

Factors affecting customers' intention to use e-commerce in Bac Ninh province

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ABSTRACT : *The outbreak of e-commerce in consumption in Vietnam surges after the COVID-19 pandemic that businesses had to change and switch from traditional sales methods to e-commerce. The research objective is to identify factors influencing customers' intention to use e-commerce in Bac Ninh province. Non-probability convenience sampling method was used to collect 276 questionnaires from consumers in Bac Ninh province. The study uses multivariate regression models to test the hypotheses. Research results show that the factors affecting customers' intention to use e-commerce in Bac Ninh province are perceived usefulness, security concerns, perceived ease of use, system quality, service quality and social influence. These findings will guide the activities of e-commerce businesses to motivate consumers to use e-commerce transactions.*

Key factors: *Customers' Intention, E-commerce, Exploratory Factor Analysis*

I. INTRODUCTION

Electronic technological advances have rapidly developed recent years, promoting applicability in many fields [1] such as human welfare [2], personal health control [3]. Smartphones have become popular personal technology devices and played an important role on social development [4], developing small businesses [5], creating access to information on agricultural production [6], increasing productivity in agriculture [7] creating communication and relationships with customers [8], monitoring physiological and behavioral changes of employees during development [9], ensuring customer satisfaction under time constraints and small product quantities [10], giving consumers the possibility of better satisfaction. Nowadays, many services such as electronic social networks, electronic payments, and e-commerce are not limited by time or location [11]. In developing countries, electronic devices are increasingly becoming the main means to carry out commercial transactions promoting the 4.0 revolution of companies and countries. Furthermore, standard wireless telecommunications technology [12] has significantly influenced the growing use of electronic devices in commercial transactions. This trend has led to the emergence of a new form of business, e-commerce [13]. In Vietnam, Bac Ninh has e-commerce activities with the largest scale and growth rate. Bac Ninh's e-commerce is expanding rapidly, driven by national growth where Vietnamese shoppers spend over \$45 million online daily. The province acts as a rising technology and digital economy hub, blending robust industrial infrastructure with "e-commerce commune" initiatives to boost local agricultural and OCOP (One Commune, One Product) sales. Bac Ninh's e-commerce is growing at an average annual rate of over 12%. Over 5,000 local businesses, cooperatives, and household producers have been supported in setting up digital storefronts. Bac Ninh consistently ranks in the top 10 localities nationwide in the e-commerce index. The province is promoting the digital economy through initiatives such as supporting businesses with digital transformation, organizing large-scale livestreaming events to sell agricultural products, and implementing the E-commerce Development Plan for the 2026–2030 period. Therefore, to develop e-commerce in Bac Ninh, it is necessary to research the influence of digital marketing factors on the intention to use e-commerce in Bac Ninh province.

II. THEORETICAL FRAMEWORK

E-commerce, also known as mobile commerce, has characteristics such as convenience, popularity, and presence on social networks includes many activities such as payment and exchange of goods information [14]. Currently, e-commerce transactions have developed and greatly impacted many activities and industries such as

ordering daily food [15]. The development of e-commerce applications (apps) spans many activities in life and society [16]. In theory, the technology acceptance model (TAM) has been widely used in e-commerce, electronic payment, mobile technology in medicine, blockchain technology applications, in construction technology and in tourism [17].

Previous studies show that many factors influencing e-commerce usage stem from convenience, attractiveness, popularity, and liveliness. Research by Mollick and colleagues [18] shows that due to the rapid advancement of telecommunications, smartphones and wireless internet, e-commerce is widely applied and has become a new form of mobile commerce when consumers with only a handheld electronic device connected to the wireless internet can search for information and decide to buy necessary goods or services. Mobile devices are widely used, creating a mobile economy that plays an important role in the economic development of all countries around the world with an increasing number of people applying mobile commerce. According to the GSMA report, mobile devices with outstanding characteristics participate in global trade, creating a mobile economy that meets many political, social and economic requirements. In 2022, mobile technology and services created \$5.2 trillion in economic value added, contributing 5% of global GDP and supporting 28 million jobs around the world. 5G network growth is expected to reach 54% (about 5.3 billion connections) by 2030 and will contribute about one trillion dollars to the global economy by 2030 across every industry. An overview of research around the world has shown the influence of digital marketing factors on the intention to use e-commerce. Because Bac Ninh is the one of the localities with the strongest e-commerce activities in Vietnam, this research objective uses a research model with multivariate regression tools and SPSS 22.0 software to test the influence of factors on the intention to use e-commerce in Bac Ninh as a basis for proposing the use of these factors to develop e-commerce in Bac Ninh province.

Perceived usefulness

People can improve their life efficiency by using technology which called perceived usefulness [19]. The Technology Acceptance Model posits that individuals adopt new technology when they perceive support for achieving positive outcomes and perceived usefulness as derived from the Technology Acceptance Model. Intention to use technology is likely to increase proportionally to the user's perceived utility of that technology. The more useful the technology, the higher the user motivation. Perceived utility of a technology or innovation has been shown by several studies to directly influence the intention to use that technology or innovation. Many other studies have shown a direct correlation between perceived usefulness and intention to adopt e-commerce found that perceived usefulness positively impacts repurchase intention. At the same time, Yu and colleagues investigated the degree of association between perceived usefulness and intention to use electronic payments [20].

Perceived ease of use

Many previous studies show that simplicity of use has a significant influence on users' ability to accept and apply information technology. When individuals can easily accept and adapt to new technologies, the desire to use them increases [21]. Consumers' ease of use of Chatbots can boost their desire to use. Simplicity of use adds enjoyment as a factor in the desirability of use. And while the complexity of using new technologies will be a significant barrier to the intention to use e-commerce [22], perceived ease of use is founded to have a significant impact on shopping desire.

System quality

After Covid 19, customers' shopping habits have changed and increased dependent on electronic applications [23]. Businesses have been focusing on e-commerce platform transformation and website innovation which enhances the shopping experience by allowing customers to enter certain stores, receive product information and make convenient purchases. Websites improve user experience by expanding the availability of Wi-Fi and 5G networks, increasing the speed and capacity of Internet applications and electronic devices [24]. The impact of system quality on the intention to use e-commerce has been studied and the results show that service quality has an impact on the intention to stick with e-commerce. Website quality and perceived usefulness, peer reviews and attitudes, significantly impact e-commerce intention [25], [26].

Service quality

Customers' purchasing decisions depend on the quality of products and services received. The role of the need for timely delivery and product compatibility and service quality significantly affects the intention to use e-commerce. Romadhoni et al. show the impact of e-service quality, trust and e-WOM on consumer satisfaction and purchasing decisions in e-commerce [27]. Modern business organizations increasingly prioritize service quality. Service quality affects customers' perception of the company they communicate with.

Social influence

According to the research results of Limna and colleagues, humans are always easily influenced by the opinions of close people including friends and colleagues [28]. Many other studies have analyzed the impact of social influence on behavioral intention [29]. The researchers find that consumers have high mobile commerce adoption intentions when there is technology recommendation from others. The impact and influence of society on human behavior, especially in technology adoption, has been widely studied and widely recognized in research. Research results show that social influence has an indirect positive impact on the intention to use mobile commerce.

Personal security

When using information technology to communicate, consumers are afraid of personal information being leaked and abused by hackers. Protection of personal information, privacy and security are important as threats and vulnerabilities are a major concern because personal data systems can be broken into and information misused [30]. According to Rese et al., when using "Emma" chat in the German online fashion retail industry, consumers' concerns about the security of the technology influenced the intention and popularity of using chat [31]. Consumers will adopt e-commerce when they trust it and do not face security concerns due to product or service consultations that require the collection of personal data. The protection of personal data leads to a decrease in the use of e-commerce.

The research model includes six independent variables in Figure 1.

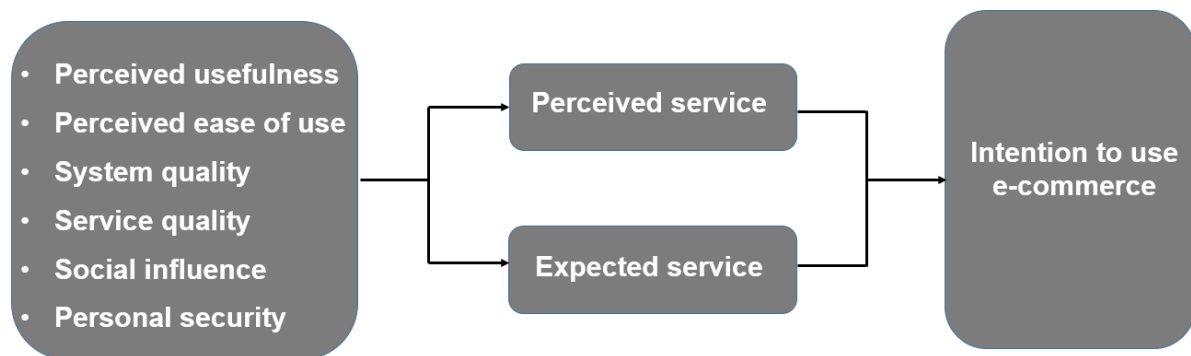


Fig 1. Research model

III. MATERIAL AND METHOD

This study adopts a mixed-methods approach, integrating both qualitative and quantitative research techniques. The qualitative phase involves comparative analysis, focus group discussions, and expert consultations to gather insights and information for the development of the preliminary measurement scales. The quantitative phase comprises two stages: a pilot study and an official survey. The pilot study is conducted to evaluate and refine the measurement scales as well as the questionnaire design, thereby ensuring their validity and reliability before the implementation of the main study.

Research Hypotheses

H1 (+): Perceived usefulness positively affects intention to use e-commerce.

H2 (+): Perceived ease of use positively impacts intention to use e-commerce

H3 (+): System quality positively affects intention to use e-commerce

H4 (+): Service quality positively affects intention to use e-commerce

H5 (+): Social influence positively affects intention to use e-commerce

H6 (+): Personal security positively affects intention to use e-commerce

The sample size was determined in accordance with the recommendation of Hair et al., who suggested that the minimum sample size should be at least five times the number of observed variables [32]. The survey questionnaire includes 46 questions (43 of the independent variable and 3 of the dependent variable). Therefore the sample number is:

$$N = 5 \times 46 = 230 \text{ samples.}$$

Furthermore, to supplement unsatisfactory survey results, the study needs to supplement and choose a safety factor of 1.2, so the number of samples needed is $1.2 \times 230 = 276$.

Based on this guideline, a total of 276 respondents were selected for the study. A non-probability sampling method was employed, whereby participants were chosen randomly from the customer population.

IV. RESULTS

Analyze the reliability and appropriateness of the scale

The scales need to be tested for Cronbach's Alpha reliability. To satisfy the requirements, the factors of the variables (independent and dependent) must have Cronbach's Alpha coefficient greater than 0.6 and the total variable correlation coefficient greater than 0.3.

Table 1 presents the results of the scale reliability testing. The reliability assessment of the research model shows that the Cronbach's Alpha coefficients ranged from 0.812 to 0.889. Compared with the acceptable threshold of 0.6, all observed variables in the measurement scales satisfied the required standard. Cronbach's Alpha reliability test of observed variables (of independent and dependent variables) decreased from 46 to 43 and all variables met the requirements.

Table 1. Results of Cronbach's Alpha test

Variables	Cronbach's Alpha	Number of eliminated variables	Number of remaining variables
Perceived usefulness (PUS)	0.821	0	8
Perceived ease of use (PEU)	0.834	1	7
System quality (SYQ)	0.885	1	7
Service quality (SEQ)	0.889	1	7
Social influence (SIN)	0.872	0	7
Personal security (PSE)	0.861	0	7
Customers' intention to use e-commerce (CIE)	0.812	0	3

Exploratory Factor Analysis (EFA)

The results of Exploratory Factor Analysis (EFA - Exploratory Factor Analysis) of the observed variables of the independent variable in Table 2 give the coefficient KMO (Kaiser-Meyer-Olkin) = 0.763 ($0.5 < \text{KMO} < 1$), Bartlett's Test with Sig value. = 0.000 (< 0.05). Results Exploratory factor analysis of the independent variables is appropriate.

Results Total initial eigenvalues (Initial Eigenvalues_Total) > 1 , we have 6 factors extracted from 36 observed variables with extracted variance of 72.733 ($> 50\%$). Rotated Component Matrix, observed variables (36) with factor loading coefficients all greater than 0.5 (meaningful), are not eliminated and converge in six separate columns.

Results Total initial eigenvalues (Initial Eigenvalues_Total) > 1 , we have a factor extracted from three observed variables with an extracted variance of 67.214% ($> 50\%$). Rotated Component Matrix of observed variables have factor loading coefficients greater than 0.5 (meaningful), extracting exactly one dependent factor,

The results of EFA analysis of the dependent variables are appropriate. The EFA analysis results satisfy the requirements.

Table 2. KMO and Barlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.763
Barlett's Test of Sphericity	Approx. Chi-Square	531.112
	df	706
	Sig	0.000

Regression Analysis

In Table 3, the adjusted R square value is 0.723. The Durbin-Watson value of 1.845 is used to test the autocorrelation of adjacent errors (also known as first-order serial correlation) with values varying from 0 to 4.

The regression relationship between Intention to use e-commerce and independent variables is as follows:

$$Y = 0.476 \cdot PUS + 0.212 \cdot PEU + 0.315 \cdot SYQ + 0.170 \cdot SEQ + 0.102 \cdot SIN + 0.348 \cdot PSE + \epsilon$$

Table 3. Regression Analysis

	Unstandardized regression coefficient		Standardized regression coefficient	t	Sig.
	Coefficient	Standard Error	Coefficient		
PUS	0.122	0.213		0.898	0.136
PEU	0.476	0.108		4.387	0.004
SYQ	0.212	0.062	0.225	2.387	0.023
SEQ	0.315	0.012	0.164	4.708	0.001
SIN	0.170	0.061	0.154	2.943	0.047
PSE	0.232	0.091	0.091	5.636	0.021
	0.348	0.020	0.021	4.328	0.003

$F = 54.43$, ** significant at 5%

$R^2 = 0.723$

Testing conditions and hypotheses: Cronbach's Alpha coefficient, EFA factor analysis, multiple linear regression all meet the requirements. The model's hypotheses all have positive correlation coefficients, so they are appropriate.

H1: Perceived usefulness positively affects intention to use e-commerce.

H2: Perceived ease of use has a positive impact on intention to use e-commerce.

H3: System quality has a positive impact on intention to use e-commerce.

H4: Service quality positively affects intention to use e-commerce.

H5: Social influence affects the intention to use e-commerce in the same direction.

H6: Personal security positively affects intention to use e-commerce.

In summary, the research results satisfy the hypothesis requirements and are accepted. The research results have satisfied the research objective of identifying and evaluating the influencing factors Intention to use e-commerce is expressed through six independent variables.

Perceived usefulness

The perceived usefulness factor has the greatest impact on the intention to use e-commerce, so businesses need to offer many applications that bring diverse benefits to consumers (such as reducing costs, time, accessing many input sources, less search effort with optimal results, ...) and improving work efficiency [33]. The economic benefits received from adopting new technologies will enhance technology acceptance [34] because consumers' intention to use technology increases proportionally to perceived benefits from the technology. As a result, the more useful a technology is, the more motivated consumers are to use it [35]. Because perceived usefulness is an important factor affecting intention to use, businesses need to firmly grasp the diverse and multifaceted components of benefits in the product and service structure, and pay attention to the impact of benefit components that change over time to promptly satisfy needs and serve customers [36].

Personal security

Personal security factor has the second biggest impact on the intention to use e-commerce, so businesses must find out application security concerns that customers encounter and research ways to thoroughly resolve them, while also making commitments to ensure consumers' peace of mind and stimulate increased use of e-commerce. This result is also consistent with the research results of Ischen et al [37]. To perform safe transactions and payments, it is necessary to research algorithms and solutions to limit security violations and device and user authentication problems in network services. When the use of devices and transactions and payment methods become very safe and secure, consumer confidence can increase. Currently, artificial intelligence (AI) is developing very strongly and businesses need to apply AI to proactively protect customers' personal factSystem quality

System Quality

The System Quality factor has the third largest impact on the intention to use e-commerce. The e-commerce system not only solves the business's product consumption problems but needs to integrate with other services such as payment services, credit card options, loans, transactions, insurance, stock market information, investment and insurance, etc. which can impact customers' acceptance and use of e-commerce and can be optimized for benefits to improve customer satisfaction and retention, build strong relationships, stabilize operations and support to overcome difficulties. This result is also consistent with the research results of Bahtar et al and Reswanto et al [38], [39].

Social influence

The Social Influence factor has a fourth impact on businesses' intention to use e-commerce. Consumers who initially search for products often rely on goods and services suggested by friends and family and then search and use them online themselves [40]. Social influence has an impact on developing the values of an element, issues related to society, innovation and entrepreneurship. People determine their beliefs, emotions, actions, and opinions through social influence. E-commerce adoption can be influenced by social media as well as friends and family relationships. Word of mouth and personal experience guide decision making and consumers feel reassured. This result is also consistent with the research results of Klayklung et al. and Cheng et al [41], [42].

Perceived ease of use

The factor Perceived ease of use has the fifth largest impact on businesses' intention to use e-commerce. This result is also consistent with the research results of Mollick et al and Jattamart et al [43], [44]. The software structure and related elements must be close to how consumers think and operate (like icons in Microsoft). Businesses can use artificial intelligence (AI) with verbal search software or provide suggestions for customers to quickly choose based on the information frame.

Service quality

The Service Quality factor has the sixth largest impact on businesses' intention to use e-commerce. Most consumers who buy online tend to learn more about product/service information before deciding to buy. This result is also consistent with the research results of Romadhoni et al. [45]. Therefore, online sales businesses must clearly understand customer requirements for product and service quality and provide useful related information in product descriptions, enthusiastic and honest advice to customers. When there is more information about a product, after selecting and evaluating, consumers are more likely to buy the product. For services, it will help customers visualize the value and have more confidence that the business will deliver the product as committed. To promote consumer confidence and encourage usage and maintain competitiveness in the market, businesses must use many incentives to attract such as promotions, coupons, and free shipping.

V. CONCLUSION

The results of this study have confirmed the role of digital marketing factors (which have been researched around the world) on the intention to use e-commerce in Bac Ninh province. The theory has proven the existence of the factors and this study demonstrates the feasibility of application through the effects of this research results.

Although the research result is a regression equation that has identified factors and verified the level of influence on consumers' intention to use commerce in Bac Ninh province. However, currently, the commercial use trend of consumers nationwide is increasing very rapidly, so the future direction needs to develop research with a national scope and more factors to be able to comprehensively assess the impact of factors on consumers' commercial use intention nationwide. With a larger scale, appropriate sampling methods are needed and the number of samples must be increased to suit research requirements.

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