intention, focusing on the mediating role of trust and the moderating effects of demographic factors. The specific research objectives are:

- 1) To describe the demographic characteristics—age, gender, years of schooling, and estimated income—of online makeup consumers in Thailand.
- 2) To compare online purchase intention, consumer attitudes, and trust across demographic groups.
- 3) To assess the effects of consumer attitudes toward AR VTO—including perceived usefulness, ease of use, enjoyment, socialization, product risk, privacy risk, visualization, realism, augmentation, interactivity, innovativeness, informativeness, and cybersecurity—on online purchase intention.
- 4) To explore the mediating role of trust in the relationship between consumer attitudes toward AR VTO and online purchase intention.
- 5) To examine the moderating effects of demographic factors—age, gender, years of schooling, and estimated income—on the mediating role of trust in the relationship between consumer attitudes and online purchase intention.

By addressing these objectives, the study provides theoretical and practical insights into AR–VTO adoption in emerging markets, offering guidance for marketers, retailers, and technology developers to enhance consumer trust, engagement, and purchase behavior in Thailand's cosmetics industry.

3. Literature Review

3.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) posits that behavioral intention to adopt technology is primarily influenced by perceived usefulness (PU) and perceived ease of use (PEOU), which shape attitudes toward technology (Davis, 1989; Venkatesh et al., 2012). In VTO adoption, PU reflects the technology's ability to improve decision-making and reduce purchase uncertainty, while PEOU captures the simplicity and intuitiveness of the interface. Empirical studies support TAM in VTO contexts: Zhang et al. (2019) found that PU and PEOU positively influence consumer attitudes and purchase intention in virtual try-on for apparel, highlighting the relevance of TAM principles to technology-mediated retail experiences. Extensions of TAM incorporate perceived enjoyment and socialization, acknowledging the hedonic and social dimensions of technology use, which are particularly relevant in cosmetics retailing, where purchase decisions are often socially and experientially driven (Plotkina & Saurel, 2019;

Hilken et al., 2022). Based on TAM, it is hypothesized that consumer attitudes toward AR VTO technology have a positive effect on online purchase intention (H2), with perceived usefulness (H2a), ease of use (H2b), enjoyment (H2c), and socialization (H2d) each having a positive effect on online purchase intention.

3.2. Trust Theory

Trust plays a central role in online environments characterized by uncertainty and information asymmetry, encompassing trust in technology, retailers, and the broader digital ecosystem (Gefen et al., 2003). In the context of AR VTO adoption, trust mitigates concerns related to privacy, product accuracy, and platform reliability, thereby transforming uncertainty into confidence and influencing behavioral intention. From the perspective of Trust Theory, both perceived risks and trust are critical determinants of online purchase intention. Product risk (H2e) and privacy risk (H2f) of AR VTO technology are hypothesized to negatively influence online purchase intention, while trust mediates the relationship between consumer attitudes toward AR VTO technology and online purchase intention (H3). Furthermore, demographic factors—including age, gender, years of schooling, and estimated income—are proposed to moderate the mediating role of trust (H4). Specifically, age (H4a) is expected to influence engagement levels, with younger consumers showing higher adoption tendencies; gender (H4b) reflects differences in trust perception and inclusivity preferences; years of schooling (H4c) enhances technological familiarity and confidence; and estimated income (H4d) strengthens the translation of favorable attitudes into purchase intention. These hypotheses align with established patterns in technology adoption, trust formation, and consumer behavior in AR and e-commerce contexts (Zhang et al., 2019; Eru et al., 2022; Nguyen et al., 2025).

3.3. Augmented Reality (AR) Theory and Virtual Try-On (VTO)

AR Theory explains how digital overlays enhance real-world environments, creating immersive and interactive experiences that improve engagement, presence, and decision-making confidence. In the cosmetics industry, these capabilities are operationalized through Virtual Try-On (VTO) technologies, which allow consumers to visualize makeup and other products on their faces in real time, thereby replicating aspects of in-store product trials (Eru et al., 2022). As a practical application of AR in e-commerce, VTO integrates visualization, interactivity, and real-time feedback to reduce uncertainty and enhance purchase evaluation. The theoretical relevance of AR Theory in this study lies in its ability to explain how technology-mediated sensory simulation can substitute for physical product interaction and influence online purchase intention. Prior studies indicate that visualization and realism enhance decision confidence, while interactivity and augmentation improve engagement, enjoyment, and perceived usefulness; additionally, informativeness supports decision-making, and trust mechanisms reduce perceived risks (Hilken et al., 2022; Pantano et al., 2020; Kim & Forsythe, 2008; Yim et al., 2017; Zhang et al., 2019; Nguyen et al., 2025). Based on these theoretical insights, AR–VTO experiential features are hypothesized to positively influence online purchase intention. Specifically, visualization (H2g), realism (H2h), augmentation (H2i), interactivity (H2j), innovativeness (H2k), informativeness (H2l), and cybersecurity (H2m) are proposed to have positive effects on consumers' online purchase intention for cosmetics products in Thailand.

3.4. Conceptual Framework

This study integrates TAM, Trust Theory, and AR Theory to explain online purchase intention toward cosmetics using AR VTO in Thailand. Independent variables span three dimensions: technology acceptance factors (perceived usefulness, ease of use, enjoyment, socialization); AR VTO experiential attributes (visualization, realism, augmentation, interactivity, innovativeness, informativeness, cybersecurity); and perceived risk factors (product risk, privacy risk). These variables influence online purchase intention both directly and indirectly

through trust as the mediating variable. Demographic variables—age, gender, years of schooling, and estimated income—serve as moderators conditioning relationships among consumer attitudes, trust, and online purchase intention (see Figure 1).

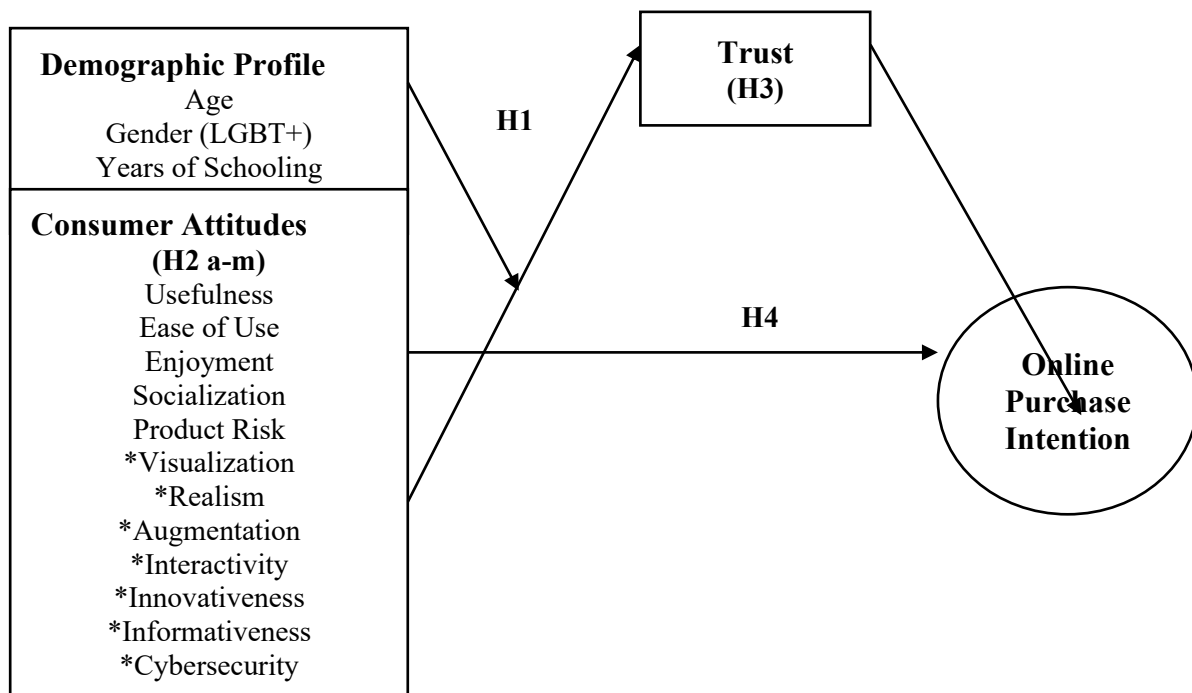


Figure 1: Research conceptual framework

Source: (Zhang et al., 2019; Eru et al., 2022; Gefen et al., 2003)

4. Research Methodology

This section details the methodology employed in the study, including population and sampling, research instruments, data collection, ethical considerations, and construct operationalization with formative and structural modeling.

4.1. Population and Samples

The target population comprised Thai consumers aged 18 years and above with no prior experience using AR VTO technology and no previous cosmetics purchases online using AR VTO features. This population was selected to examine pre-adoption attitudes, trust formation, and behavioral intentions. Sampling employed purposive, quota, and snowball techniques. Purposive sampling restricted participation to Thai nationals meeting non-user criteria. Quota sampling ensured proportional representation across four generational cohorts: Generation Z (18-28 years), Generation Y (29-44 years), Generation X (45-60 years), and Baby Boomers (61-79 years), with 100 respondents per group. Snowball sampling supported recruitment of underrepresented subgroups, particularly older participants. A total of 400 valid responses were utilized for the analysis. This sample size exceeds the minimum requirement for Partial Least Squares Structural Equation Modeling (PLS-SEM), thereby ensuring adequate statistical power. In accordance with the ten-times rule proposed by Hair et al. (2017), the minimum required sample size for the most complex structural path was 130. Thus, the obtained sample of 400 respondents substantially surpasses this threshold, supporting the robustness and reliability of the analysis.

4.2. Research Instrument

Data were collected using a structured, self-administered questionnaire adapted from validated scales in prior research (Fornell & Larcker, 1981; Hair et al., 2017; Henseler et al., 2015). All measurement items were framed to capture anticipated use and hypothetical exposure, ensuring their appropriateness for respondents with no prior experience with AR VTO technology. The instrument assessed technology acceptance attributes, AR VTO experiential characteristics, perceived risks, consumer trust, online purchase intention, and demographic variables. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Consumer attitude toward AR VTO was operationalized following a three-step modeling approach. In Step 1, it was specified as a formative higher-order construct composed of thirteen dimensions, expressed as $ATTITUDE = w_1PU + w_2EOU + w_3ENJ + w_4SOC + w_5PR + w_6PV + w_7VIS + w_8REA + w_9AUG + w_{10}INT + w_{11}INN + w_{12}INF + w_{13}CS + \zeta$, where each w represents the formative weight of its respective indicator, and ζ denotes the residual variance. This formative specification was appropriate as the dimensions collectively define the construct rather than reflect it (Hair et al., 2017). Multicollinearity among formative indicators was assessed using the Variance Inflation Factor (VIF), with all values below the threshold of 3.3, indicating no issues of multicollinearity (Hair et al., 2022). Reflective constructs—Trust and Online Purchase Intention—demonstrated Cronbach's alpha (.812–.947) and Composite Reliability (.883–.959) above .70. Average Variance Extracted (AVE = .594–.835) confirmed convergent validity, and the Fornell–Larcker criterion confirmed discriminant validity (HTMT < .85). All items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

4.3. Ethical Approval (if any)

This study involved human participants and adhered to established ethical research standards. Participation was entirely voluntary, and informed consent was obtained from all respondents prior to survey completion. Respondents were assured of anonymity and confidentiality, and no personally identifiable information was collected. Ethical approval for the study was obtained from the relevant institutional ethics committee prior to data collection.

5. Research Findings

This section reports the findings in accordance with the study's five research objectives. Data from 400 respondents were analyzed to examine the effects of consumer attitudes toward AR Virtual Try-On (VTO) technology on trust and online purchase intention for cosmetics in Thailand. Age, years of schooling, and estimated income were included as continuous moderators, while gender was treated as a categorical variable and assessed using multi-group analysis (MGA). The analysis involved evaluating the measurement model for reliability and validity and testing direct, mediating, and moderated relationships, employing appropriate statistical procedures to ensure the robustness of all estimates (Hair et al., 2017; Henseler et al., 2015).

Table 1 presents the demographic characteristics of the sample. The age distribution was evenly balanced across four generations (25% each), with a mean of 2.5 (SD = 1.119). Gender identity showed 59.3% female, 27.3% male, and 13.7% LGBTQ+ participants. The estimated monthly income revealed 29.5% earning less than 10,000 THB and 29.0% earning 30,001–50,000 THB (mean = 2.482, SD = 1.238). Years of schooling showed 33.0% with 13–16 years of schooling (mean = 3.2, SD = 1.337).

Table 1: Demographic Profile of Online Makeup Consumers in Thailand (N=400)

Characteristics	Frequency	Percent%	M (SD)
Age (years)			2.5 (1.119)
18-28 (Gen Z)	100	25.0	
29-44 (Gen Y)	100	25.0	
45-60 (Gen X)	100	25.0	
61-79 (Baby Boomers)	100	25.0	
Gender Identity			
Female	237	59.3	
Male	109	27.3	
LGBTQ+ (Combined)	54	13.7	
Estimated Monthly Income (THB)			2.482 (1.238)
<10,000	118	29.5	
10,001-30,000	82	20.5	
30,001-50,000	116	29.0	
50,001-100,000	57	14.3	
>100,000	27	6.8	
Years of Schooling			3.2 (1.337)
0-6 years	62	15.5	
7-9 years	36	9.0	
10-12 years	103	25.8	
13-16 years	132	33.0	
17-21 years	57	14.3	
>21 years	10	2.5	

Note. Income measured in Thai Baht (THB) per month. LGBTQ+ includes bisexual, gay, lesbian, transgender, and non-binary identities.

One-way ANOVA was conducted to examine differences in consumer attitudes, trust, and online purchase intention across demographic groups. Table 2 presents significant results only, showing substantial demographic variations across multiple constructs.

Table 2: Significant Demographic Group Differences in Consumer Attitudes, Trust, and Online Purchase Intention (N=400)

Variable	Demographic	Lowest Group M (SD)	Highest Group M (SD)	F	p-value
Usefulness	Age	61-79:2.88 (1.01)	18-28:3.90 (0.61)	52.006	<.001
	Gender	Male: 3.39 (0.78)			
	Estimated Income	<10K:3.42 (0.95)			
	Years of Schooling	0-6 years: 3.03 (0.92)			
Ease of Use	Age	61-79: 2.93 (0.98)	29-444:3.99 (0.44)	26.407	<.001
	Estimated Income	<10K: 3.41 (0.91)	50-100k:3.88 (0.73)	3.336	.012
	Years of Schooling	0-6 years: 3.18 (0.95)	>21 years: 4.20 (0.42)	10.64	<.001
Enjoyment	Age	61-79: 2.87 (0.96)	29-44:4.10 (0.50)	72.421	<.001
Product Risk	Age	18-28: 3.70 (0.67)	61-79:4.56 (0.42)	43.645	<.001
Cybersecurity	Age	18-28: 3.89 (0.70)	61-79:4.89 (0.28)	0.709	<.001
Trust	Age	61-79: 2.58 (0.74)	18-28:3.75 (0.47)	49.400	<.001
	Gender	Male: 3.00 (0.89)	Gay:3.94 (0.55)	4.57	<.001
		>100k: 2.74 (0.98)		2.911	.024
	Estimated Income	0-6 years: 2.91 (0.92)	<10k 3.36 (0.90)	5.08	<.001
Years of Schooling		7-9 years:3.81 (0.82)			

Online Purchase Intention	Age	61-79: 2.87 (1.17) Male:3.16 (1.18)	18-28:3.99 (0.97) Gay:4.27 (1.10)	23.31 3.55	<.001 .001
	Gender	0-6 years: 3.26	7-9 years: 3.94	4.82	<.001
	Years of Schooling	(1.04)	(0.86)		

Note. Only significant results ($p < .05$) are reported. Privacy Risk by age ($p = .098$) and Online Purchase Intention by income ($F = 1.134, p = .343$) were not significant and are excluded. Income measured in Thai Baht (THB) thousands per month.

Table 3 reports Cronbach’s α , composite reliability, and average variance extracted for all constructs. Cronbach’s α values range from .812 to .947, composite reliability values range from .883 to .959, and AVE values range from .594 to .835. Discriminant validity was examined using the Fornell–Larcker criterion. The square root of AVE values ranged from .778 to 1.000 and exceeded the corresponding inter-construct correlations.

Table 3: Summary of Measurement Model Assessment (N = 400)

Criterion	Result	Recommended Threshold	Assessment
Cronbach’s α	.812- .947	$\geq .70$	Satisfactory
Composite Reliability (CR)	.883- .959	$\geq .70$	Satisfactory
Average Variance Extracted (AVE)	.594- .835	$\geq .50$	Satisfactory
Discriminant Validity (Fornell-Larcker)	$\sqrt{\text{AVE}} (.778- 1.000) >$ inter-construct correlations	$\sqrt{\text{AVE}} >$ correlations	Established

Note. All constructs met or exceeded recommended reliability and validity thresholds (Hair et al., 2017).

Table 4 presents the coefficient of determination (R^2) and predictive relevance (Q^2) for the endogenous constructs. Both Trust ($R^2 = .400, Q^2 = .272$) and Online Purchase Intention ($R^2 = .386, Q^2 = .158$) demonstrated medium explanatory and predictive power.

Table 4: Analysis of R^2 and Q^2 Using PLS Algorithm and PLS-Predict for the AR VTO Model

Construct	R^2	Adj. R^2	Model’s Explanatory Power	Q^2	Model’s Predictive Capability
Trust	.400	.380	Medium	.272	Medium
Online Purchase Intention	.386	.363	Medium	.158	Medium

Note. R^2 values: $<.25 =$ weak, $.25-.50 =$ medium, $>.50 =$ substantial. Q^2 values: $>.00$ indicates predictive relevance; higher values indicate better prediction (Hair et al., 2017).

Out of 13 direct paths tested, 2 paths were statistically significant in table 5, the Usefulness \rightarrow OPI path showed a standardized coefficient of $\beta = -.215$ ($SE = .090, t = 2.396, p = .017, 95\% \text{ CI } [-.391, -.039]$), and the Cybersecurity \rightarrow OPI path showed a standardized coefficient of $\beta = -.154$ ($SE = .064, t = 2.418, p = .016, 95\% \text{ CI } [-.279, -.029]$). The remaining 11 direct paths were non-significant ($p > .05$).

Table 5: Path Analysis Results for Sub-Hypotheses of H2: Effects of Consumer Attitudes Toward AR VTO Technology on Online Purchase Intention

Path	β	SE	t	p-value	95% CI	Decision (H_a)
Usefulness \rightarrow OPI	-.215	.090	2.396	.017	[-.391, -.039]	Accepted
Cybersecurity \rightarrow OPI	-.154	.064	2.418	.016	[-.279, -.029]	Accepted

Note. OPI = Online Purchase Intention; β = standardized path coefficient; SE = standard error; t = bootstrap t-value (5,000 resamples); p = two-tailed significance; CI = confidence interval.

Only significant direct effects are reported; all other tested paths (n = 11) were non-significant (p > .05).

Table 6 shows effect sizes for structural paths. Trust demonstrated a large effect on online purchase intention (f² = .223), while all other paths showed negligible to small effects.

Table 6: Effect Sizes for Key Structural Paths

Path	f ²	Result
Trust → OPI	.223	Large
Years of Schooling → Trust	.033	Small
Cybersecurity → OPI	.020	Small
Usefulness → OPI	.017	Small
Age → Trust	.010	Small
All other paths	<.020	Negligible

Table 7 presents significant mediation results. Trust partially mediated five relationships between consumer attitudes and online purchase intention, with cybersecurity showing marginal significance.

Table 7: Significant Indirect Effects via Trust

Indirect Path	β	SE	t	p-value	95% CI
Usefulness → Trust → OPI	.096	.036	2.653	.008	[.026, .166]
Realism → Trust → OPI	.097	.041	2.344	.019	[.017, -.177]
Innovativeness → Trust → OPI	.079	.035	2.269	.023	[.011, .147]
Product Risk → Trust → OPI	-.073	.030	2.446	.014	[-.131, -.015]
Enjoyment → Trust → OPI	-.093	.045	2.059	.040	[-.181, -.005]
Cybersecurity → Trust → OPI†	-.056	.029	1.957	.050	[-.113, .000]

Note. †Marginal significance (p = .050). Seven paths were non-significant (p > .05).

Table 8 presents conditional indirect effects across moderator levels. Years of schooling and estimated income significantly moderated the trust-mediated pathway, with effects strengthening at higher levels. Age showed no significant moderation.

Table 8: Conditional Indirect Effects at Different Moderator Levels

Moderator	Level	β	SE	95% CI	Index	p-value
Years of Schooling	Low	.071	.026	[.025, .128]	.034	<.05
	Mean	.098	.028	[.048, .159]		
	High	.139	.034	[.078, .212]		
Estimated Income	Low	.083	.029	[.031, .142]	.042	<.05
	Medium	.121	.031	[.067, .186]		
	High	.167	.038	[.098, .248]		
Age	Young	.104	.031	[.051, .171]	.006	.412
	Middle	.098	.029	[.048, .162]		
	Older	.092	.033	[.035, .164]		

Note. Low = -1SD, Mean = average, High = +1SD. Income categories: Low <10,000 THB, Medium 10,001-30,000 THB, High >30,001 THB.

Table 9 shows gender-based path differences. Three paths differed significantly between Female + LGBTQ+ and Male groups, though the overall indirect effect through trust remained comparable across groups.

Table 9: Multi-Group Analysis: Significant Path Differences by Gender (N=400)

Path	Female + LGBTQ+ (n=291) β	Male (n=109) β	Path Difference $\Delta\beta$	p-value	Result
Ease of Use → OPI	.315	-.096	.411	.029	Significant
Usefulness → OPI	-.314	.028	.343	.036	Significant
Trust → OPI	.391	.615	.2225	.030	Significant
Indirect: ATT → Trust → OPI	.089	.071	.018	.412	Not Significant

Note. β = standardized path coefficient; $\Delta\beta$ = absolute difference between groups; ATT = Consumer Attitudes toward AR VTO; TR = Trust; OPI = Online Purchase Intention. All other structural paths showed no significant differences between groups ($p > .05$).

6. Discussion and Conclusion

This study examined the effects of consumer attitudes toward AR Virtual Try-On (AR VTO) technology on online purchase intention for makeup products among Thai non-users, focusing on the mediating role of trust and the moderating effects of demographic factors. The findings provide important theoretical and practical insights into technology adoption in pre-adoption contexts, particularly within emerging markets. The demographic profile revealed a digitally connected yet economically stratified consumer base, characterized by high levels of smartphone and internet penetration alongside persistent income disparities. This reflects broader patterns in Thailand’s digital economy, where access to technology is widespread but purchasing power remains uneven (World Bank, 2024). Younger cohorts, particularly Generation Z and Generation Y, demonstrated higher levels of perceived usefulness, ease of use, enjoyment, trust, and online purchase intention, supporting prior research that highlights the role of digital nativity in technology adoption (Thi et al., 2022; Kovács & Keresztes, 2024).

In contrast, older consumers reported higher levels of product risk and cybersecurity concerns, consistent with literature linking age to risk perception and lower digital literacy (Syamsudin et al., 2025). Gender-related findings further revealed that LGBTQ+ consumers exhibited higher levels of trust and purchase intention compared to cisgender groups, suggesting that AR VTO functions as an inclusive and identity-affirming technology (McInroy & Craig, 2017). Additionally, income and years of schooling significantly influenced behavioral outcomes, with lower-income consumers demonstrating higher trust but lower purchase intention due to financial constraints, while education showed a non-linear relationship with purchase intention (Chai-Arayalert & Suttapong, 2020; Rungruangjit et al., 2023; Gao & Liang, 2025). The structural model results revealed counterintuitive findings that challenge traditional assumptions of the Technology Acceptance Model (TAM). Of the thirteen hypothesized direct paths, only perceived usefulness and cybersecurity significantly influenced online purchase intention, and both effects were negative. This contradicts established TAM and UTAUT frameworks, which posit that perceived usefulness and ease of use positively influence behavioral intention (Davis, 1989; Venkatesh et al., 2012). The findings suggest that non-users evaluate AR VTO technology through a risk-and-uncertainty perspective rather than functional benefits, where awareness of usefulness may increase perceived complexity, and cybersecurity concerns heighten perceived risk and avoidance behavior (Bansal et al., 2010; Featherman & Pavlou, 2003; Lwin et al., 2007; Pavlou, 2003). The non-significance of other variables, including ease of use, enjoyment, and AR-specific features, indicates that existing adoption models may have limited explanatory power in pre-adoption contexts. This aligns with expectancy violation theory, which suggests that individuals without prior experience lack the cognitive framework to evaluate advanced technological features (Burgoon, 1993).

Despite these findings, the model demonstrated moderate explanatory power, indicating that online purchase intention is shaped by the cumulative influence of multiple factors rather than a single dominant predictor (Coltman et al., 2008 & MacKinnon et al., 2000). The mediation analysis underscores the central role of trust as a key mechanism linking consumer attitudes to online purchase intention. Trust was found to partially mediate several relationships, including those involving perceived usefulness, realism, innovativeness, product risk, and enjoyment. Notably, variables that exhibited negative direct effects became positive when mediated through trust, highlighting its role in transforming perceived risk into favorable behavioral outcomes (Gefen et al., 2003; McKnight et al., 2002). The strong effect size of trust indicates that for non-users, confidence in platform reliability, data security, and product authenticity is more influential than technological features (Kimery & McCord, 2002; Park & Kim, 2021). These findings are consistent with Trust Theory, which emphasizes the importance of reducing uncertainty and fostering confidence in online transactions (Pavlou, 2003; Zhang et al., 2019). In the context of Thai consumers, trust mitigates concerns related to data privacy, virtual product accuracy, and platform performance, suggesting that retailers should prioritize transparency, protective policies, and credibility-building strategies (Karwatzki et al., 2017; Nguyen, 2022).

The moderated mediation analysis further demonstrated that years of schooling and estimated income significantly strengthened the trust-mediated pathway, while age did not exhibit a significant moderating effect. Higher levels of education enhanced consumers' ability to interpret AR features and translate them into trust, supporting diffusion of innovation theory, which highlights the role of knowledge in technology adoption (Rogers, 2003). Similarly, higher-income consumers exhibited stronger indirect effects, reflecting greater sensitivity to quality signals and access to advanced technological devices (Atwal & Williams, 2009; Chaudhuri & Holbrook, 2001; Forsythe & Shi, 2003; Kaplan et al., 1974; Rauschnabel et al., 2022). The non-significant role of age suggests that widespread digital exposure has reduced generational differences in technology use (Smink et al., 2020; Venkatesh et al., 2012). Furthermore, multi-group analysis revealed that while female and LGBTQ+ consumers were more influenced by ease of use and perceived usefulness, male consumers relied more heavily on trust in shaping purchase intention. However, the overall indirect effect through trust remained consistent across gender groups, indicating that trust functions as a universal mechanism in driving online purchase behavior (Venkatesh et al., 2012; McKnight et al., 2002; Pavlou, 2003).

From a theoretical perspective, this study contributes to the literature by integrating the Technology Acceptance Model, Trust Theory, and Augmented Reality frameworks to explain AR VTO adoption in emerging markets. The findings extend technology adoption theory by demonstrating that traditional predictors operate differently in pre-adoption contexts, where risk perception dominates functional evaluation. Trust emerges as the most critical determinant, highlighting the importance of psychological factors over technological attributes. Additionally, the study contributes to inclusive marketing literature by demonstrating higher engagement among LGBTQ+ consumers, reinforcing the role of AR VTO as an identity-affirming technology (McInroy & Craig, 2017). From a managerial perspective, the findings suggest that firms should prioritize trust-building strategies when targeting non-users of AR VTO technology. Retailers should emphasize data security, transparent privacy policies, and reliable transaction systems to reduce perceived risk. Providing product guarantees, return policies, and trial opportunities can further enhance consumer confidence. Marketing strategies should be tailored based on income and education levels, with a focus on affordability and value for lower-income consumers and innovation for higher-income segments.

Inclusive marketing approaches that reflect diverse identities are also essential in maximizing engagement. Furthermore, increasing consumer exposure through influencer marketing, tutorials, and experiential campaigns can help reduce uncertainty and enhance familiarity with AR technology. In conclusion, this study demonstrates that AR Virtual Try-On adoption in Thailand's cosmetics market is primarily driven by trust rather than technological sophistication. Consumers in pre-adoption stages evaluate AR VTO through a lens of uncertainty and perceived risk, leading to counterintuitive effects of traditional predictors such as usefulness and cybersecurity. Trust plays a transformative role in converting negative perceptions into positive behavioral intentions, while education and income enhance the effectiveness of trust-building mechanisms. The findings also highlight the importance of inclusivity and segmentation in promoting AR VTO adoption. As market familiarity increases, the influence of AR features is expected to strengthen, supporting broader adoption in the future.

7. Limitations and Recommendations

This study has several limitations. The cross-sectional design limits causal inference and does not capture changes in consumer perceptions over time. The exclusive focus on non-users restricts generalizability to experienced users and may explain the counterintuitive findings. The study is also context-specific to Thailand, limiting applicability to other markets. Additionally, reliance on self-reported measures may not fully reflect actual purchasing behavior, and multicollinearity among constructs may have affected the significance of some relationships. Future research may adopt longitudinal designs to examine changes in trust and behavior over time and include both users and non-users for comparison. Cross-cultural studies are recommended to assess the generalizability of findings across different markets. Experimental research manipulating AR features, such as realism and privacy messaging, can provide insights into effective design strategies. Further studies should also explore the intention-behavior gap, the role of social influence and influencers, and the impact of inclusive design on diverse consumer groups. As AR VTO technology matures, future research should reassess these relationships to determine whether the influence of technological features becomes more significant.

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