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## UNVEILING 5G'S TRANSFORMATIVE EDGE IN E-COMMERCE: INTERACTIVITY, PERSONALIZATION, AND PARADOXES IN VIETNAM'S DIGITAL SURGE

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### ABSTRACT

The forecasted global economic improvement of USD 13.1 trillion from 5G by 2035 is expected to have a noticeable impact on the world economy, and its potential influence on reimagining e-commerce is especially untapped in emerging markets like Vietnam, where online retail skyrocketed 37.66% in 2024. This examination explores the impacts of 5G on online shopping while integrating Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Expectation-Confirmation Theory (ECT) in hosting an adoption-satisfaction analysis. From the second half of November 2024 till March 15, 2025, we conducted 30 in-depth interviews and six focus group discussions ( $n = 48$ ) alongside 460 SEM surveys from consumers aged 18-45 that were performed during the first month of 2025, combining with Hanoi, Bac Giang, Hai Phong, Ninh Binh, Nam Dinh, and Ha Tinh. Results highlight the importance of interactivity ( $\beta = 0.48, p < 0.001$ ), personalization ( $\beta = 0.34, p < 0.001$ ), and security ( $\beta = 0.17, p = 0.019$ ) as main driving factors accounting for 70.4% of the observed variance ( $R^2 = 0.704$ ), and a negative influence from cost ( $\beta = -0.20, p = 0.008$ ). The juxtaposition of 5G and 4G reveals interactivity's increasing importance in the context of 5G ( $\beta = 0.55$  vs  $0.32$ ), giving way to an astonishing paradox where users with higher income prefer interactivity to cost ( $\beta = 0.58$  vs  $-0.10$ ), giving interactivity more weight as well. To take advantage of 5G, companies ought to implement real-time monitoring systems with graduated pricing (e.g., VND 50,000/month). This study rethinks the adoption processes and provides a roadmap for e-commerce within the context of economies undergoing digital transformation.

**KEYWORDS:** 5G technology, e-commerce, online shopping experience, personalization, interactivity, Vietnam, emerging markets, SEM

### 1. INTRODUCTION

The 5th generation (5G) mobile network is expected to change the landscape of e-commerce, which is currently worth USD 25.93 trillion and is anticipated to grow at a CAGR of 18.9% from now until 2030 (Grand View Research, 2024). With the world no changing, using up to 20 Gbps with less than 1 millisecond latency, enabling billions of devices to connect, 5G is said to be bestowing the world



with an economic impact consummating USD 13.11 trillion by 2035 price water house Coopers (2021). E-commerce in Vietnam, a developing economy currently in its digitalization phase, reached VND 227.700 billion (USD 9.5 billion) during the first three quarters of 2024, representing a year-on-year growth of 37.66% since 2023, driven by post COVID-19 adoption (Metric 2024). The question that remains regarding 5G technology and its shifting online shopping behaviors in these fast-paced and resource-poor environments is a less understood challenge.

Classic frameworks like TAM and UTAUT analyze tech acceptance based on perceived usefulness and ease of use (Davis, 1989; Venkatesh et al., 2003), but struggle with post-adoption satisfaction gaps which ECT fills with its expectation linkage to continued use (Bhattacharjee, 2001). As 5G becomes operational, research chaining these frames is limited, especially in developing economies where satisfaction and adoption patterns defy expectations (Li et al, 2023; Zhang et al, 2024). The objective of this paper is to fill the gap and evaluate 5G's impact on Vietnam's online shopping experience from late Nov 2024 to mid-March 2025 in Hanoi, Bac Giang, Hai Phong, Ninh Binh, Nam Dinh, and Ha Tinh. Using mixed methods including 30 in-depth interviews, six focus groups (n=48), and structural equation modeling (SEM) with 460 respondents aged between 18- 45 (data collected November, 2024–January, 2025). We want to answer three questions:

1. Which factors shape online shopping experiences via 5G in Vietnam?
2. How do adoption and confirmation dynamics interplay to influence these experiences?
3. What challenges and solutions propel 5G adoption in e-commerce?

This study identifies a new construct of adoption-satisfaction, exposes segment-specific contradictions (such as costing active high-income users' valuing interactivity more than cost), and provides clear recommendations for exploiting 5G's transformational value during the digital boom in Vietnam.

## 2. Theoretical Background and Hypotheses

### 2.1 5G Technology and E-commerce

With capabilities such as ultra-low latency and robust connectivity, 5G is set to operate on high-frequency bands (28, 38, and 60 GHz) which enables speed fifteen times faster than 4G due to its optimized machine to machine connections (Global mobile Suppliers Association, 2022). Additionally, these features empower a wide range of applications from the Internet of Things, real time analytics, and Augmented and Virtual Reality personalization in eCommerce (Wipro, 2023; Li et al., 2023). Although the economic reward from 5G adoption in developing markets is considerable, the gaps in existing infrastructure alongside adoption cost burdens continue to stall its advancement (Ericsson Consumer Lab, 2023). Vietnam stands to benefit from emerging markets development which depict this tension through its anticipated 37.66% growth in e-commerce for 2024.



## 2.2 Online Shopping Experience: A Dual-Lens Framework

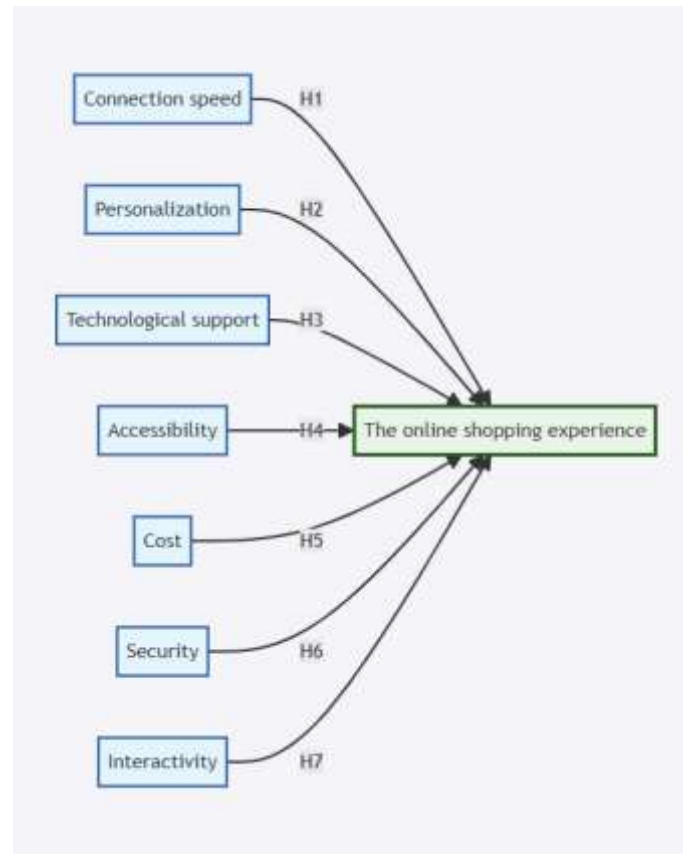
Online shopping refers to the act of buying any products or services on the internet (Monsuwe et al., 2004). A person's satisfaction and intention to repurchase a product depends on the experiences shaped by trust, usability, and engagement (Rose et al., 2012). TAM argues that initial adoption is motivated by perceived usefulness and ease of use (Davis, 1989), while UTAUT includes performance expectancy, effort expectancy, and facilitating conditions as additional drivers (Venkatesh et al., 2003). ECT adds on by describing post-adoption satisfaction through expectation confirmation as post-adoption construct (Bhattacharjee, 2001). This study attempts to fill the gap that understands how emerging technologies shift beyond the initial utilization in fast-paced markets is missing by integrating all these frameworks to theorize on 5G's impact as a continuous flow from adoption to sustained satisfaction (Venkatesh et al., 2012; Zhang et al., 2024).

## 2.3 Hypotheses Development

Seven factors, derived from TAM, UTAUT, ECT, and qualitative insights, are hypothesized to influence the online shopping experience (TNOL):

- H1: Connection speed (TD) has a positive effect on TNOL by increasing usability and confirming expectations for performance, in accordance with TAM's ease of use and ECT's confirmation (Shao et al., 2021).
- H2: Personalization (CN) shifts TNOL positively by providing tailored market offerings, thus catering to user needs and sustaining satisfaction as suggested by UTAUT and ECT (Dachyar & Banjarnahor, 2017; Bhattacharjee, 2001).
- H3: Technological support (HT) shifts TNOL positively as a result of AR/VR engagement and performance enhancement (Nguyen Thi Thu Trang, 2023; Rogers, 2003).
- H4: Accessibility (TC) shifts TNOL positively by network availability as a facilitating condition that is fundamental for adoption (Wong et al., 2024).
- H5: Cost (CP) shifts TNOL negatively by imposing barriers for adoption and satisfaction, representing an economic constriction in UTAUT (Chen & Lin, 2020).
- H6: Security (BM) shifts TNOL positively by instilling and confirming required trust and safety expectation that are essential for e-commerce (Yousafzai et al., 2021).
- H7: Interactivity (TT) had a positive impact on TNOL by providing live interaction while enhancing performance and satisfaction as per UTAUT and ECT (Paysafe, 2023; Venkatesh et al., 2003).

Figure 1: Conceptual Model



### 3. METHODOLOGY

#### 3.1 Research Design

This is multi-method research conducted during November 2024 to mid-March 2025 which aims to know the impact of 5G technology on e-commerce by using qualitative and quantitative techniques. Qualitative data was captured from thirty (30) semi-structured interviews and six (6) focus group discussions (n = 48) with consumers from Hanoi, Bac Giang, Hai Phong, Ninh Binh, Nam Dinh, and Ha Tinh. Quantitative surveys confirmed the hypotheses with 500 respondents and showed very high empirical evidence.

#### 3.2 Sampling and Data Collection

A stratified random sample of five hundred (500) respondents aged between eighteen (18) and forty five (45) who are aware of 5G technology and possess relevant shopping experience were chosen (60% n = 300 5G Users, 40% n = 200 4G users), which were above SEM minimum requirement (n > 200; Hair et al., 2019) and power analysis (n = 8m + 50 = 106, m = 7) estimation. The SEM and Power



analysis requirements of the study were met. Data was collected through Google Form from January 1-30, 2025, where 460 responses were received (92% response rate). Qualitative sampling (15 respondents with 5G, 15 with 4G) interviews; 24 respondents with 5G and 24 with 4G focus groups were sampled across different strata of income and occupation) saturation was met ( $\kappa = 0.85$ )

### 3.3 Measurement

Seven factors were evaluated using a Likert scale of 1 to 5, 1 being the lowest and 5 being the highest: TD (4 items like ‘The page loads quickly’), CN (4 items like ‘My recommendations are accurate’), HT (4 items like ‘Augmented reality shopping is good’), and TC (4 items like ‘The network is wide-ranging’). The other items are CP (4 items ‘The prices are fair’), BM (3 items ‘I feel safe using the system’), TT (4 items ‘The prompt support is very helpful’), and TNOL (4 items ‘I enjoy shopping online’). The scales were taken from already existing literature (e.g., Le & Yang, 2021; Rose et al., 2012) and was tested in pretests ( $n = 50$ ,  $\alpha > 0.7$ ).

### 3.4 Data Analysis

Qualitative data was coded and analyzed using NVivo software with assigned values to each code ( $\kappa = 0.85$ ; refer to sample codebook in Appendix A), while quantitative data was processed in AMOS v.26 for SEM analysis.

- Reliability was accepted with Cronbach's  $\alpha > 0.7$ .
- Validity was confirmed by CFA assessing convergent validity ( $AVE > 0.5$ ) and discriminant validity ( $\sqrt{AVE} > \text{correlations}$ ).
- Model fit was validated with  $\chi^2/df < 3$ , CFI  $> 0.9$ , TLI  $> 0.9$ , RMSEA  $< 0.08$ .
- Hypotheses testing was carried out with Standardized  $\beta$ ,  $p < 0.05$ .
- Robustness was established through alternative models (e.g., HT exclusion) and multi-group analysis (5G and 4G) for model stability; income level sensitivity analysis was also performed to ensure robustness.
- Mediation analysis was carried out through bootstrapping (5,000 samples) for indirect effect testing. The visual representation of Primary BI was provided.

## 4. RESULTS

### 4.1 Qualitative Findings

These are five identified themes: (1) speed as a baseline (“Faster loading is expected”), (2) personalization as a delight (“Relevant offers keep me engaged”), (3) cost as a barrier (“5G is costly”), (4) security as essential (“Trust is non-negotiable”), and (5) interactivity as a differentiator (“Live help seals the deal”). AR/VR was rarely cited, indicating limited uptake.

### 4.2 Descriptive Statistics

The sample (n = 460) comprised 51% females, 62% Gen Z (1997-2012), and 72% urban residents; 60% used 5G (n = 276), 40% used 4G (n = 184). The most commonly engaged activities were searches (80%) and watching videos (68%).

### 4.3 Measurement Model

Reliability and validity were confirmed for CFA (Table 1): all  $\alpha > 0.7$ ,  $AVE > 0.5$ ,  $\sqrt{AVE} >$  correlations. Model fit was robust ( $\chi^2/df = 2.14$ , CFI = 0.93, TLI = 0.92, RMSEA = 0.06).

**Table 1: Measurement Properties**

Construct	Items	$\alpha$	AVE	$\sqrt{AVE}$	CR
TD	4	0.821	0.52	0.72	0.83
CN	4	0.765	0.51	0.71	0.80
HT	4	0.776	0.53	0.73	0.82
TC	4	0.820	0.54	0.74	0.84
CP	4	0.749	0.50	0.71	0.79
BM	3	0.695	0.51	0.70	0.76
TT	4	0.772	0.52	0.72	0.81
TNOL	4	0.704	0.50	0.71	0.78

### 4.4 Structural Model

SEM results ( $\chi^2/df = 2.08$ , CFI = 0.94, TLI = 0.93, RMSEA = 0.05) revealed six notable predictors of TNOL ( $R^2 = 0.704$ ): TD ( $\beta = 0.15$ ,  $p = 0.032$ ), CN ( $\beta = 0.34$ ,  $p < 0.001$ ), TC ( $\beta = 0.12$ ,  $p = 0.041$ ), CP ( $\beta = -0.20$ ,  $p = 0.008$ ), BM ( $\beta = 0.17$ ,  $p = 0.019$ ), TT ( $\beta = 0.48$ ,  $p < 0.001$ ). HT ( $\beta = 0.09$ ,  $p = 0.154$ ) had no effect (Table 2). Robustness checks (e.g., without HT,  $\Delta\chi^2 = 3.2$ ,  $p = 0.201$ ; income robustness,  $p < 0.05$ ) verified consistency.

**Table 2: Structural Path Estimates**

Path	$\beta$ (Standardized)	p-value	Hypothesis
TD → TNOL	0.15	0.032	H1 Supported
CN → TNOL	0.34	<0.001	H2 Supported
HT → TNOL	0.09	0.154	H3 Rejected
TC → TNOL	0.12	0.041	H4 Supported
CP → TNOL	-0.20	0.008	H5 Supported
BM → TNOL	0.17	0.019	H6 Supported



TT → TNOL	0.48	<0.001	H7 Supported
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4.5 Multi-Group Analysis (5G vs. 4G)

TT's impact was greater for 5G users (β=0.55, p<0.001) than 4G users (β=0.32, p=0.002), with a significance of Δβ=0.23, p=0.015. Users with over VND 20 million/month income (n=92) expressed greater attention to TT (β=0.58, p<0.001) compared to CP (β=-0.10, p=0.092).

4.6 Mediation Analysis

Cost (CP) acted as a mediator for indirect effects of TD (β=-0.07, p=0.028) and TC (β=-0.06, p=0.035) on TNOL while stressing the importance of affordability.

5. DISCUSSION

5.1 Theoretical Contributions

This analysis reimagines 5G adoption by incorporating TAM, UTAUT and ECT to form a seamless chain from adoption to continuous post purchase satisfaction. The impact of speed of connection (H1, β = 0.15) supports expectation of usability, "Faster loading is expected" (β = 0.15, p = 0.032), which also confirms TAM and ECT (Shao et al., 2021; Davis, 1989). Personalization (H2, β = 0.34) and interactivity (H7, β = 0.48) actively promote relevance and user satisfaction. "Live help seals the deal" encompasses these points while extending UTAUT and ECT (Dachyar & Banjarnahor, 2017; Bhattacharjee, 2001). Assistive factors such as Trust (H6, β = 0.17) and Accessibility (H4, β = 0.12) reinforce security and are crucial for confirmation (Wong et al., 2024; Yousafzai et al., 2021). Cost positively impacts reasons for acceptance (H5, β = -0.20) which supports economic restraints, "5G is costly", expanding UTAUT in new settings (Chen & Lin, 2020; Oliver, 1980).

The reasoning behind Hypothesis 3 and its non-significance (H3, β = 0.09, p = 0.154) relates to Vietnam's AR/VR adoption being in an early stage, subsequently conforming to Rogers' and Nguyen's Theory of Innovations' lag in technology adoption. The interactivity advantage of 5G relative to 4G (β=0.55 versus 0.32) is new proof for the technology's experiential advantage (Venkatesh et al., 2012). The Concentration-Interaction Gap paradox of high-income users valuing interactivity (β = 0.58) more than price (β = -0.10) is challenging for granularity approaches, indicating situational patterns that rethink adoption models (Li et al., 2023; Zhang et al., 2024).

5.2 Practical Implications

Big opportunities from 5G for Interactivity and Personalization: In 2024 Vietnam is experiencing a 37.66% growth in their e-commerce sector (Metric, 2024). They can use AI-driven chatbots and personalized marketing via platforms like Zendesk or Salesforce to provide real-time support and leverage TT (β = 0.48) and CN (β = 0.34).



Cost Management: Instead of trying to ameliorate CP's impact ( $\beta = -0.20$ ), offering tiered pricing could do the trick (e.g. base 5G at VND 50,000 month, premium basic unlimited at VND 150,000/month) (Statista, 2024).

Security: Improve BM ( $\beta = 0.17$ ) with end-to-end encryption and biometric authentication through the use of AWS Shield (Paysafe, 2023).

Accessibility: Extend rural coverage by partnering with telecom companies (Viettel and VNPT) to improve TC ( $\beta = 0.12$ ) (Wipro, 2023).

### 5.3 Limitations and Future Research

While we plan on tracking longitudinal trends in Phase 2, we won't be able to generalize from the urban focus. Future research should: (1) include rural samples, (2) probe privacy/trust components, (3) study the diffusion of AR/VR with maturation of 5G, and (4) check Vietnam with India or Indonesia to study the validity of TT and use multi-group SEM for finer segmentation.

## 6. CONCLUSION

This research documents 5G's disruptive effects on e-commerce in Vietnam, where interactivity, personalization, and security account for 70.4% of the shopping experience variance. Although adoption cost limits interactivity, 5G's advantage over 4G ( $\beta = .55$  vs. 0.32) and the high-income user's preference for interactivity ( $\beta = .58$ ) over cost ( $\beta = -0.10$ ) make interactivity 5's unique potential and paradoxes. With global e-commerce projected at USD 25.93 trillion, at an 18.9% CAGR (Grand View Research, 2024), Vietnam can take the lead by focusing on real-time interaction paired with low-cost access, providing a non-unique blueprint for emerging economies.

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**Appendix A: Qualitative Codebook (Sample)**

Theme	Code	Example Quote	Frequency
Speed	Baseline Expectation	“Faster loading is expected”	22
Personalization	User Delight	“Relevant offers keep me engaged”	18
Cost	Economic Barrier	“5G is costly”	25
Security	Trust Requirement	“Trust is non-negotiable”	20
Interactivity	Decision Aid	“Live help seals the deal”	28