Empirical Study of Sustainable E-Commerce Adoption by Small and Medium-Sized Enterprises in Vietnam

Chu Ba Quyet[1*], Phung Viet Ha[2]

[1] *Faculty of Economic Information System and E-commerce, Thuongmai University, 79 Ho Tung Mau, Cau Giay District, Hanoi, Vietnam, E-mail:* quyetcb@tmu.edu.vn

[2]*Faculty of Finance and Banking, Thuongmai University, 79 Ho Tung Mau, Cau Giay District, Hanoi, Vietnam, E-mail:* ha.pv@tmu.edu.vn

Abstracts: E-commerce has been adopted by businesses and consumers in Vietnam for consumption activities, profit-seeking, buying and selling goods, conducting business, competing, and expanding markets. Businesses have chosen e-commerce due to its benefits, the trend of applying digital technology, and the ongoing modern business environment. Many previous studies have identified factors influencing the acceptance of e-commerce, but only some studies have approached sustainable e-commerce. Developing sustainable e-commerce requires businesses to invest more money and technology in business processes, which consumers may only sometimes accept. This article applies the TOE framework to identify factors influencing the acceptance of sustainable e-commerce by measuring the importance coefficient of these factors. The research results reflect changes in the factors affecting the acceptance of sustainable e-commerce. The study also provides recommendations for stakeholders involved in developing sustainable e-commerce.

Keywords: Sustainable E-commerce, Technology-Organization-Environment (TOE) Framework, Influencing Factors.

1. INTRODUCTION

Implementing new technologies in practice always faces two extremes: acceptance-opposition, readiness to embrace hesitation and concern, and agreement-denial. Like the story that unfolded centuries ago when machinery was introduced into production, many workers feared losing their jobs, threatening their livelihoods and incomes. E-commerce has also been seen as a business sector utilizing new technology, accepted by businesses and consumers for nearly three decades. Alongside the benefits of e-commerce, its harms and obstacles also coexist. However, addressing the harms and obstacles of e-commerce has gradually been resolved, such as the issue of online fraud, information risks, disclosure of personal financial secrets, and sale of counterfeit/fake goods online. While e-commerce still faces certain obstacles, humanity has witnessed the rapid development of this commercial form. E-commerce has changed how people do business, shop, trade, distribute goods and services, and distribute benefits among stakeholders in commodity value chains, supply chains, and national and global consumption chains.

From a scientific perspective, e-commerce also attracts many researchers in economics, business, commerce, and consumer behavior to clarify the existing issues in the e-commerce business, seeking optimal solutions in implementing electronic business [14], [24], [7], [4]. Research on the acceptance of e-commerce by businesses has answered many questions, elucidating the motivations and reasons why businesses accept e-commerce with widely used models such as TAM (Technology Acceptance Model) and TOE framework (Technology-Organization-Environment framework) over the past thirty years.

The Technology Acceptance Model (TAM) is a model that conceptualizes how users accept and use technology. Behavioural intention (BI) is a factor that drives people to use technology, and BI is influenced by attitude (A), which is the general impression of the technology. The model suggests that when users are introduced to a new technology, several factors influence their decision about how and when they will use it, namely perceived usefulness (PU) and perceived ease of use (PEOU). Davis (1989) defines: "PU is the degree to which a person believes that using a specific system will enhance their job performance" and "PEOU is the degree to which a person believes that using a specific system will not require much effort." [5] In other words, users will choose

technology only when perceived as valuable and easy to use. In addition to PU and PEOU, the influence of external social factors on attitude and intention to use technology is also essential. In the context of e-commerce, the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003) is constructed to explain users' intention to use information systems and subsequent usage behaviour [22]. UTAUT posits that there are four main factors, of which three factors: 1) expected performance, 2) effort expectancy, 3) social influence directly determines intention and usage behaviour, and the fourth factor, facilitating conditions, directly influences user behaviour.

The TOE model, i.e. Technology-Organization-Environment (TOE) framework, is a theoretical framework that explains the adoption of technology within organizations and describes how the process of technology innovation adoption and implementation is influenced by the technological context, organizational context, and environmental context as proposed by Tornatzky and Fleischer (1990) [19]. The TOE focuses on broader macro-level factors (meaning the technological infrastructure of the organization adopting the new technology, internal aspects of the organization, and external environmental factors) rather than the detailed behaviours of individuals within each organization.

Therefore, when researching the acceptance of new technology, such as accepting electronic payments, accepting the use of social networks, accepting ERP usage, accepting mobile commerce, e-commerce, etc., at the individual or consumer level, models such as the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and the Technology Acceptance Model (TAM) should be applied. Conversely, TOE is more appropriate for organizational technology acceptance studies and is less or rarely used in individual consumer technology acceptance research. The advantage of TOE is that it divides the factors influencing the acceptance of technology applications by organizations into three groups, including a group of technology measures - T, and two other groups: internal factors related to the organization - O, and external factors related to the environment - E. TOE only consists of three groups of framing factors. In contrast, the component factors group can vary freely. The disadvantage is that the division of factors is too general; sometimes, a specific factor can belong to either the T or O group, for example, the technological infrastructure of the organization, or the factor of IT human resources could fall into all three groups T, O, E. However, due to the clear division of the three groups of factors in each study, researchers have overcome this by establishing component factors and assigning them to a specific factor group. Therefore, when researching the acceptance of new technology, such as accepting electronic payments, accepting the use of social networks, accepting ERP usage, accepting mobile commerce, e-commerce, etc., at the individual or consumer level, models such as the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and the Technology Acceptance Model (TAM) should be applied.

Conversely, TOE is more appropriate for organizational technology acceptance studies and is less or rarely used in individual consumer technology acceptance research. The advantage of TOE is that it divides the factors influencing the acceptance of technology applications by organizations into three groups, including a group of technology measures - T, and two other groups: internal factors related to the organization - O, and external factors related to the environment - E. TOE only consists of three groups of framing factors. In contrast, the component factors group can vary freely. The disadvantage is that the division of factors is too general; sometimes, a specific factor can belong to either the T or O group, for example, the technological infrastructure of the organization, or the factor of IT human resources could fall into all three groups T, O, E. However, due to the clear division of the three groups of factors in each study, researchers have overcome this by establishing component factors and assigning them to a specific factor group.

2. CONCEPTS ON SUSTAINABLE E-COMMERCE

How does the concept of sustainable e-commerce differ from that of regular e-commerce? Sustainable e-commerce is a new topic that has attracted many researchers because the understanding, perspectives, and conditions for sustainable e-commerce development vary significantly among international organizations, countries, and e-commerce businesses. In Vietnam, the perspective on sustainable e-commerce is addressed in the Sustainable E-commerce Development Report: Driving Forces for the Digital Economy in 2023, jointly published by VCCI, Lazada,

and a group of industry experts. The report does not define sustainable e-commerce but establishes the contents of sustainable e-commerce development across six key aspects: sustainability in long-term investment in infrastructure, technology, logistics, and human resources; sustainability in business to create more value for all parties by building a community with values shared by partners, businesses, and consumers; sustainability in technology, reflecting businesses' priority investment in technologies that support platform openness; sustainability in customer experience, aiming to expand connections with diverse payment partners and methods; and social sustainability: implementing the strategy of universalizing e-commerce across all sectors and regions nationwide. Thus, the perspective on sustainable e-commerce development in this report is seen from the standpoint of e-commerce businesses, specifically, those continuing to invest in e-commerce to generate profits for the business, benefits for customers and society, and long-term development in the future.

From the sustainable development perspective of the United Nations, which is to "meet the needs of the present without compromising the ability of future generations to meet their own needs," sustainable e-commerce development has been approached consistently with the viewpoint of the United Nations by the Committee on the Internal Market and Consumer Protection (IMCO) of the European Parliament, as well as numerous authors. Table 1 summarizes the viewpoints on sustainable e-commerce from current studies.

Table 1. A compilation of studies on sustainable e-commerce

No.	Research Group/Author	Content, Perspective
1	Pazaitis, Kostakis & Bauwens, 2017 [11]	Voice the need to maintain a balance between the development of online retail businesses and the negative impacts on the environment and society.
2	Oláh, Kitukutha, Haddad, Pakurár, Máté & Popp, 2019 [10]	All stakeholders need to collaborate and take appropriate responsibility to promote sustainable e-commerce development.
3	IMCO, UN [19]	Developing guidelines and policies on sustainable e-commerce development.
4	DHL, 2021 [6]	Researching efficient environmentally friendly packaging methods.
5	Amazon [6]	Describing some sustainable e-commerce development activities.
6	Raghavan, 2022 [12]	Sustainable e-commerce involves conducting business activities in a manner that does not degrade the natural environment through measures and approaches that address the needs of current generations without jeopardizing future generations.
7	Virstiuk, (2022) [23]	Sustainable e-commerce necessitates environmentally friendly shipping, the use of eco-friendly packaging, and minimizing returns.
8	Bigcommerce [6]	Entailing social equity, environmental protection, and economic development.
9	Sun, Grondys, Nazim Hajiyev, & Zhukov, 2021 [18]	The three aspects of sustainable e-commerce are economic sustainability, reflecting the quality of electronic business activities; environmental sustainability, reflecting a company's impact on the environment; and social sustainability, reflecting the level of interaction with employees, customers, etc.
10	Laudon & Traver, 2014 [9]	The development of sustainable e-commerce is associated with the responsibility of all stakeholders to protect the environment.

As shown in Table 1, the viewpoint on sustainable e-commerce is that e-commerce development is tied to environmental protection, benefits all parties and generations, and is the responsibility of stakeholders in the present. Thus, sustainable e-commerce is the application of e-commerce to meet the needs of individuals and organizations but requires balancing the interests of all parties and future generations, with environmental protection at its core. This viewpoint aligns with the United Nations' perspective on sustainable development since 1987 [20], contextualized within e-commerce. It demands responsibility from all relevant parties, from manufacturers, distributors, carriers, and consumers, for sustainable e-commerce development.

3. RESULTS AND DISCUSSIONS RESEARCH MODEL OF THE ACCEPTANCE OF SUSTAINABLE E-COMMERCE BY ENTERPRISES ACCORDING TO THE TOE FRAMEWORK

Awareness of enterprises' sustainable e-commerce development: what benefits and challenges are there in accepting sustainable e-commerce? According to Rawash's (2021) [15] study on the acceptance of e-commerce by small and medium enterprises (SMEs) in Jordan, there are six variables influencing the acceptance of e-commerce, including 2 variables belonging to the T factor: relative advantage of technology - RA and compatibility - CO, 2 variables belonging to the O factor: organization's technological readiness - TR and management support - MS, and 2 variables belonging to the E factor: government support - GS and competitive pressure - CP. The model of factors influencing the acceptance of e-commerce is built from the original TOE framework, as shown in Figure 1, and Figure 2 is the modified model by Rawash (2021) [15].
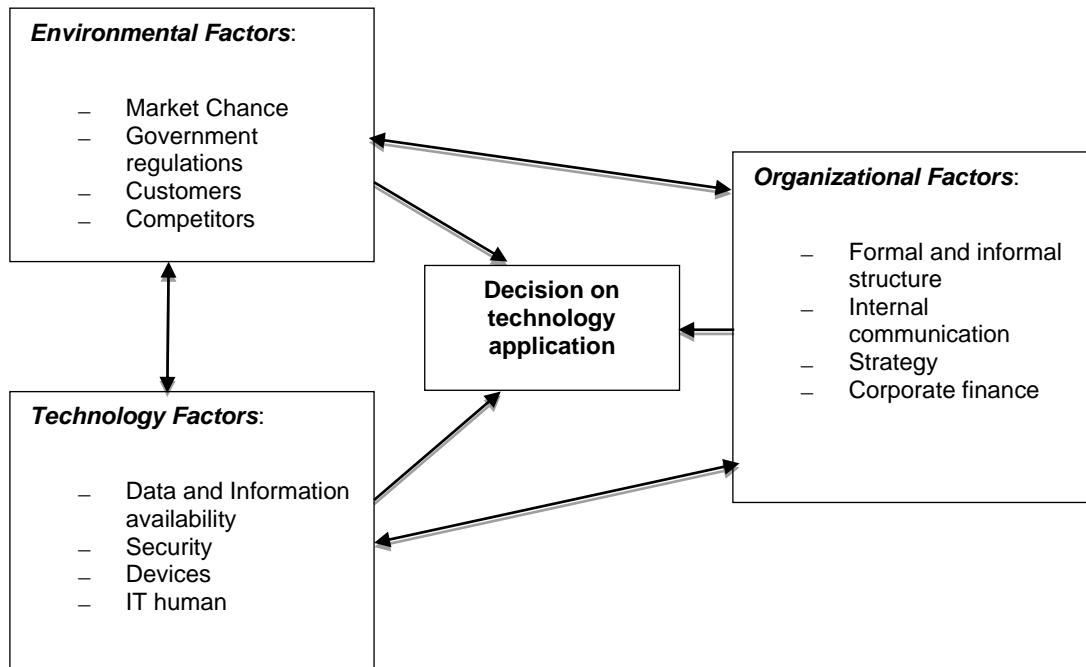
Environmental Factors:

- Market Chance
- Government regulations
- Customers
- Competitors

Organizational Factors:

- Formal and informal structure
- Internal communication
- Strategy
- Corporate finance

Decision on technology application

Technology Factors:

- Data and Information availability
- Security
- Devices
- IT human

Figure 1. TOE prototype [19]

Factor T:
- RA
- CO

Factor O:
- TR
- MS

Factor E:
- GS
- CP

H1
H2
H3
H4
H5
H6

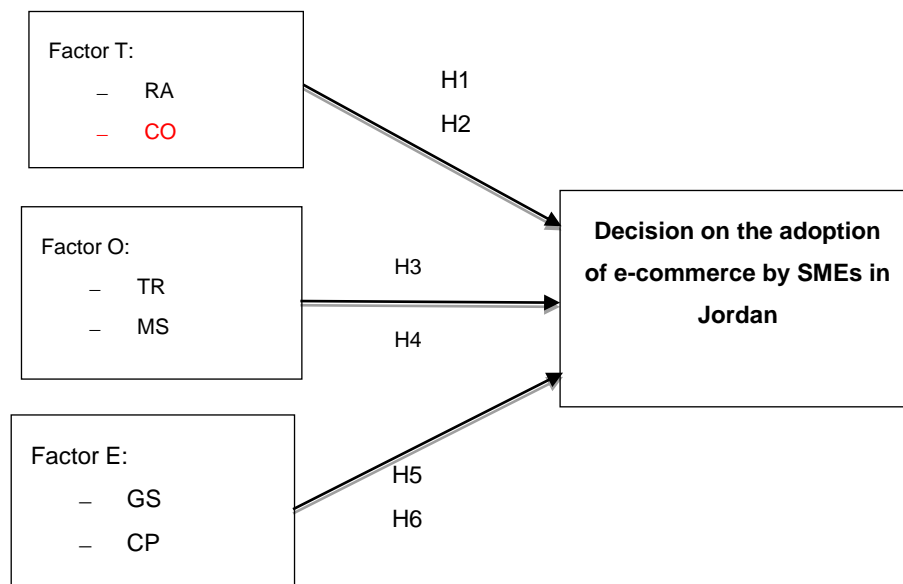**Decision on the adoption of e-commerce by SMEs in Jordan**

Figure 2. Model of factors influencing the adoption of e-commerce by SMEs in Jordan [15]

In Rawash's (2021) study [15], the author drew upon the research of Tornatzky and Fleischer (1990) and the research models of Rogers (1983) on the Diffusion of Innovations (DOI) theory when utilizing variables RA and CO as two components of the T factor [17]. In the O factor, the author built upon Abed's (2020) [1] study on the acceptance of social commerce using the TOE framework with the variable MS and drew from Alraja et al. (2020) [2] with the variable TR. In the E factor, the variables GS were derived from Al Zoubi and Al Zoubi (2018) [3] and the variable CP from Rahayu and Day's (2015) research [13].

In Abed's (2020) [1] study on the acceptance of mobile commerce using the TOE framework by small and medium enterprises in Saudi Arabia, six factors were also proposed, including two variables belonging to the T factor, namely RA similar to Rawash's (2021) [15] study, and information security; two variables belonging to the O factor, MS similar to Rawash's (2021) study [15], and organizational readiness; and two variables belonging to the E factor, CP which has been adopted by Rawash (2021) [15], and customer benefits factor.

In Oláh et al. (2019) [10] study on sustainable e-commerce, the group of authors constructed a model with three independent variables: environmental dimension, economic dimension, and social dimension, and the dependent variable was sustainable e-commerce development. The study's main purpose was to investigate how integrating the three dimensions/aspects of e-commerce could make e-commerce more sustainable by accepting trade-offs that could bring maximum benefits to retailers, consumers, and the environment.

The research on the acceptance of sustainable e-commerce by Vietnamese businesses employing the TOE framework and drawing on insights from the studies of Abed (2020) [1], Rawash (2021) [15], and Oláh et al. (2019) [10] with adjustments to the constituent variables of the 3 TOE factors T, O, E, specifically:

The T factor group: The research inherits from the studies of Abed (2020) [1] and Rawash (2021) [15], using the variable RA, that when businesses perceive the benefits of sustainable e-commerce, they will accept it. The organisational technological capability variable is used with the variable compatibility - CO in Rawash's (2021) [15] study and the information security variable in Abed's (2020) [1] study. The proposed hypotheses are:

H1: Relative advantage (RA) positively influences SMEs' acceptance of sustainable e-commerce.

H2: The organisation's technological capability (TR) positively influences SMEs' acceptance of sustainable e-commerce.

Note that the flexibility of TOE allows the research group to adjust the TR variable from the O group to the T group, as it is appropriate because the organisation's technological capability also belongs to the technology factor.

The O factor group draws from the research of Abed (2020) [1] and Rawash (2021) [15], using the variables MS and organizational readiness replaced by the variable financial capability of the organization - a variable measuring the economic dimension in Oláh et al. (2019) model [10]. The hypotheses are proposed as follows:

H3: Management support within the organization - MS positively influences SMEs' acceptance of sustainable e-commerce.

H4: Financial capability of the organization - FC positively influences SMEs' acceptance of sustainable e-commerce.

The E factor group incorporates findings from the research of Abed (2020) [1], Rawash (2021) [15], and Oláh et al. (2019) [10]. The variable competitive pressure - CP, government support - GS, and customer benefits are replaced by consumer acceptance. In accepting sustainable e-commerce, the government imposes strict environmental regulations, causing SMEs to increase costs and create pressure on customers. Therefore, within the E factor group, three hypotheses are proposed:

H5: Competitive pressure - CP positively influences SMEs' acceptance of sustainable e-commerce.

H6: Government regulations and policies - GS positively influences SMEs' acceptance of sustainable e-commerce.

H7: Customer acceptance - CA positively influences SMEs' acceptance of sustainable e-commerce. The proposed research model is depicted in Figure 3.
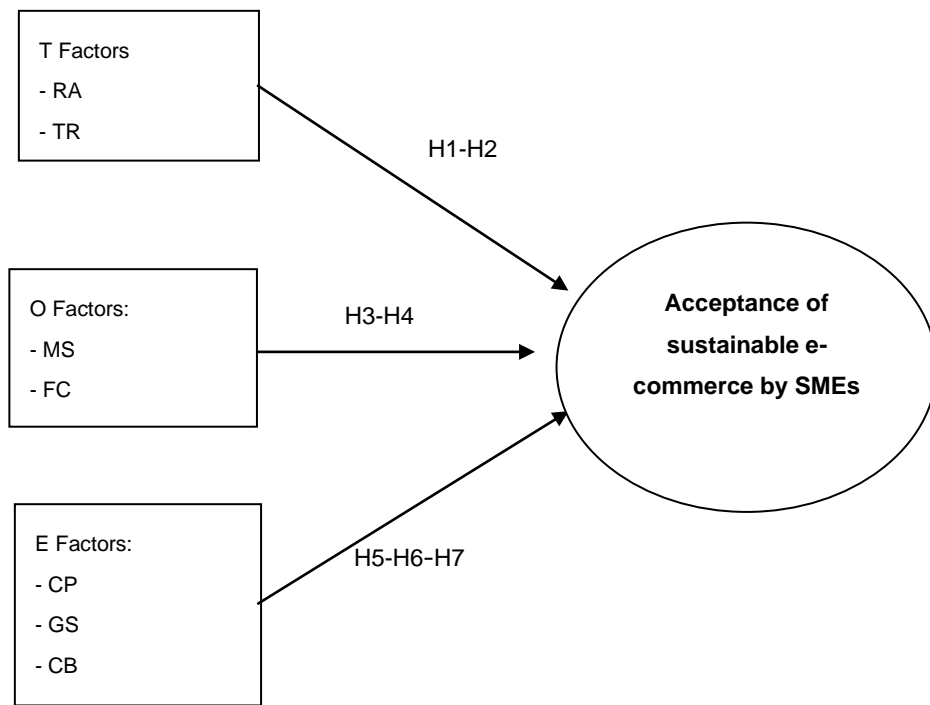
4. RESEARCH METHODOLOGY

To test the statistical significance of the seven hypotheses, data were collected from small and medium-sized enterprises (SMEs) in Vietnam. The number of enterprises collected after excluding those with no application of e-commerce totalled 285, of which 80% had opened online stores on electronic trading platforms for online sales, 48% had e-commerce websites, and 95% used social media pages to showcase goods or sell online. Surveys were sent to these enterprises to collect information on the acceptance of sustainable e-commerce. Questions regarding the acceptance of sustainable e-commerce development options were measured using a 5-point Likert scale (1 = strongly disagree, to 5 = strongly agree). Table 3 summarizes the data obtained from the survey on SMEs' acceptance of sustainable e-commerce in Vietnam (SeCom).

Table 3. Data Encoding and Statistical Results

No.	Encoding	Descriptive question	Score Levels and Response Rates				
Factor group T			1	2	3	4	5
Relative advantage	ra1	S-eCom offers more benefits than traditional commerce	33%	27%	20%	10%	10%
	ra2	S-eCommerce offers more benefits than e-Commerce	12%	13%	35%	25%	15%
	ra3	S-eCommerce helps businesses achieve long-term sustainable growth	9%	12%	44%	25%	10%
	ra4	All members of the organization benefit from choosing S-eCommerce	8%	15%	50%	21%	6%
Technological readiness	tr1	Technology infrastructure adequacy	5%	15%	30%	27%	23%
	tr2	Technology-responsive	8%	16%	52%	19%	5%

		human resource adequacy					
	tr3	Investing in technology is always right	9%	8,5%	45%	28%	9,5%
	tr4	External compatibility	12%	15%	33%	25%	15%
Factor group O							
Management Support	ms1	Business leaders have S-eCom development strategies	10%	12%	46%	18%	14%
	ms2	Leaders develop team members	9%	11%	46%	24%	10%
	ms3	Leaders have S-eCom development plans	14%	13%	39%	19%	15%
Financial Capability	fc1	Financial readiness for S-eCom development	5%	30%	40%	16%	9%
	fc2	Diminished financial capacity when implementing S-eCom	6%	24%	38%	21%	11%
	fc3	Easy financial mobilization when implementing S-eCom	18%	22%	42%	25%	3%
Factor Group E							
Competitive Pressure	cp1	Implementing S-eCom for survival	10%	17%	39%	19%	15%
	cp2	Facing too many competitive rivals	5%	23%	47%	16%	9%
	cp3	Potential competitors	10%	10%	46%	20%	14%
Government support	gs1	Government favorable to S-eCom	6%	30%	39%	20%	5%
	gs2	Government policies have some shortcomings for S-eCom	6%	26%	42%	19%	7%
	gs3	Lack of S-eCom development policies	10%	30%	32%	17%	11%
	gs4	Policies incompatible with S-eCom	23%	38%	21%	16%	2%
Customer benefits	cb1	Customers Expect S-eCom	9%	11%	46%	24%	10%
	cb2	Customers accept higher costs for S-eCom	8%	12%	44,3%	18%	17,3%
	cb3	Customers accept reduced satisfaction for S-eCom	5%	19%	36%	29%	7%
Organizational Decision to Use sustainable e-commerce							
S-ecom	Secom1	Economic sustainability	23%	18%	39%	29%	1%
	Secom2	Environmental sustainability	20%	15%	45%	17%	3%
	Secom3	Social sustainability	6%	13%	37%	23%	17%

With a survey sample of 285 questionnaires comprising general information about the businesses, including 23 questions elucidating the factors influencing the acceptance of sustainable e-commerce and 3 questions measuring the dimensions of sustainable e-commerce, reliability and representativeness in elucidating the sustainable e-commerce (S-ecom) application decision have been achieved. All questions used scales in factor analysis using EFA, and the sample size was determined to be at least n = 5*m, where m is the number of questions (Roger, 2006) [16].

5. DATA ANALYSIS

The study utilized SPSS 22 software to analyze and process the data.

5.1. Results of Testing the Reliability of Factor Scales

To evaluate the reliability of the scales in the research model, the authors used the composite reliability coefficient with a threshold greater than 0.6 for confirmatory studies and the composite correlation coefficient of observed variables greater than 0.3. All observed variables met the requirements (see Table 4).

Table 4. Summary of Cronbach's Alpha Test Results

Name of Observed Composite Variable	Symbol	Number of Observed Variables	Initial Cronbach's Alpha	Removed Observed Variables	Subsequent Cronbach's Alpha
Relative advantages of sustainable e-commerce	ra	4	0,836	0	0,836
Technological readiness of the organization	tr	4	0,724	0	0,724
Management support for the development of Sustainable e-Commerce	ms	3	0,752	0	0,752
Financial capability of the organisation	fc	3	0,851	0	0,851
Competitive pressure	cp	3	0,812	0	0,812
Government support policies for sustainable e-commerce	gs	4	0,838	0	0,838
Customer benefits from sustainable e-commerce	cb	3	0,793	0	0,793
Acceptance of sustainable e-commerce	Secom	3	0,719	0	0,719

5.2. Exploratory Factor Analysis Results

The research team employed the exploratory factor analysis technique to reduce the 24 independent variables in the research model. Appropriate criteria for exploratory factor analysis include a Kaiser-Meyer-Olkin (KMO) coefficient > 0.5, variance explained greater than 50%, and factor loading coefficients > 0.5. The principal component analysis method with varimax rotation was used.

The results of the exploratory factor analysis of independent variables: the KMO coefficient of the factors is 0.748 > 0.5, Bartlett's test is statistically significant (Sig < 0.05), Eigenvalue > 1, the total variance explained from 7 out of 24 variables is 81.29% > 50%, indicating that the EFA model is appropriate (see table 5 and table 6).

Table 5. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.748
Bartlett's Test of Sphericity	Approx. Chi-Square	10839.693
	df	465
	Sig.	.000

Table 6. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.604	24.460	24.460	6.604	24.460	24.460	5.315	19.685	19.685
2	4.930	18.261	42.721	4.930	18.261	42.721	3.323	12.309	31.994
3	4.384	16.236	58.957	4.384	16.236	58.957	3.313	12.272	44.266
4	2.230	8.259	67.216	2.230	8.259	67.216	3.175	11.761	56.027
5	1.567	5.805	73.020	1.567	5.805	73.020	3.044	11.274	67.301
6	1.208	4.473	77.494	1.208	4.473	77.494	2.439	9.032	76.333
7	1.006	3.725	81.219	1.006	3.725	81.219	1.319	4.886	81.219
8	.810	2.999	84.218						
9	.673	2.491	86.709						
10	.595	2.203	88.913						

Extraction Method: Principal Component Analysis.

Similarly, for the EFA analysis of dependent variables, there are Tables 7 and 8.

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.650
Bartlett's Test of Sphericity	Approx. Chi-Square	167.947
	df	3
	Sig.	.000

KMO = 0.650 > 0.5, indicating that the factor analysis is appropriate. Sig < 0.05 demonstrates that the observed variables are correlated with each other. The results of the rotated factor matrix analysis reveal 1 factor extracted from the observed variables, with an explained variance of 63.559% and an Eigenvalue of 1.907 > 1. (see Table 7, 8)

Table 8. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.907	63.559	63.559	1.907	63.559	63.559
2	.659	21.973	85.532			
3	.434	14.468	100.000			

Extraction Method: Principal Component Analysis.

5.3. Pearson Correlation Test

The Pearson correlation test is used to examine the linear correlation between independent and dependent variables and identify multicollinearity issues early when independent variables are strongly correlated. The Pearson correlation coefficient closer to 1 indicates a stronger correlation, closer to 0 indicates a weaker correlation, and if sig < 0.05, then there is a correlation; if sig > 0.05, then there is no correlation (refer to Table 9).

Table 9. Pearson Correlation Test

		Secom	ra	tr	ms	fc	cp	gs	cb
qd	Pearson Correlation	1	.646**	.098	.122*	.770**	.124*	.138*	.775**
	Sig. (2-tailed)		.000	**.103**	.042	.000	.038	.021	.000
	Covariance	.731	.385	.067	.071	.439	.090	.080	.468
	N	285	285	285	285	285	285	285	285

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results from Table 9 indicate that the Sig value for the variable "Technological Readiness of the Organization" (tr = 0.103) is greater than 0.05. Therefore, there are only 6 independent variables that have a linear correlation with the dependent variable 'Acceptance of Sustainable e-Commerce (Secom)'.

5.4. Multiple Linear Regression Analysis

The independent variables were entered into the model using the Enter method. The model's appropriateness was evaluated through R-square, hypothesis testing of the overall model significance using F-test, and the significance of the regression coefficients using the t-value (refer to Tables 10 and 11).

Table 10. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.825[a]	.681	.674	.488459111399	1.672

a. Predictors: (Constant), ra, ms,tc, cp, gs, cb

b. Dependent Variable: Secom

Source: SPSS Data Analysis Results

Table 11. Results of Multiple Linear Regression Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.825ª	.681	.674	.488459111399	1.672

a. Predictors: (Constant), ra, ms,tc, cp, gs, cb
b. Dependent Variable: Secom

R-squared = 0.681 = 68.1%, which means that 6 independent variables account for 68.1% of the variance in the dependent variable, while the remaining 31.9% is attributed to factors outside the model and random error. The Durbin–Watson value is 1.672, falling within the range of 1.5 to 2.5, indicating no violation of the first-order autocorrelation assumption (Qiao, 2011) [21].

5.5. Coefficients Table and Test for Multicollinearity

The multiple linear regression analysis with 6 independent variables using the Enter method yielded results in Table 12. If the Sig value is greater than 0.05, the independent variable is not significant. In Table 12, the variable "cp" has Sig > 0.05 and needs to be removed to continue the analysis for Table 13.

Table 12. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	.246	.240		1.027	.306		
ra	.200	.060	.163	3.321	.001	.485	2.061
cp	.073	.067	.058	1.089	.277	.408	2.449
fc	.439	.081	.343	5.414	.000	.292	3.423
ms	.065	.035	.064	1.863	.044	.987	1.013
cb	.045	.067	.036	.672	.050	.407	2.455
eg	.455	.073	.376	6.191	.000	.317	3.154

a. Dependent Variable: Secom

Table 13. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	.305	.233		1.308	.192		
ra	.195	.060	.159	3.240	.001	.489	2.046
fc	.448	.081	.350	5.550	.000	.295	3.388
ms	.065	.035	.064	1.864	.043	.987	1.013
cb	.101	.043	.081	2.330	.021	.979	1.022
eg	.450	.073	.372	6.138	.000	.318	3.144

The regression equation is standardized as follows:

Secom = 0.159ra + 0.350fc + 0.064ms + 0.081cb + 0.372eg

Thus, there are five component variables composing three factor groups, with one variable in group T (ra), two variables (ms and fc) in group O, and two variables (cb and eg) in group E. Two out of seven hypotheses were rejected through data analysis, namely the Technological Readiness of the Organization (tr) and Competitive Pressure (cp). The equation above reflects that five hypotheses are accepted across all three factor groups T, O, and E, influencing the acceptance of sustainable e-commerce. Notably, the financial capability within factor O and

Government Support for Sustainable e-Commerce Development within factor E have the highest impact coefficients on SMEs' acceptance of sustainable e-commerce. Management support and customer benefits have relatively low impact coefficients on SMEs' acceptance of sustainable e-commerce.

DISCUSSION AND RECOMMENDATIONS

The TOE framework can be applied to study the factors influencing the acceptance of sustainable e-commerce. Previous studies by Abed (2020) [1] and Rawash (2021) [15] have used the TOE framework to investigate e-commerce acceptance. This study drew from and developed the research model with seven proposed factors positively correlating with the acceptance of sustainable e-commerce applications. The results of data analysis with a scale of 285 responses have shown changes in the factors influencing SMEs' acceptance of sustainable e-commerce. Some components, such as the organisation's technological readiness to accept e-commerce, are no longer critical. This can be explained by the fact that about 80% of businesses have opened online stores on electronic platforms, and 95% of businesses use social media for advertising and online sales, making technological readiness less crucial for SMEs.

If competitive pressure requires businesses to enhance e-commerce applications, as in previous studies, this component maintains its importance. However, in this study, competitive pressure no longer significantly drives SMEs to accept sustainable e-commerce. Additionally, acceptance of sustainable e-commerce must meet sustainability requirements in economics, environment, and society, requiring businesses to have good financial resources and be proactive in the highly competitive e-commerce market. Government regulations on sustainable e-commerce businesses have the most substantial impact on SMEs' acceptance of sustainable e-commerce because only governments with mandatory rules and supportive policies can create an effect on thousands of companies participating in various stages of e-commerce, building sustainable e-commerce value chains.

Overall, the findings suggest that businesses should align with government policies and regulations while ensuring financial stability to adopt sustainable e-commerce practices effectively.

Based on the research findings, it is evident that governments need to swiftly develop management policies and support mechanisms for businesses to implement sustainable e-commerce. Vietnam's government and relevant authorities should establish policies and guidelines to guide enterprises in conducting sustainable e-commerce shortly.

Businesses wishing to implement sustainable e-commerce quickly need to prepare well in terms of financial capability. Alongside assessing the business advantages of e-commerce in their industry, leaders of the enterprise need to have a roadmap for implementing sustainable e-commerce. This aligns with international companies like DHL and Amazon, which already have established brands, strong financial capabilities, and plans for implementing sustainable e-commerce (DHL, 2021). [6]

CONCLUSIONS

In a study on sustainable e-commerce, Ingaldi and Ulewicz (2019) [8] argued that companies implementing sustainable e-commerce while meeting customer expectations face a significant challenge due to increased product and service costs. In this study, five factors influencing SMEs' acceptance of sustainable e-commerce were identified, with the customer benefits factor, although not pivotal, being one of them. The research results reflect that businesses can implement sustainable e-commerce; however, this depends on internal and external factors. Limitations of the study include a limited scale of business involvement and a lack of expert opinions on the factors influencing the acceptance of sustainable e-commerce. The research primarily relied on drawing from existing models published worldwide, which may only partially be suitable for the Vietnamese environment. The following research direction should address this study's limitations and examine the acceptance of sustainable e-commerce among Vietnamese consumers.

REFERENCES

[1] Abed, S. (2020). Social commerce adoption using TOE framework: An empirical investigation of Saudi Arabian SMEs. *International Journal of Information Management,* 53(6) 102118. https://doi.org/10.1016/j.ijinfomgt.2020.102118

[2] Alraja et al. (2020). Does Facebook commerce enhance SMEs performance? A structural equation analysis of Omani SMEs. *SAGE Open*, 10(1), 2158244019900186. https://doi.org/10.1177/2158244019900186

[3] Al Zoubi, I. S., & Al Zoubi, I. A. (2019). An Investigation of Factors affecting E-Marketing Customers' Behavioral intention to use Telecommunication industry in Jordan. *International Journal of Marketing Studies*, 11(3). https://doi.org/10.5539/ijms.v11n3p125

[4] Cherednichenko, O., Ivashchenko, O., Lincenyi, M., & Kováč, M. (2023). Information technology for intellectual analysis of item descriptions in e-commerce. *Entrepreneurship and Sustainability Issues*, 11(1), 178-190. http://doi.org/10.9770/jesi.2023.11.1(10)

[5] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. https://doi.org/10.2307/249008

[6] DHL. (2021). *The Environmental Sustainability of E-Commerce.* COA: DHL White Paper.

[7] Fedorko, I., Bacik, R., Gavurova, B., & Fedorko, R. (2021). Social media in the context of technology acceptance model. *Entrepreneurship and Sustainability Issues*, 9(1), 519-528. http://doi.org/10.9770/jesi.2021.9.1(32)

[8] Ingaldi, M., & Ulewicz, R. (2019). How to Make E-Commerce More Successful by Use of by Use of Kano's Model to Assess Customer Satisfaction in Terms of Sustainable Development. *Sustainability*, 11(18), 4830. https://doi.org/10.3390/su11184830

[9] Laudon, K.C., & Traver, C.G. (2014). *E-commerce: Business. Technology Society.* London, UK: Pearson Education International, ISBN 0136006450.

[10] Oláh, J., Kitukutha, N., Haddad, H., Pakurár, M., Máté, D., & Popp, J. (2019). Achieving Sustainable E-Commerce in Environmental, Social and Economic Dimensions by Taking Possible Trade-Offs. *Sustainability*, 1-22. https://doi.org/10.3390/su11010089

[11] Pazaitis, A., Kostakis, V., & Bauwens, M. (2017). Digital economy and the rise of open cooperativism: the case of the Enspiral Network. Transfer: *European Review of Labour and Research*, 23(2), 177-192. https://doi.org/10.1177/1024258916683865

[12] Raghavan, R. (2022). *What is Sustainable eCommerce and Why Should Every Business Adopt It?* Accessed from https://acowebs.com/sustainable-ecommerce

[13] Rahayu, R., & Day, J. (2015). Determinant Factors of E-commerce Adoption by SMEs in Developing Country: Evidence from Indonesia.Procedia - Social and Behavioral Sciences 195(5), 142-150. https://doi.org/10.1016/j.sbspro.2015.06.423

[14] Ramdansyah, A.D. & Taufik, H.E.R. (2017). Adoption Model of E-Commerce from SMEs Perspective in. *European Research Studies Journal*, 227-243. https://doi.org/10.35808/ersj/887

[15] Rawash, H.N. (2021). E-commerce Adopting TOE Model by SMEs in Jordan. *Multicultural Education*, 7(3). https://doi.org/10.5281/zenodo.4598098

[16] Roger Bove (2006), *Estimation and Sample Size Determination for Finite Populations*. 10th Edition, CD Rom Topics, Section 8.7, West Chester University of Pennsylvania. http://courses.wcupa.edu/rbove/Berenson/10th%20ed%20CD-ROM%20topics/section8_7.pdf

[17] Rogers, E.M. (1983). *Diffusion of Innovations*, Free Press, New York

[18] Sun, M., Grondys, K., Hajiyev, N., & Zhukov, P. (2021). Improving the E-Commerce Business Model in a. *Sustainability*, 22. https://doi.org/10.3390/su132212667

[19] Tornatzky, L. & Fleischer, M. (1990). *The process of technology innovation*, Lexington, MA. Lexington Books.

[20] UN. (1987). *Our common future.* Oxford: Oxford University Press.

[21] Qiao, Y. (2011). *Instertate Fiscal Disparities in America*, New York: Routledge.

[22] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425-478. https://doi.org/10.2307/30036540

[23] Virstiuk, A. (2022, April 15). https://gepard.io/ecommerce-strategy/sustainable-ecommerce Accessed from https://gepard.io

[24] Ziaran, P., Fedorko, R., Gavurova, B., Bacik, R. (2021). Motivational factors at work of e-commerce and e-business employees. What is the difference between genders? *Entrepreneurship and Sustainability Issues*, 9(1), 23-36. http://doi.org/10.9770/jesi.2021.9.1(2)