

Factors Influencing Merchants' Willingness to Participate in E-commerce Marketing in Digital Africa: A Case Study of Lagos, Nigeria

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Abstract: This study examines the current state of merchants' participation in e-commerce marketing within the context of the digital economy, focusing on merchants in Lagos, Nigeria. It explores the impact of behavioral attitudes, subjective norms, perceived behavioral control, and traditional transaction costs on their willingness to engage in e-commerce marketing. Grounded in the Theory of Planned Behavior (TPB) and employing a questionnaire survey, the study utilizes SPSS 23.0 and AMOS 22.0 for data analysis. The findings confirm the significant positive effects of behavioral attitudes, subjective norms, and perceived behavioral control on merchants' willingness, as well as the significant negative effect of traditional transaction costs. The results indicate that the advancement of digital economy policies has lowered participation barriers for merchants, with factors such as behavioral attitudes, social support, and digital skills playing crucial roles in decision-making. This paper recommends enhancing the usability of e-commerce platforms, improving infrastructure, and optimizing policy support. These suggestions provide theoretical insights and practical guidance for promoting Nigeria's digital economy and advancing research on merchants' e-commerce behavior.

Keywords: Digital economy; E-commerce marketing; Theory of Planned Behavior; Merchants' willingness to participate; Lagos; Nigeria

Online publication: February 19, 2025

1. Introduction

This study examines the current state of merchants' participation in e-commerce marketing within the digital economy, analyzing its development background and influencing factors. The objective is to provide a reference for advancing research and practice in this field.

In recent years, Nigeria has implemented a series of policy measures to promote digital economic development. In August 2019, the country launched the National e-Government Master Plan and, in October of the same year, renamed the Ministry of Communications to the Ministry of Communications and Digital Economy, underscoring its commitment to digital transformation. In March 2020, Nigeria initiated the "National Broadband Plan"^[1], recognizing telecommunications infrastructure as critical national infrastructure. In June

2022, President Muhammadu Buhari announced the establishment of the “Presidential Council on Digital Economy and e-Government” to enhance the adoption of digital technologies, improve governmental efficiency and transparency, and foster a more business-friendly environment.

The Nigerian government considers big data a key driver of the digital economy, advocating the idea that “data is the new oil.” This vision aims to facilitate economic transformation and reduce the country’s over-reliance on oil. At the macro level, the digital economy has become a new engine for high-quality development and a crucial strategy for Nigeria’s economic diversification. Its rapid growth not only enhances service efficiency and drives technological innovation but also generates employment and business opportunities, thereby significantly improving living standards. These developments have encouraged merchants to actively engage in e-commerce marketing.

In 2023, Nigeria’s e-commerce sector continued to expand, with both traditional and emerging forms of e-commerce contributing significantly to economic development. During the COVID-19 pandemic in 2020, e-commerce marketing played a vital role, gradually becoming an integral part of daily life for both merchants and consumers. As online services have advanced, entry barriers to e-commerce marketing have steadily decreased, alleviating merchants’ concerns about adopting new technologies. Merchants now benefit from the efficiency and convenience of e-commerce, fostering trust and recognition of this business model. It is estimated that by 2025, Nigeria’s e-commerce penetration rate will reach 52.5%, with the number of e-commerce users surpassing 122.5 million, the highest in Africa. This robust growth underscores the critical role of e-commerce marketing in driving merchant participation.

The Nigerian government continues to accelerate the development of the digital economy. For instance, in March 2023, the implementation of a cashless policy in Lagos significantly increased the adoption of electronic payment systems, further integrating merchants into the digital economy. By participating in e-commerce marketing, merchants not only improve their economic standing and quality of life but also contribute to the expansion of digital commerce, attracting more talent to the sector and fostering high-quality industrial development.

Despite these advancements, academic research on the factors influencing merchants’ participation in e-commerce marketing within the context of “Digital Africa” remains limited. In particular, there is a lack of systematic analyses of merchants’ e-commerce behavior and the mechanisms underlying their decision-making processes. This study focuses on merchants in Lagos, Nigeria, using a questionnaire survey to examine the effects of behavioral attitudes, subjective norms, perceived behavioral control, and traditional transaction costs on their willingness to engage in e-commerce marketing. Additionally, it explores secondary and tertiary variables influencing merchant behavior, offering theoretical insights and practical guidance for future research in this field.

2. Literature review

2.1. Studies on the African e-commerce market

Recent research on the African e-commerce market has primarily focused on its development potential and associated challenges. Peprah *et al.* analyzed how Jumia, one of Africa’s leading e-commerce companies, has employed non-market strategies to navigate institutional voids, thereby enhancing its legitimacy and operations ^[2]. Similarly, Chun and Ogwal examined the localization strategies of Canadian multinational enterprises entering African markets, underscoring the importance of adapting to local cultural and market dynamics ^[3].

The proliferation of mobile payments and the rise of a young, tech-savvy population in Africa have been identified as critical drivers of e-commerce growth. However, weak infrastructure and underdeveloped legal systems remain significant barriers. Additionally, DHL’s expansion of its e-commerce platform into African markets highlights both the region’s untapped potential and the logistical challenges it faces ^[4].

Studies on African e-commerce startups have frequently focused on Nigeria, which serves as a prime example

due to its diverse and thriving e-commerce ecosystem. De Goeij *et al.* observed that inefficiencies in logistics and limited payment options continue to impede e-commerce growth in the country ^[5]. Nevertheless, the innovative strategies of startups have positioned Nigeria as a model for e-commerce development across Africa.

2.2. Studies on the “Digital Africa” strategy

In the context of the “Digital Africa” strategy, scholars widely acknowledge digital transformation as a key driver of economic and social development. Zhang emphasized the importance of bridging the digital divide through digital literacy education, arguing that enhancing digital skills is essential for equitable access to digital resources ^[6]. Similarly, Miao and Liu highlighted strategies for fostering high-quality digital economy development, stressing the role of policy frameworks and cross-sectoral cooperation in achieving sustainable growth ^[7].

The African Union’s “African Digital Transformation Strategy (2020–2030)” envisions the establishment of a unified digital market. Noh and Wang examined strategies for overcoming barriers to digital resource utilization, emphasizing the need to address access and usability challenges ^[8]. These insights are particularly relevant for tackling the digital divide, which remains a major obstacle to “Digital Africa” initiatives.

Additionally, studies have explored digital transformation across various industries, yielding broader implications for Africa’s strategy. For instance, Kim and Ma analyzed the digital transformation of a fashion brand, demonstrating how businesses can leverage digital technologies to enhance operational efficiency and consumer engagement ^[9]. Their findings provide valuable insights for African enterprises seeking to integrate digital solutions into their operations.

To bridge the digital divide and foster inclusive growth, scholars have proposed measures such as optimizing digital literacy education, enhancing technological capabilities, and improving access to digital resources ^[10]. These strategies collectively aim to establish a solid foundation for Africa’s digital transformation goals.

2.3. Studies on factors influencing e-commerce marketing willingness

Existing research on factors influencing e-commerce marketing willingness has yielded diverse findings regarding the impact of merchants’ personal characteristics—such as educational background, age, gender, and household income—as well as external environmental factors. Wang and Zhang found that rural e-commerce merchants’ willingness to adopt digital upgrades is significantly influenced by their perceptions of digital transformation benefits and the availability of supportive infrastructure ^[11]. Similarly, Li *et al.* found that consumers’ adoption of vegetable e-commerce in Beijing was primarily determined by factors such as trust in the platform, perceived ease of use, and logistics efficiency ^[12]. These findings highlight the interdependence between consumer behavior and merchant willingness in the development of e-commerce ecosystems.

Guo *et al.* conducted an empirical study on consumers’ willingness to purchase agricultural products online, emphasizing that platform reliability, payment system convenience, and product quality assurance directly influence participation ^[13]. Their research underscores the importance of trust and reliability in motivating both merchants and consumers. Additionally, Do *et al.* highlighted external challenges affecting merchants’ willingness, such as inadequate logistics services, which increase operating costs and reduce enthusiasm for participation ^[14]. Cybersecurity concerns and the absence of robust regulatory frameworks also pose significant barriers, as noted by Udo ^[15]. Addressing these issues through targeted policy support, platform training programs, and technological enhancements could help mitigate these barriers and boost merchant participation.

In conclusion, merchants’ willingness to engage in e-commerce marketing is shaped by a combination of individual characteristics, platform reliability, and external factors such as policy support and infrastructure availability. These insights provide valuable theoretical and practical references for enhancing participation in

e-commerce activities.

3. Theoretical foundation

This study is based on the Theory of Planned Behavior (TPB), a widely recognized theoretical model in behavioral sciences proposed by Ajzen ^[16]. TPB posits that an individual's behavioral intention is determined by three key factors (**Figure 1**):

- (1) Behavioral attitude: An individual's positive or negative evaluation of a specific behavior.
- (2) Subjective norms: The expectations of society and significant others regarding the behavior, as well as their influence on the individual's decision-making.
- (3) Perceived behavioral control: An individual's self-perception of their ability to perform the behavior, including access to resources and opportunities.

In this study, the TPB framework is applied to analyze the willingness of merchants in Lagos, Nigeria, to participate in e-commerce marketing. Specifically, it examines how behavioral attitudes (e.g., acceptance and interest in e-commerce marketing), subjective norms (e.g., social support and peer influence), and perceived behavioral control (e.g., mastery of digital skills and the usability of e-commerce platforms) collectively influence merchants' decision-making processes.

By integrating TPB into this context, the study aims to validate and extend its applicability within the digital economy, providing theoretical support and practical insights for enhancing merchants' participation in e-commerce marketing.

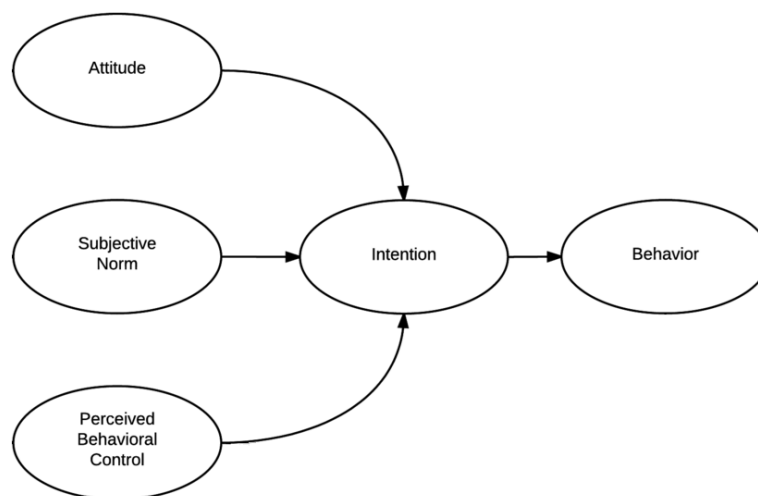


Figure 1. The Theory of Planned Behavior (TPB)

Merchants' willingness to engage in e-commerce is shaped by multiple factors. When this willingness is present, merchants are more likely to adopt e-commerce marketing practices. Therefore, TPB serves as an appropriate framework for analyzing merchants' willingness to participate in e-commerce marketing.

4. Hypothesis development and model construction

4.1. Hypothesis development

Based on the preceding analysis, the factors influencing merchants' willingness to participate in e-commerce

marketing are summarized, and the research hypotheses are formulated as follows:

4.1.1. The impact of behavioral attitude factors on merchants' willingness to participate in e-commerce marketing

Wang and Zhang identified behavioral attitudes as a key determinant of merchants' willingness to adopt digital upgrades in rural e-commerce^[11]. Specifically, when merchants perceive that e-commerce marketing can increase sales, enhance revenue, or optimize operational costs, they develop more positive behavioral attitudes, thereby strengthening their willingness to participate.

Sambamoorthi further demonstrated that consumers' positive attitudes toward e-commerce significantly enhance their willingness to adopt such practices. While their study primarily focuses on consumer behavior, its findings offer valuable insights into merchants' willingness to engage in e-commerce marketing^[17].

Behavioral attitudes are typically measured through four indicators:

- (1) Increased product sales
- (2) Higher product pricing
- (3) Enhanced industry revenue
- (3) Reduced sales costs

These attitudes are jointly influenced by belief strength and outcome evaluation. Merchants with a strong interest in e-commerce marketing and a positive perception of its benefits are more likely to demonstrate a higher willingness to participate. Conversely, those who do not recognize the advantages of the e-commerce model tend to be less inclined to engage, based on subjective judgment. Thus, the following hypothesis is proposed:

H1: Behavioral attitude factors positively influence merchants' willingness to participate in e-commerce marketing.

4.1.2. The impact of subjective norm factors on merchants' willingness to participate in e-commerce marketing

Merchants' willingness to engage in e-commerce marketing is significantly influenced by subjective norm factors, which reflect the role of social environments in shaping behavioral intentions. Kosasih and Sulaiman emphasized that social support, including encouragement from family, friends, and local organizations, plays a crucial role in motivating rural merchants to adopt digital transformation in e-commerce^[18]. Similarly, Yaseen *et al.* highlighted that support from close associates and government initiatives enhances merchants' trust and confidence in adopting e-commerce practices^[19].

Subjective norm factors can be categorized into four key indicators:

- (1) Support from family and friends for e-commerce participation
- (2) Encouragement from close associates to engage in e-commerce marketing
- (3) Training provided by local alliance organizations in relevant digital technologies
- (4) Strong promotion and policy support from government and society

Subjective norms are shaped by normative beliefs and individuals' motivation to align with expectations from significant social groups. Merchants who receive positive reinforcement from trusted individuals and institutions experience reduced psychological barriers and an increased willingness to participate in e-commerce marketing. These findings align with Dai *et al.*, who suggested that social influence and community well-being contribute to individuals' adoption of innovative practices^[20]. Thus, the following hypothesis is proposed:

H2: Subjective norm factors positively influence merchants' willingness to participate in e-commerce marketing.

4.1.3. The impact of perceived behavioral control factors on merchants' willingness to participate in e-commerce marketing

Pavlou and Fygenon expanded TPB to e-commerce contexts, demonstrating that perceived behavioral control significantly influences intentions and behaviors in digital environments ^[21]. Similarly, Nur DP and Gusrafani emphasized that perceived ease of use, operational capabilities, and access to resources are critical determinants of e-commerce adoption ^[22]. Based on these studies, perceived behavioral control factors encompass a merchant's assessment of their capacity to engage in e-commerce marketing, shaped by their skills, confidence, and access to supporting resources.

Key indicators affecting merchants' willingness to participate in e-commerce marketing include:

- (1) Perceived difficulty of entering e-commerce marketing
- (2) Availability of personnel and time for managing digital transactions
- (3) Competency in operational e-commerce skills
- (4) Understanding of transaction and logistics procedures
- (5) Access to supportive policies and infrastructure

Perceived behavioral control reflects a merchant's self-efficacy and resource availability. Higher perceived control reduces barriers, fosters confidence, and increases the likelihood of e-commerce participation. According to Widiar *et al.*, when individuals perceive e-commerce systems as manageable, their behavioral intentions strengthen ^[23]. Similarly, Adams argued that targeted training programs and resource accessibility significantly enhance perceived control, facilitating participation ^[24]. By equipping merchants with essential skills and resources, barriers to entry can be mitigated, thereby increasing their willingness to adopt e-commerce marketing practices. Thus, the following hypothesis is proposed:

H3: Perceived behavioral control factors positively influence merchants' willingness to participate in e-commerce marketing.

4.1.4. The impact of traditional transaction costs on merchants' willingness to participate in e-commerce marketing

Hennart highlighted the transaction cost theory as a foundational framework for understanding how businesses minimize exchange costs, particularly in international markets ^[25]. Cuypers *et al.* further demonstrated that reducing transaction costs enhances operational efficiency and decision-making, particularly when adapting to novel business environments ^[26].

In the context of e-commerce marketing, traditional transaction costs remain a significant barrier for merchants, compelling them to seek alternative solutions. These costs include:

- (1) Transportation expenses
- (2) Fees for maintaining product quality
- (3) Intermediary charges
- (4) Information-gathering costs

Merchants operating in traditional markets often encounter challenges such as:

- (1) Limited access to timely and accurate market prices and consumer demand information
- (2) Unstable and unreliable sales channels
- (3) Inconsistent quality standards from intermediaries or vendors
- (4) Weak bargaining power due to market asymmetries

E-commerce marketing mitigates these challenges by streamlining market access, improving transparency, and reducing intermediary reliance, thereby lowering transaction costs. Through digital platforms, merchants can bypass inefficiencies associated with traditional markets, enhancing their willingness to participate. Drawing on

transaction cost theory, this study posits that traditional transaction costs serve as a significant factor in merchants' decision-making. Thus, the hypothesis is formulated as follows:

H4: Traditional transaction costs negatively influence merchants' willingness to participate in e-commerce marketing.

4.2. Model construction

This research model examines merchants' willingness to participate in e-commerce marketing, incorporating four core factors: behavioral attitude, subjective norms, perceived behavioral control, and traditional transaction costs (Figure 2).

- (1) Behavioral attitude: Represents merchants' interest, perceived convenience, and expected benefits from e-commerce marketing. The hypothesis posits that a more positive attitude increases willingness to participate.
- (2) Subjective norms: Captures the influence of social groups and peers on merchants' decision-making. The hypothesis suggests that stronger social or peer influence enhances willingness to participate.
- (3) Perceived behavioral control: Encompasses technical capabilities, financial resources, and internet access. The hypothesis asserts that greater perceived control strengthens willingness to participate.
- (4) Traditional transaction costs: Includes logistics expenses, payment efficiency, and information asymmetry. The hypothesis proposes that lower transaction costs facilitate greater willingness to engage in e-commerce marketing.

These variables collectively shape merchants' decision-making processes, interacting to determine their willingness to participate in e-commerce marketing.

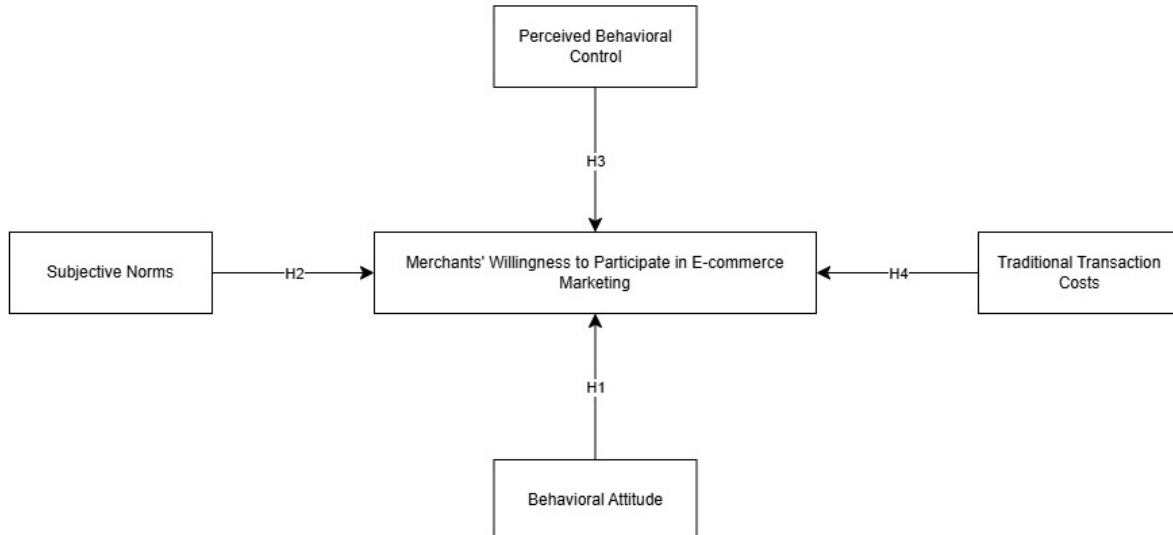


Figure 2. Research model path coefficients

5. Research design

5.1. Sample and data collection

This study targets merchants in Lagos, Nigeria, specifically those operating on Lagos Island. A total of 1,707 questionnaires were distributed for data collection. After excluding invalid responses, 1,583 valid questionnaires were obtained, yielding an effective response rate of 92%. The characteristics of the survey sample are presented in Table 1.

Table 1. Descriptive statistics of merchant characteristics

Sample characteristics	Category	Frequency	Percentage (%)
Gender	Female	705	44.5
	Male	876	55.5
Age	Under 20	143	9.0
	20–30 years	483	30.5
	31–40 years	617	39.0
	41–50 years	245	15.5
	Over 51	95	6.0
Education level	Junior high school	87	5.5
	High School/College	1,354	85.5
	University or above	142	9.0
Industry distribution	Transportation/Logistics	222	14.0
	Information Technology/ Communication	213	13.5
	Culture/Entertainment/Sports	71	4.5
	Public Administration/Defense	71	4.5
	Other industries	1,006	63.5
Annual household income	Under 1 million RMB	641	40.5
	1–5 million RMB	515	32.5
	5–10 million RMB	427	27.0

Regarding gender distribution, male respondents account for 55.5%, while female respondents constitute 44.5%, aligning closely with the actual gender ratio of merchants in the region. This consistency enhances the analytical reliability of the study.

In terms of educational background, 85.5% of respondents hold a high school or college diploma, 9.0% have a university degree or higher, and 5.5% have completed junior high school, indicating that the majority of surveyed merchants possess a relatively high level of education.

The age distribution is concentrated within the 20–40 age group (69.5%), suggesting a younger demographic predominance in the sample.

With respect to annual household income, the largest proportion falls within the 1–5 million RMB range (32.5%), followed by the 5–10 million RMB category (27.0%).

Overall, the sample characteristics are consistent with the current demographic distribution of merchants engaged in e-commerce marketing, ensuring representativeness and providing a strong data foundation for the subsequent empirical analysis.

5.2. Variable measurement

To ensure reliability and validity, this study adopts well-established measurement scales from domestic and international literature, making necessary adjustments to fit the specific research context. Survey responses are measured using a five-point Likert scale, where: 1 = Strongly disagree; 2 = Somewhat disagree; 3 = Neutral; 4 = Somewhat agree; and 5 = Strongly agree. Higher scores indicate a stronger level of agreement with the

corresponding statement. The questionnaire collects basic merchant information, evaluates their current e-commerce engagement, assesses their operational capabilities and satisfaction levels, and explores potential solutions to existing challenges. All latent variables are measured using a five-point Likert scale, as shown in **Table 2**.

5.2.1. Independent variable measurement dimensions scale

The independent variables include four key dimensions:

- (1) Merchants' behavioral attitudes
- (2) Subjective norms
- (3) Perceived behavioral control
- (4) Traditional transaction costs

These dimensions comprise 17 measurement items, presented in **Table 2**.

Table 2. Independent variable measurement dimensions scale

Variable	Code	Measurement Item	Reference
Merchants' behavioral attitudes	BA1	Promote product sales	Wu J-H, Wang S-C, 2005 ^[27]
	BA2	Increase product sales price	
	BA3	Increase industry income	
	BA4	Reduce sales costs	
Merchants' subjective norms	SN1	Family and friends' support and encouragement	Venkatesh V, Davis FD, 2000 ^[28]
	SN2	Influence from friends and the surrounding crowd	
	SN3	Village committee organizing training on relevant technology	
	SN4	Strong government and social support and promotion	
Merchants' perceived behavioral control	PBC1	Low entry threshold for participating in e-commerce	Ajzen I, 2002 ^[29]
	PBC2	Familiarity with online transaction procedures and finds them simple	
	PBC3	Sufficient personnel or time to handle online transactions	
	PBC4	Possesses certain e-commerce operation abilities	
	PBC5	Believes relevant policies facilitate participation in e-commerce	
Merchants' traditional transaction costs	TC1	Difficulty in obtaining market prices and consumer demand information promptly	Wang N, 2007 ^[30]
	TC2	Unstable channels for selling products in traditional markets	
	TC3	Inconsistent product quality assessment by vendors or intermediaries	
	TC4	Weak bargaining power in the product market	

5.2.2. Dependent variable measurement dimensions scale

The dependent variable is merchants' willingness to participate in e-commerce marketing, measured using two items, as detailed in **Table 3**.

Table 3. Dependent variable measurement dimensions scale

Variable	Code	Measurement Item	Reference
Merchant's willingness to participate in e-commerce marketing	C1	Strong willingness to participate in e-commerce marketing	Parent M, Plangger K, Bal A, 2011 ^[31]
	C2	Desire to learn about and participate in e-commerce training	

6. Empirical analysis

6.1. Reliability analysis

To assess the reliability and validity of the scale, Cronbach's alpha coefficient is employed to evaluate data reliability. In general, a Cronbach's alpha value exceeding 0.7 indicates a high level of reliability, suggesting that the questionnaire is suitable for further correlation analysis.

As shown in **Table 4**, Cronbach's alpha coefficients for all dimensions in this study exceed 0.7, confirming that the questionnaire demonstrates satisfactory reliability.

Table 4. Reliability test results

Variable name	Number of items	Cronbach's α
Merchant's behavioral attitude	4	0.807
Merchant's subjective norms	4	0.707
Merchant's perceived behavioral control	5	0.835
Merchant's traditional transaction costs	4	0.788
Merchant's willingness to participate in e-commerce marketing	2	0.814

6.2. Validity test

Validity refers to the accuracy and appropriateness of a measurement instrument in assessing the intended constructs. While reliability serves as the foundation of validity, validity represents the ultimate goal of measurement accuracy.

Before conducting factor analysis, it is necessary to assess sampling adequacy using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Sphericity Test.

In general, a KMO value greater than 0.7 suggests that the dataset is suitable for factor analysis. As presented in **Table 5**, the KMO test result is 0.894, exceeding the 0.7 threshold, while the significance level of Bartlett's Sphericity Test is 0.000 (< 0.001). These findings indicate that factor analysis is appropriate, confirming the sound structural design of the questionnaire.

Table 5. Validity test results

KMO value	Approximate χ^2	Degrees of freedom	Significance
0.894	792.758	171	0.000

6.3. Correlation analysis

SPSS 22.0 software was used to conduct correlation analysis to examine the hypothesized relationships within the model. Factor analysis was first applied to classify the variables into four distinct factors, followed by an examination of their correlations using SPSS 22.0.

As shown in **Table 6**, the "***" symbol in the upper right corner signifies that the correlation is significant at the 0.01 level. This result confirms that each independent variable is significantly correlated with merchants' willingness to participate in e-commerce marketing.

Specifically, the correlation coefficients between merchants' attitudes, subjective norms, perceived behavioral control, and their willingness to participate in e-commerce marketing are 0.823, 0.729, and 0.751, respectively. All P -values are 0.000 (< 0.01), indicating a statistically significant positive correlation with merchants' willingness to engage in e-commerce marketing.

Conversely, the correlation coefficient between traditional transaction costs and merchants' willingness

to participate in e-commerce marketing is -0.767, with a *P*-value of 0.000 (< 0.01). This suggests a significant negative correlation, indicating that higher traditional transaction costs reduce merchants' likelihood of engaging in e-commerce marketing.

Table 6. Correlation test results

		Merchant's attitude	Merchant's subjective norm	Merchant's perceived behavioral control	Merchant's traditional transaction costs
Merchant's willingness to participate in e-commerce marketing	Pearson correlation	0.823**	0.729**	0.751**	-0.767**
	Significance (two-tailed)	0.000	0.000	0.000	0.000
	Case count	504	504	504	504

Note: "0.000" indicates statistical significance at the 0.01 level (two-tailed); "0.823, 0.729, 0.751, and -0.767" represent the strength and direction of the correlations between the variables.

6.4. Path analysis of the structural model

This study examines merchants' intention to participate in e-commerce marketing by assessing the direct impact of merchants' attitudes, subjective norms, perceived behavioral control, and traditional transaction costs on their participation decisions. The objective is to evaluate whether hypotheses H1, H2, H3, and H4 are supported based on the proposed conceptual model and research assumptions.

Following the correlation and validity tests, AMOS 23.0 statistical analysis software was used to construct the initial model path diagram, which integrates both the measurement model and the structural model. The four key factors in this study were treated as latent variables, while data from 17 observed variables were incorporated into the structural model diagram. This process facilitated the formation of second-level (X) and third-level indicators for merchants' intention to participate in e-commerce marketing.

6.4.1. Model fit test of the structural equation model

The model fit test is primarily assessed using fit indices. After refining the initial structural equation model, an exploratory factor analysis was conducted to obtain the final model fit indices, as presented in **Table 7**. The fit indices of the hypothesis model fall within the acceptable range, indicating that the theoretical model aligns well with the empirical data structure and demonstrates a strong model fit.

Table 7. Model fit indices

Fit index	CMIN	DF	CMIN/DF	GFI	AGFI	RMSEA	IFI	TLI (NNFI)	CFI
Standard value	-	-	< 3.00	> 0.80	> 0.80	< 0.08	> 0.90	> 0.90	> 0.90
Measured value	385.236	142	2.713	0.919	0.892	0.058	0.962	0.954	0.962

As shown in **Table 7**, the CMIN/DF value is 2.713, which is below the standard threshold of 3, indicating a good model fit. The GFI (0.919) and AGFI (0.892) exceed the 0.8 threshold, confirming that the model meets the required criteria. Additionally, TLI (0.954), IFI (0.962), and CFI (0.962) all surpass 0.9, indicating an excellent model fit. The RMSEA value (0.058), which falls below 0.08, further confirms the model's suitability.

6.4.2. Analysis of standardized load coefficients in the model

Table 8. Factor loading matrix

Variable	Code	Standardized Load
Merchants' behavioral attitude	BA1	0.791
	BA2	0.840
	BA3	0.851
	BA4	0.815
Merchants' subjective norms	SN1	0.801
	SN2	0.780
	SN3	0.731
	SN4	0.739
Merchants' perceived behavioral control	PBC1	0.714
	PBC2	0.784
	PBC3	0.793
	PBC4	0.818
	PBC5	0.683
Merchants' traditional transaction costs	TC1	0.792
	TC2	0.816
	TC3	0.832
	TC4	0.786
Merchants' willingness to participate in e-commerce marketing	C11	0.792
	C12	0.822

As presented in **Table 8**, all factor loading values exceed 0.6, indicating strong construct validity and a well-adapted model structure.

6.4.3. Path coefficient analysis of the structural equation model

The path coefficients between indicators were estimated using the variance and covariance of the variables. This model employs a recursive structure, where the observed variables in the regression equations are generally linear. Consequently, the maximum likelihood estimation (MLE) method was used to estimate the path coefficients.

MLE provides an estimation approach that maximizes the likelihood of observing the given data, ensuring that the path coefficients accurately represent the relationships between variables. These coefficients are then used to assess the strength and direction of the relationships between factors, validating the hypotheses and determining their impact on merchants' intention to participate in e-commerce marketing.

Table 9. Path coefficients

Path relationship		Standardized coefficient	Unstandardized error	Standard error	t-value	P-value	Hypothesis support
Dependent variable	Independent variable						
Merchants' willingness to participate in e-commerce marketing	Merchants' behavioral attitude	0.232	0.206	0.049	4.204	***	Supported
	Merchants' subjective norms	0.190	0.178	0.062	2.87	0.004	Supported
	Merchants' perceived behavioral control	0.215	0.244	0.067	3.641	***	Supported
	Merchants' traditional transaction costs	-0.216	-0.217	0.057	-3.807	***	Supported

From **Table 9**, the following conclusions can be drawn:

- (1) Merchants' behavioral attitude significantly positively influences their intention to participate in e-commerce marketing (standardized coefficient: 0.232, $P < 0.05$).
- (2) Merchants' subjective norms have a significant positive correlation with their intention to participate (standardized coefficient: 0.190, $P < 0.05$).
- (3) Merchants' perceived behavioral control also exhibits a significant positive correlation with their intention to participate (standardized coefficient: 0.215, $P < 0.05$).
- (4) Traditional transaction costs are negatively correlated with merchants' intention to participate in e-commerce marketing (standardized coefficient: -0.216, $P < 0.05$).

These findings are visually represented in **Figure 2**, where the numbers on the arrows indicate path coefficients, reflecting the direct effect magnitude between variables.

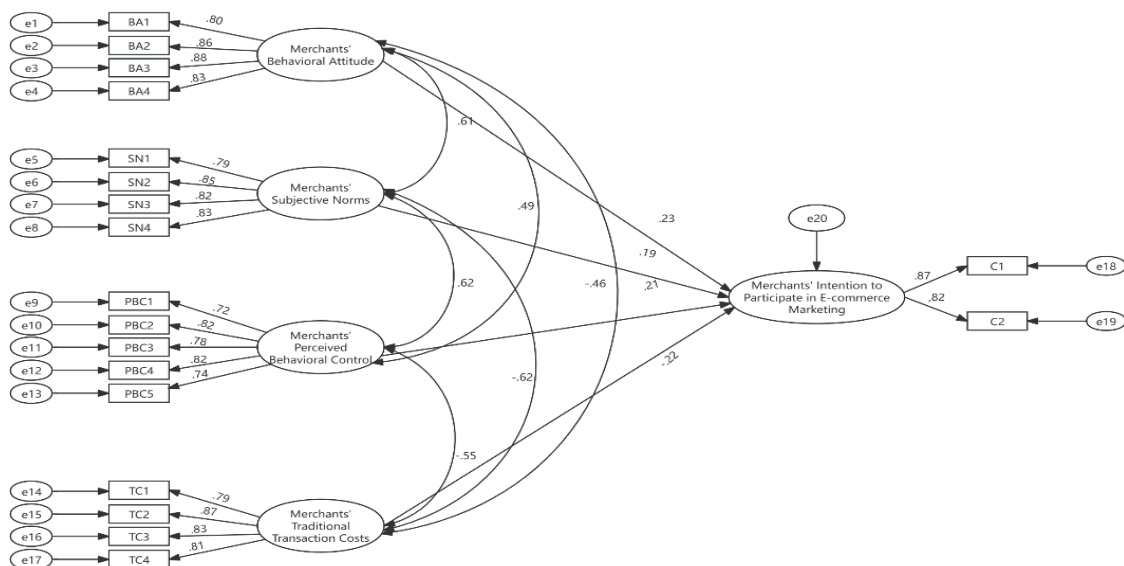


Figure 2 Path Coefficient Analysis of the Structural Equation Model

Figure 2. Path coefficient analysis of the structural equation model

6.4.4. Hypothesis testing summary

Based on the analysis performed using AMOS 23.0, the hypothesized model was thoroughly evaluated, and the path coefficients of influencing factors were analyzed. The results confirm that the structural model is reasonable,

and all hypotheses are supported (**Table 10**).

H1: The merchant’s behavioral attitude positively influences the intention to participate in e-commerce marketing.

H2: The merchant’s subjective norms positively influence the intention to participate due to peer influence and social encouragement.

H3: The merchant’s perceived behavioral control positively impacts the intention to participate, as greater confidence in handling e-commerce operations increases participation likelihood.

H4: Traditional transaction costs negatively influence intention to participate, as higher costs deter merchants from engaging in e-commerce marketing.

Table 10. Hypothesis testing results

Hypothesis	Relationship between variables	<i>P</i>	Test result
H1	Merchant behavior attitude → Merchant e-commerce marketing intention	***	Supported
H2	Merchant subjective norm → Merchant e-commerce marketing intention	0.004	Supported
H3	Merchant perceived behavioral control → Merchant e-commerce marketing intention	***	Supported
H4	Merchant traditional transaction costs → Merchant e-commerce marketing intention	***	Supported

6.4.5. Analysis of merchant participation in e-commerce marketing based on structural equation modeling

After a detailed analysis of the data and path testing of the influencing factors model, the final results indicate that the model and hypotheses are reasonable. The analysis results are summarized as follows:

6.4.5.1. Positive influences

6.4.5.1.1. Behavioral attitude’s positive influence on merchant willingness to participate in e-commerce marketing

The standardized coefficient for the influence of merchants’ behavioral attitudes on their willingness to participate in e-commerce marketing is 0.232 ($P < 0.05$), indicating a significant positive correlation. This suggests that a more positive attitude toward e-commerce marketing strengthens merchants’ intention to participate.

In this study, behavioral attitude refers to a merchant’s positive or negative perception of e-commerce marketing, shaped by both emotional and economic considerations. When merchants experience greater emotional satisfaction and perceive higher economic benefits from e-commerce participation, their willingness to engage increases. The estimated standardized regression coefficient for behavioral attitude (0.232) is the largest among the four influencing factors. Survey results based on product sales volume, sales prices, industry revenue, and product sales costs demonstrate that the more favorable the perceived impact, the greater the benefits merchants associated with e-commerce, significantly enhancing their participation intention.

6.4.5.1.2. Subjective norms’ positive influence on merchant willingness to participate in e-commerce marketing

The standardized coefficient for the effect of subjective norms on merchant participation in e-commerce marketing is 0.190 ($P < 0.05$), indicating a significant positive influence. This suggests that when merchants perceive strong encouragement or pressure from peers or other influential individuals, their willingness to engage in e-commerce marketing increases.

In this study, subjective norms refer to the influence of significant individuals, such as family, friends, or

peers, on a merchant's decision. Survey results indicate that support from family and friends, encouragement from peers engaged in e-commerce, and social support—such as government or industry association initiatives promoting digital skills—motivate merchants to participate more actively in e-commerce marketing.

6.4.5.1.3. Perceived behavioral control's positive influence on merchant willingness to participate in e-commerce marketing

The standardized coefficient for the influence of perceived behavioral control on merchant willingness to participate in e-commerce marketing is 0.215 ($P < 0.05$), indicating a significant positive correlation. Merchants who perceive themselves as capable of managing e-commerce operations are more inclined to participate.

This study examines five key factors affecting perceived behavioral control: the entry barriers to e-commerce, the availability of sufficient staff and time to manage online transactions, e-commerce operational capabilities, knowledge of online transaction procedures, and the presence of supportive policies. The findings indicate that merchants who receive greater external support and have stronger self-perceived e-commerce capabilities are more likely to engage in e-commerce marketing.

6.4.5.2. Negative influence

6.4.5.2.1. Traditional transaction costs' negative influence on merchant willingness to participate in e-commerce marketing

The standardized coefficient for the influence of traditional transaction costs on merchant willingness to participate in e-commerce marketing is -0.216 ($P < 0.05$), indicating a significant negative correlation. Higher traditional transaction costs reduce merchants' likelihood of engaging in e-commerce marketing.

This study focuses on four key factors related to traditional transaction costs: the availability of timely market price and demand information, the stability of product sales channels in traditional markets, the role of intermediaries in product quality grading, and bargaining power in the market. The results indicate that a lower prevalence of these challenges in traditional market transactions reduces transaction costs, thereby increasing merchants' willingness to participate in e-commerce marketing. These findings support the hypothesis that traditional transaction costs negatively influence merchant participation in e-commerce marketing.

7. Research conclusion and suggestions

7.1. Research conclusion

Through factor analysis, this study categorizes the factors influencing merchants' willingness to participate in e-commerce marketing into four dimensions: behavioral attitude, subjective norms, perceived behavioral control, and traditional transaction costs. The findings are as follows:

- (1) Behavioral attitude: Factors such as product sales volume, pricing, industry revenue, and costs have a significant positive influence on merchants' willingness to participate in e-commerce marketing. The more favorable merchants' perceptions of these factors, the stronger their intention to engage.
- (2) Subjective norms: Support from family and friends, encouragement from peers, and backing from industry associations and the government significantly enhance merchants' willingness to participate in e-commerce marketing. When merchants perceive positive external influences, their likelihood of engagement increases.
- (3) Perceived behavioral control: Elements such as the entry threshold for participation, resource availability, e-commerce operational capabilities, and policy support strongly impact merchants' willingness to participate. When merchants believe they possess the necessary resources and competencies, their

inclination to engage in e-commerce marketing increases.

- (4) Traditional transaction costs: Challenges in obtaining market information, channel stability, product quality identification, and bargaining power in traditional markets have a significant negative effect on merchants' willingness to participate. Higher traditional transaction costs discourage participation in e-commerce marketing.

7.2. Suggestions

Policy and practical implications: To enhance merchant participation in e-commerce marketing, efforts should focus on improving merchants' attitudes, strengthening external support, and increasing their perceived control over e-commerce operations. Additionally, reducing traditional transaction costs—particularly by improving access to market information, enhancing channel stability, and simplifying product quality identification—will further encourage engagement.

These findings provide a strong foundation for developing policies and practices aimed at increasing merchant involvement in e-commerce marketing.

Disclosure statement

The authors declare no conflict of interest.

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