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Article

E-commerce applications: A study of customers' behavioral intentions and behaviors of using these applications towards online shopping

Thi Thuy Nguyen[1,*], Linh Thi Thuy Nguyen[2]

[1] Faculty of Economics-Management, Thang Long University, Hanoi 100000, Vietnam
[2] Faculty of Business Administration, East Asia University of Technology, Hanoi 100000, Vietnam
*** Corresponding author:** Thi Thuy Nguyen, nthuy189@gmail.com

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Abstract: This study uses the UTAUT2 (Unified theory of acceptance and use of technology) model as well as adding other factors such as Platform Usability, User Autonomy to determine the behavioral intention and behavior of online shoppers using e-commerce applications (ECAs) in Vietnam. Using the analysis results from structural equation modeling, it was shown that Social Influence, Use Proficiency, Hedonic Motivation, User Skill, Effort Expectancy positively affect Behavioral Intention. At the same time, Behavioral Intention is negatively affected by Performance Expectancy. Behavioral Intention and Facilitating Conditions are two factors that positively affect Use Behavior. Besides, User Autonomy negatively affects Use Behavior. The research results are an important basis for ECAs providers, managers and stakeholders to apply in assessing the behavioral intentions and behaviors of online shopping customers using ECAs in Vietnam to promote the use of ECAs in online shopping.

Keywords: behavioral intention; e-commerce; use behavior; UTAUT2

1. Introduction

An e-commerce platform is a software solution that allows online retailers to manage their business and customers to shop online via the internet, electronic devices, mobile devices, opening up the possibility of providing services e-commerce services on a global scale (Ha Van Duong, 2022). An ECAs is a software solution that allows businesses to centrally manage their, omnichannel marketing, digitals sales and operations (Optimizely, 2023).

According to Ha (2023), the change in behavioral intentions, consumption trends and ECAs use behavior of Vietnamese consumers has contributed to the growing development of online shopping in Vietnam. In Vietnam, e-commerce operations are conducted through ECAs, omnichannel retail, using available online marketing tools and associated with personalization of shopping experiences. Vietnamese consumers are spending more time, as well as their behavioral intentions and use behavior using ECAs to increasingly shop for goods of larger value and quantity. Because an ECAs enables the commercial purchase process to take place, it has a search feature that allows customers to find a specific product, manage orders and make payments.

The challenges of e-commerce growth in Vietnam are due to many reasons, such as the habit, ECAs usability and belief of buying goods online (Nguyen and Luu, 2024). Besides, Sovann (2024) also said that cybersecurity threats, fraud, data breaches are concerns in e-commerce usage in Vietnam due to platform usability and user autonomy, as well as poor user shopping experience. Therefore, this study added factors such as Platform Usability, User Autonomy to the UTAUT2 model to propose this study.

For ECAss, research on customers' behavioral intentions and use behavior of these platforms in online shopping will contribute to promoting the diversification of business methods, bringing benefits to consumers, ECAs are increasingly used in online shopping.

2. Literature and hypotheses

2.1. Customers' behavioral intentions, use behavior and the UTAUT2 model

The behavior of using ECAs for online shopping has become a trend in shopping transactions. As most consumers use websites or commercial platforms to shop for goods and services (Yuniar, et al., 2019). Online consumer behavioral intention is consumers decide for online shopping from ECAss. Their shopping is influenced by requirements and ever-changing expectations. The expectations that drive online consumer behavioral intention are rooted in the commonality, it includes expectations regarding accessibility to products, the cost of shipping, a simple buying experience, delivery transparency. Although needs are different for each online consumer, but those impact how online customers make their shopping on the internet (Chamat, 2022). The fast connections, easy access to ECAs, and diverse options for online purchases have a positive effect on behavioral intention as well as use behavior of many customers (Saleem, et al., 2022).

Zhou et al. (2021) proposed using the UTAUT2 model to study the usage behavior of ECAs, which showed that ECAs and online shopping stimulated consumers to adopt direct e-commerce shopping. Besides, the growth of live e-commerce shopping needs to understand the customers' behavioral intention, use behavior and psychological determination mechanism. When applying the UTAUT2 model in research in Vietnam, Ha (2023) discovered factors affecting consumers' behavioral intentions as well as their behavior in using ECAs.

By incorporating three additional factors of Hedonic Motivation, Value and Habit into the UTAUT model, Venkatesh et al. (2012) formed the UTAUT2 model with factors, including Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Value, Habit, Behavioral Intention and Use Behavior, which can be seen in **Figure 1**.

2.2. Hypothesis development

This study added two more factors such as Platform Usability, User Autonomy to the UTAUT2 model to form a model with factors including Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Value, Habit, Platform Usability, User Autonomy, Behavioral Intention and Usage Behavior, which can be seen in **Figure 1**.

Performance expectancy (PE) is a fundamental construct that determines the adoption and use of technology by which individuals believe that using this system will help improve their work better and better (Venkatesh et al., 2012). From extrinsic motivation, usefulness perceptions and job fit for using ECAs, performance expectancy has a positive impact on users' behavioral intention (Mansur et al., 2019).

Customers' behavioral intention to use e-commerce is positively influenced by performance expectations (Cabrera-Sánchez et al., 2020). Chatsirichai et al. (2022) showed that users' behavioral intentions when using ECAs are influenced by performance expectancy. In addition, users' behavioral intention when using ECAs is also driven by performance expectancy (Ezennia and Marimuthu, 2022). Therefore, the hypothesis is as follows:

Hypothesis 1 (H1). Vietnamese consumers' behavioral intention to use ECAs is positively affected by Performance Expectancy.

Effort Expectancy (EE) refers to the convenience and ease of using an e-commerce platform for consumers to purchase products and services. Furthermore, consumers' behavioral intention to use an e-commerce platform is positively influenced by effort expectancy (Mansur et al., 2019). On ECAs, many consumers easily chose the products and services and they have quick purchase that products and services. On the other hand, consumers' behavioral intention to use online shopping and e-commerce websites is positively influenced by effort expectancy (Hungilo and Setyohadi, 2020; Ezennia and Marimuthu, 2022). Ha (2023) also revealed that consumers are motivated to make purchases and improve the quality of online shopping when using ECAs because of effort expectancy. Therefore, hypothesis H2 is stated as follows:

Hypothesis 2 (H2). Vietnamese consumers' behavioral intention to use ECAs is positively affected by Effort Expectancy.

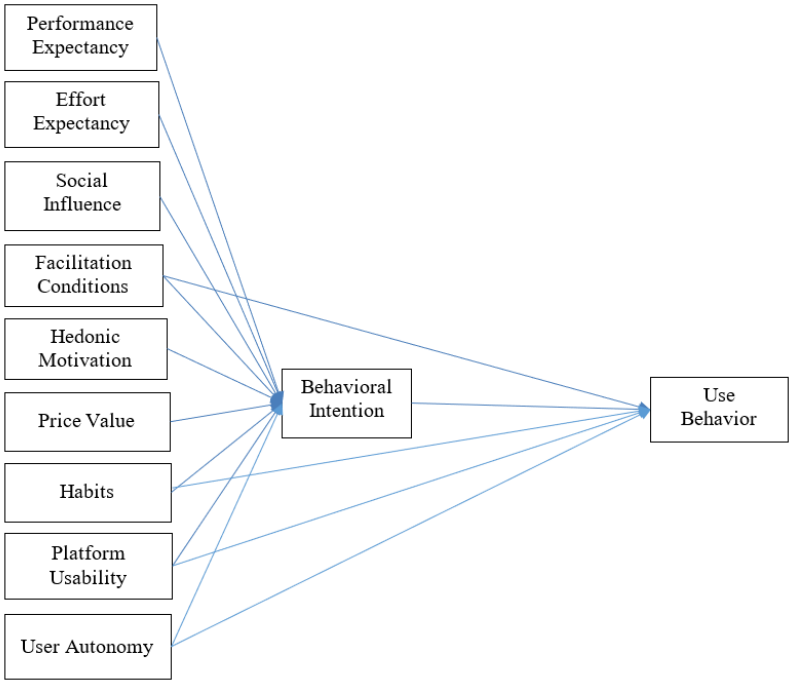

Figure 1. The research model.

Source: Author's proposed model based on Venkatesh et al. (2012) and supplement.

Social Influence (SI) measures the pervasive and powerful mechanisms for consumers' behavior intention change due to influence by family and friends as well as they think it is necessary to use other people's technology platforms (Venkatesh et al., 2012). The study of Chen et al. (2021), Ezennia and Marimuthu (2022) shows that

social influence impacts on the consumers' behavioral intention of using ECAs. Ha (2023) also found that social influence is the factor that has a positive impact on the consumers' behavioral intention of using ECAs. Hypothesis H3 is formed as follows:

Hypothesis 3 (H3). Vietnamese consumers' behavioral intention to use ECAs is positively affected by Social Influence.

Facilitating Conditions (FC) is presented as individuals' beliefs regarding the availability of sufficient resources for them to use technology (Venkatesh et al., 2012). Pobee (2021) found that facilitating conditions had a positive impact on the customers' behavioral intention and behavior of using ECAs. Rehman et al. (2022) and Ezennia and Marimuthu (2022) also revealed that customers' behavioral intention to use ECA is positively affected by facilitating conditions. The hypotheses were stated:

Hypothesis 4a (H4a): Vietnamese consumers' behavioral intention to use ECAs is positively affected by Facilitating Conditions.

Hypothesis 4b (H4b): Vietnamese consumers' behavioral of using ECAs is positively affected by Facilitating Conditions.

Hedonic motivation (HM) refers to the impact of a person's pleasure receptors on their motivation toward the goal of using technology, and it is described as a factor that influences users' technology adoption (Venkatesh et al., 2012). Hedonic motivation will positively influence the consumers' behavioral intention to use ECAs, and they will experience a sense of enjoyment when using ECAs (Ezennia and Marimuthu, 2022). The customers' behavior for buying decision on ECAs is influenced by hedonic motivation (Kamalia et al., 2022). Ha (2023) also showed that hedonic motivation has a positive impact on the consumers' behavioral intentionusing of ECAs. Hypothesis H5 is formed as follows:

Hypothesis 5 (H5). Vietnamese consumers' behavioral intention to use ECAs is positively affected by Hedonic motivation.

Price value (PV) is the factor by which customers can compare the costs incurred with the benefits of using technology and this is also the customer's perceived trade-off between costs and benefits received from technology application (Venkatesh et al., 2012). Uers tend to purchase online through ECAs and price value is the main concern as they believe in paying less and getting fair prices as well as other benefits (Singh et al., 2017). Hungilo and Setyohadi (2020) show that uers' purchase behavioral intentions through ECAs are significantly influenced by price value. The study of Ezennia and Marimuthu (2022) showed that price value affected uers' behavioral intention to use the ECAs. Hypothesis H6 is formed as follows:

Hypothesis 6 (H6). Vietnamese consumers' behavioral intention to use ECAs is positively affected by Price value.

Habits (HA) are an active frequency that has been repeated in a high degree due to the learning process of consumers who tend to adopt technology automatically (Venkatesh et al., 2012). Yoga and Triami (2021) indicated that consumers' use behavior for ECAs is significantly influenced by habits. ECAs usage habits have a positive effect on consumers' behavioral intentions, and these habits have a positive effect on their usage behavior (Wulandari et al., 2022). Setiyani et al. (2023) shows that customers' behavioral intentions to use ECAs are affected by habits. Hence, the hypotheses were stated:

Hypothesis 7a (H7a): Vietnamese consumers' behavioral intention to use ECAs is positively affected by Habits.

Hypothesis 7b (H7b): Vietnamese consumers' behavioral of using ECAs is positively affected by Habits.

Platform usability (PU), where usability is the terms that refers to talk about digital platforms, and platform usability makes users comfortable when they use a website, app, or basically any digital platform (Bragg, 2018). Consumers' behavior and intention in adopting e-commerce depends on the importance of this platform usability (Venkatesh and Bala, 2008). Website platform usability has a impact on consumers' behaviour and shopping intention (Bai et al., 2008). The study of Perdana and Suzianti (2017) shows that usability factors that directly affect customers' intentions on online e-commerce sites. By enhancing usability, the providers can better navigate the consumers' behavior and drive e-commerce platform adoption (Hossain et al., 2023). Hypothesis H8 is formed as follows:

Hypothesis 8a (H8a): Vietnamese consumers' behavioral intention to use ECAs is positively affected by Platform usability.

Hypothesis 8b (H8b): Vietnamese consumers' behavioral of using ECAs is positively affected by Platform usability.

User Autonomy (UA), according to De Charms (1968), user autonomy is experiencing freedom of choice and feeling free to perform user behavior. This is the ability to control a user's experience with technology without being manipulated or coerced by other parties. Kohler (2022) show that user autonomy is seen as users being completely free to choose and explore as they wish. Therefore, user autonomy is essential for sustainable technological development, as it respects the users' preferences, fosters trust, engagement and innovation. User autonomy has a positive impact on shopping decisions, and user power moderates the relationship between competence and shopping decisions (Fan and Liu, 2022). The findings of Ha (2023) indicate that user autonomy has a positive impact on behavioral intention and promotes the users' behavioral intention of using the ECAs. Hypothesis H9 is indicated as follows:

Hypothesis 9a (H9a): Vietnamese consumers' behavioral intention to use ECAs is positively affected by User autonomy.

Hypothesis 9b (H9b): Vietnamese consumers' behavioral of using ECAs is positively affected by User autonomy.

Behavioral intention (BI) is defined as a user's level of trust and willingness to adopt technology in the future, and it determines the users' technology use behavior (Venkatesh et al., 2012). Behavioral intention of using the technology and ECAs is significantly correlated with consumer use behavior (Ha and Nguyen, 2022). The study of Ha (2023) also shows that behavioral intention has a positive impact on consumer use behavior. Hypothesis H10 is indicated as follows:

Hypothesis 10 (H10): Vietnamese consumers' behavioral of using ECAs is positively affected by Behavioral intention.

3. Research methodology

3.1. Research design

Qualitative research is an approach to exploring, describing and explaining based on survey questionnaires the awareness, motivation, behavioral intention and behavior of using ECAs of consumers.

Quantitative research is often associated with testing to quantify, measure, reflect and interpret relationships between factors (variables). The data is of a statistical nature to obtain basic information for statistical purposes and analysis of data collected through surveys of consumers' behavioral intentions and behavior of using ECAs. This study uses AMOS software to conduct analysis steps and uses structural equation modeling (SEM) to meet research requirements.

3.2. Sample and data

Data is collected from ECAs users in Vietnam. The data collection was through a questionnaire sent directly to each customer. The selected customers were those who had used ECAs. With the purposive sampling method, with the purposive sampling method, the survey questionnaire has a 5-point Likert scale from 1 to 5 and in order to completely agree (level 5), strongly disagree (level 1). In which, the questionnaire describes user characteristics in part 1 and in part 2, it describes factors measuring the behavioral intention to accept and use ECAs in Vietnam.

The study used a number of samples surveyed in urban centers and large shopping centers in Vietnam. Therefore, these research samples can represent the majority of online shoppers in Vietnam.

A number of 750 samples were emitted and a number of 718 samples were collected from the interviewees. Based on the determination of the sample size of 5-10 multiplied by the question item, the actual sample number is guaranteed for this study.

4. Research results

4.1. Demographic statistics

The results of demographic statistics using SPSS 25.0 software show that the age of the interviewees ranged from 22 to 40 years old with the highest percentage at 47.22% and 49.03% of them were male. Surveying the experience of using ECAs shows that over 1–3 years accounts for the highest percentage of 37.47%. The majority of those interviewed had college degrees, 50.84%, and the rest had graduated from university and postgraduate degrees. The income level of the interviewees ranges from 800 USD to 1500 USD/month, which is the highest income level among the interviewees, as depicted in **Table 1**.

Table 1. Demographic profile.

Item	Optional	Frequency	Percentage
Age	22–40 years old	339	47.22
	41–60 years old	256	35.65
	60 years old and up	123	17.13
Gender	Male	352	49.03
	Female	366	50.97
Experience	Under 1 year	269	37.47
	Over 1–3 years	236	32.86
	Over 3 years	213	29.67
Education level	Graduated from college	365	50.84
	Graduated from university	333	46.37
	Postgraduate level	20	2.79
Income level	800–1500 USD/Month	539	75.07
	Over 1500–2500 USD/Month	154	21.45
	Over 2500 USD/Month	25	3.48

Source: Primary data, processed in 2023.

4.2. Cronbach's alpha reliability analysis

The results of Cronbach's Alpha coefficient analysis of the scales are all greater than 0.6 and the scale accepted in terms of reliability. At the same time, variables with a total correlation coefficient greater than 0.3 are considered suitable (Hulin et al., 2001). Therefore, all scales are eligible for EFA (Exploratory Factor Analysis) as described in **Table 2**.

Table 2. Independent, moderating and dependent variables in the research.

No.	Code	Observed variables	Corrected Item-Total Correlation
	PE	Cronbach's alpha = 0.879	
1	PE1	Using ECA helps me to buy goods online quickly anywhere.	0.732
2	PE2	Using ECA helps me to understand buying goods online more easily.	0.683
3	PE3	Using ECA meets my expectations for online shopping.	0.593
4	PE4	Using ECA allows me to buy goods online more seamlessly.	0.608
5	PE5	Using ECA is suitable for my work and effective in my daily activities.	0.637
6	PE6	Using ECA makes me more comfortable when shopping online.	0.795
7	PE7	Using ECA gives me the benefit of 24-hour online shopping.	0.614
	EE	Cronbach's alpha = 0.825	
8	EE1	Using ECA helps me save a lot of time during my online shopping transactions.	0.688
9	EE2	Using ECAs helps me buy many high-quality products.	0.523
10	EE3	Using an e-commerce platform helps me shop online more safely.	0.624
11	EE4	Using ECA helps me understand a lot of information about online goods purchasing.	0.576
12	EE5	Using ECAs helps me have enough information to shop online.	0.595
13	EE6	Using ECA helps me to enhance efficiency in online goods purchasing.	0.555

Table 2. (*Continued*).

No.	Code	Observed variables	Corrected Item-Total Correlation
	SI	Cronbach's alpha = 0.847	
14	SI1	My behavior of using ECAs in online goods purchasing is influenced by many influencers.	0.678
15	SI2	I was advised to use ECAs for online goods purchasing by many influencers.	0.608
16	SI3	I was advised to use an e-commerce platform for online goods purchasing by people familiar with me.	0.606
17	SI4	My behavior of using ECAs in online goods purchasing is influenced by my colleagues and friends.	0.615
18	SI5	I receive support for using ECAs for online goods purchasing from my family.	0.606
19	SI6	I received support for using ECAs for online goods purchasing from many people in my neighborhood.	0.675
	FC	Cronbach's alpha = 0.837	
20	FC1	I am given permission to control the use of ECAs for online goods purchasing.	0.682
21	FC2	I have knowledge of using ECAs for online goods purchasing.	0.592
22	FC3	I am guaranteed trading conditions when I use the ECAs.	0.619
23	FC4	I have all the necessary resources to buy online goods on ECAs.	0.608
24	FC5	My shopping is safe when I use ECAs.	0.608
25	FC6	I have smart devices and support from ECAs providers for online goods purchasing.	0.565
	HM	Cronbach's alpha = 0.819	
26	HM1	I feel comfortable online goods purchasing via ECAs.	0.546
27	HM2	I feel lucky to shop online through ECAs.	0.530
28	HM3	I find it interesting to shop online via ECAs.	0.675
29	HM4	I feel happy when online goods purchasing through ECAs.	0.578
30	HM5	I feel excited when online goods purchasing through ECAs.	0.732
	PV	Cronbach's alpha = 0.776	
31	PV1	Using ECAs helps me save time shopping online.	0.554
32	PV2	Using ECAs helps me save a lot of online shopping costs.	0.631
33	PV3	Using ECAs helps me pay the appropriate costs of internet subscriptions.	0.662
34	PV4	Using ECAs helps me avoid having to pay transaction check fees for online shopping.	0.515
35	PV5	Using ECA saves me from having to pay extra fees for any online transactions.	0.509
	HA	Cronbach's alpha = 0.674	
36	HA1	I often shop online via ECAs.	0.403
37	HA2	I can do my own online shopping via ECAs.	0.477
38	HA3	I have a habit of shopping online through ECAs.	0.496
39	HA4	When shopping online, I also receive transaction guidance from e-commerce platform providers.	0.490
40	HA5	When no one is simulating, I can still use ECAs to shop online.	0.494
	PU	Cronbach's alpha = 0.679	
41	PU1	I believe that ECAs always ensure efficiency for all users to shop online.	0.426
42	PU2	I find that ECAs platform always ensures accurate information verification when shopping online.	0.456

Table 2. (*Continued*).

No.	Code	Observed variables	Corrected Item-Total Correlation
	PU	Cronbach's alpha = 0.679	
43	PU3	I believe that ECAs are always secure when shopping online.	0.475
44	PU4	I believe that ECAs platform meets all the needs of online goods purchasing users.	0.478
45	PU5	I believe that my online shopping data is kept securely on ECAs.	0.485
46	PU6	My online goods purchasing is not subject to unauthorized access via using ECAs.	0.452
	UA	Cronbach's alpha = 0.654	
47	UA1	I believe that ECAs always ensure a variety of goods for selection when shopping online.	0.497
48	UA2	I find that ECAs always ensure freedom for online goods purchasing.	0.426
49	UA3	I believe that ECAs always ensure online shopping according to users' wishes.	0.469
50	UA4	I believe that ECAs always respect the preferences of online shopping users.	0.464
51	UA5	I believe that ECAs promote the need for users to shop online.	0.436
52	UA6	My online shopping is not manipulated or coerced by other parties through the use of ECAs.	0.424
	BI	Cronbach's alpha = 0.765	
53	BI1	My online goods purchasing will continue via ECAs.	0.599
54	BI2	When I need to buy goods, I will use ECAs.	0.587
55	BI3	I would recommend others to shop online via ECAs.	0.611
	UB	Cronbach's alpha = 0.692	
56	UB1	When I have difficulty using an e-commerce platform, certain people and communities will help me shop online.	0.479
57	UB2	I may not need help from others when shopping online via ECAs.	0.521
58	UB3	Although I have never used an e-commerce platform, I can use it for online shopping.	0.522

Source: Authors' suggestions.

4.3. Exploratory factor analysis

The results of the Kaiser-Meyer-Olkin (KMO) and Bartlett tests for independent variables show that the KMO coefficient is 0.813, reaching a value of 0.5 or more ($0.5 \leq KMO \leq 1$), so EFA is suitable for the research data set. Sig. = $0.000 \leq 0.05$ proves that the observed variables are correlated with each other on the whole. Performing varimax rotation (absolute value below: 0.3) shows that 52 observed variables are divided into 12 groups. The total variance value extracted is 60.328%. These 12 factors explain 60.328% of the variability of the data. The 12th factor with the lowest Eigenvalue is 1100 > 1, as depicted in **Table 3**.

Table 3. Exploratory factor analysis for independent variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	Cumulative %
1	6.891	13.253	13.253	6.891	13.253	13.253	4.122	7.928
2	3.633	6.986	20.238	3.633	6.986	20.238	3.541	14.738
3	3.249	6.248	26.486	3.249	6.248	26.486	3.377	21.233

Table 3. (*Continued*).

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	Cumulative %
4	2.801	5.386	31.873	2.801	5.386	31.873	3.324	27.624
5	2.635	5.067	36.940	2.635	5.067	36.940	3.006	33.404
6	2.563	4.929	41.869	2.563	4.929	41.869	2.748	38.689
7	2.401	4.618	46.487	2.401	4.618	46.487	2.336	43.182
8	2.064	3.969	50.456	2.064	3.969	50.456	2.308	47.621
9	1.636	3.146	53.602	1.636	3.146	53.602	2.120	51.697
10	1.262	2.427	56.030	1.262	2.427	56.030	1.503	54.588
11	1.135	2.182	58.212	1.135	2.182	58.212	1.494	57.461
12	1.100	2.116	60.328	1.100	2.116	60.328	1.490	60.328
13	0.991	1.905	62.233					

Source: Calculation from SPSS 25.0.

After performing the rotation, the factor loadings were all greater than 0.5 and there were 3 new factors (HA1 and HA2; PU5 and PU6; UA5 and UA6). HA1 and HA2 are associated with the user's proficiency in using ECAs, so they are called Proficient Use (UP). The UP hypothesis is stated similarly to the HA hypothesis. PU5 and PU6 are associated with the user's ease of using ECAs, so they are called Easy Level (EL). The EL hypothesis is stated similarly to the PU hypothesis. At the same time, UA5 and UA6 are associated with the user's skill in using ECAs, so they are named User Skills (US). The US hypothesis is stated similarly to the UA hypothesis, as depicted in **Table 4**.

Table 4. Rotated component matrix for independent variables.

Variables	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
PE6	0.829											
PE1	0.774											
PE7	0.735											
PE3	0.708											
PE2	0.706											
PE5	0.696											
PE4	0.643											
SI6		0.778										
SI1		0.747										
SI3		0.697										
SI4		0.697										
SI2		0.687										
SI5		0.664										
FC1			0.792									

Table 4. (*Continued*).

Variables	Component											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
FC3			0.745									
FC5			0.729									
FC2			0.717									
FC4			0.714									
FC6			0.694									
EE1				0.801								
EE3				0.762								
EE5				0.717								
EE6				0.707								
EE4				0.699								
EE2				0.621								
HM5					0.856							
HM3					0.817							
HM4					0.728							
HM1					0.696							
HM2					0.685							
PV3						0.814						
PV2						0.777						
PV1						0.729						
PV5						0.686						
PV4						0.598						
UA2							0.768					
UA4							0.744					
UA3							0.739					
UA1							0.670					
PU2								0.774				
PU3								0.750				
PU4								0.743				
PU1								0.653				
HA5									0.832			
HA4									0.818			
HA3									0.734			
HA1										0.800		
HA2										0.767		
PU6											0.815	
PU5											0.798	
UA6												0.783
UA5												0.769

Source: Calculation from SPSS 25.0

The results of KMO and Bartlett tests for dependent variables show that the KMO coefficient is 0.873, reaching a value of 0.5 or more ($0.5 \leq KMO \leq 1$), so EFA is suitable for the research data set. Sig. = $0.000 \leq 0.05$ proves that the observed variables are correlated with each other on the whole. Performing varimax rotation (absolute value below: 0.3) shows that 6 observed variables are divided into 2 groups. The total variance value extracted is 65.088%. These 2 factors explain 65.088% of the variability of the data. The 2nd factor with the lowest Eigenvalue is 1637 > 1, as depicted in **Table 5**.

Table 5. Exploratory factor analysis for dependent variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	Cumulative %
1	2.269	37.809	37.809	2.269	37.809	37.809	2.046	34.095
2	1.637	27.279	65.088	1.637	27.279	65.088	1.860	65.088
3	0.652	10.869	75.958					

Source: The authors' calculation from SPSS 25.0.

After performing the rotation, the factor loadings were all greater than 0.5 and two factors were found as can be shown in **Table 6**.

Table 6. Rotated component matrix for dependent variables.

Variable	Component	
	1	2
BI3	0.834	
BI1	0.819	
BI2	0.814	
UB3		0.802
UB2		0.788
UB1		0.762

Source: Calculation from SPSS 25.0.

4.4. Confirmatory factor analysis

The KMO coefficient is 0.808 (greater than 0.5) and Sig = 0.000 < 0.05, showing that the CFA results are consistent with research data. At the same time, perform a promax rotation with a number of observations of 718 as well as the links e1 and e3, e4 and e5, e4 and e6, e8 and e10, e11 and e12, e15 and e18, e17 and e19, e26 and e28 , e27 and e28, e28 and e30, e29 and e30, e34 and e35, e38 and e39, e42 and e43 to correct covariance shows that this model has Chi-square = 2805.054, with 1493 degrees of freedom (df) ; Chi-square/df = 1.879 < 3 with *p*-value = 0.000 and other criteria are met such as CFI = 0.908 (Hair et al., 2010); GFI = 0.884 (Byrne and Campbell, 1999) and Kline (2011); TLI = 0.898 (Malekmohammadi, 2013); RMSEA = 0.035 < 0.06 (Hu and Bentler, 1999); PCLOSE = 1000 > 0.05. The total variance value is greater than 0.5 and the unstandardized and standardized coefficients are greater than 0.5 (Hu and Bentler, 1999). Therefore, the model perfectly fits the data in this study, as depicted in **Figure 2.**

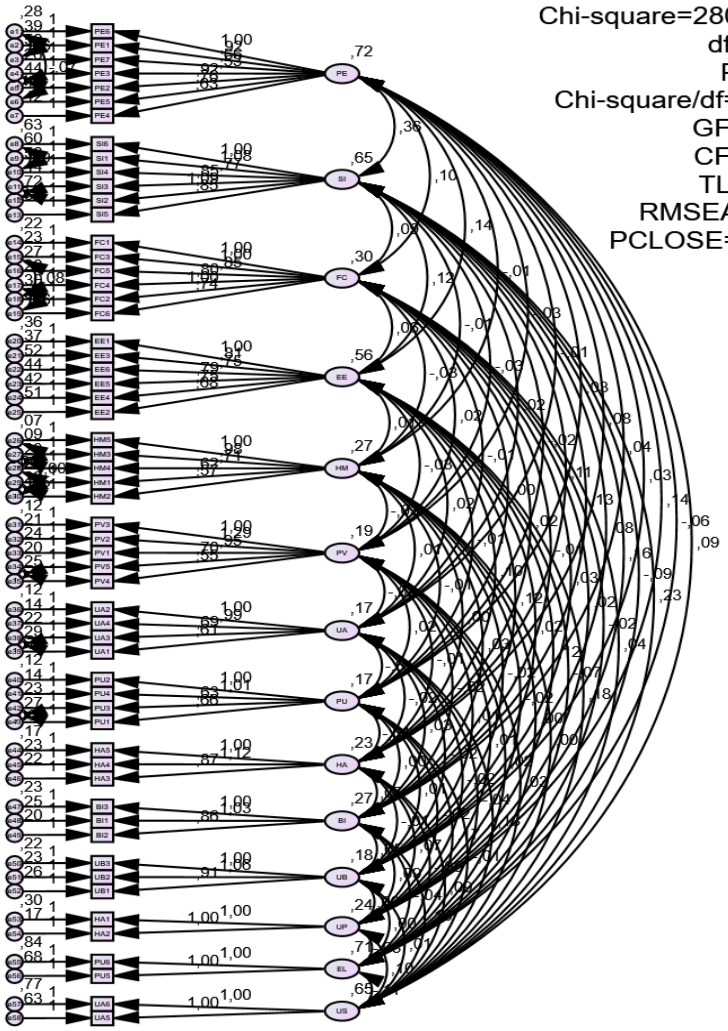

Figure 2. Confirmatory factor analysis.

Source: Calculation from AMOS 24.0

4.5. Structural equation modeling

The results of this research model are even more consistent after SEM analysis through the Chi square index = 2827.495; df = 1498; $p = 0.000$; Chi square/df = 1.888; TLI = 0.897; CFI = 0.907; GFI = 0.883; RMSEA = 0.035; PCLOSE = 1000. This research model achieves compatibility with the research data as depicted in **Figure 3**.

The results of regression weights and standardized regression weights show that BI is positively affected by EE, SI, HM, UP and US with *p*-values of 0.006; 0.000; 0.002; 0.000; 0.003 respectively. While BI is negatively affected by PE with *P* value of 0.005. At the same time, UB is positively affected by FC and BI with *P* values of 0.006 and 0.000 respectively. While UB is negatively affected by UA with *P* value of 0.002 as shown in **Table 7**.

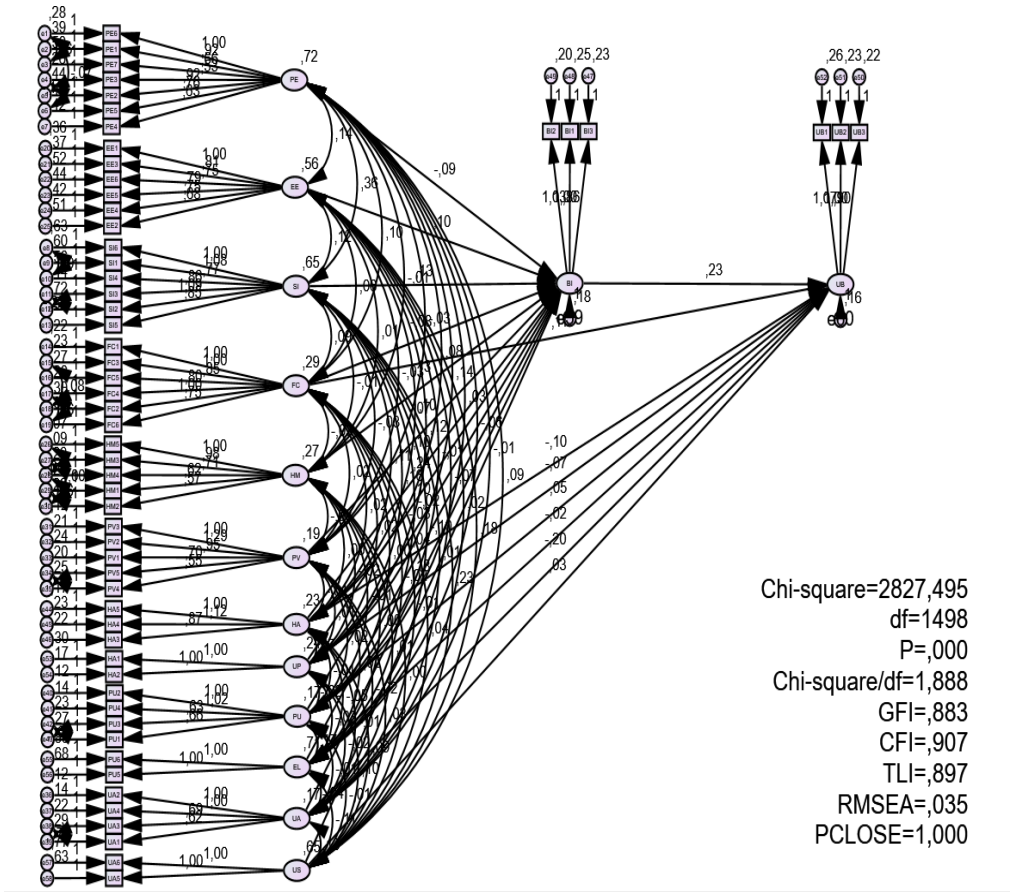

Figure 3. Structural equation modeling.

Source: Calculation from AMOS 24.0.

Table 7. Regression weights and standardized regression weights.

			Unstandardized Coefficients				Standardized Coefficients
			Estimate	**S.E.**	**C.R.**	***P value***	**Estimate**
BI	←	PE	−0.093	0.033	−20.838	0.005	−0.153
BI	←	EE	0.096	0.035	20.743	0.006	0.139
BI	←	SI	0.133	0.039	30.449	***	0.208
BI	←	FC	−0.080	0.042	−10.896	0.058	−0.084
BI	←	HM	0.127	0.042	30.052	0.002	0.128
BI	←	PV	−0.072	0.056	−10.290	0.197	−0.061
BI	←	HA	0.099	0.054	10.833	0.067	0.093
BI	←	UP	0.241	0.066	30.637	***	0.228
BI	←	PU	0.096	0.071	10.353	0.176	0.077
BI	←	EL	−0.026	0.037	−0.700	0.484	−0.043
BI	←	UA	0.035	0.071	0.495	0.621	0.028
BI	←	US	0.134	0.045	20.976	0.003	0.210
UB	←	FC	0.107	0.039	20.772	0.006	0.136
UB	←	HA	−0.096	0.050	−10.904	0.057	−0.108
UB	←	BI	0.233	0.053	40.369	***	0.281

Table 7. (*Continued*).

			Unstandardized Coefficients				Standardized Coefficients
			Estimate	**S.E.**	**C.R.**	***P value***	**Estimate**
UB	←	UP	−0.074	0.056	−10.309	0.191	−0.084
UB	←	PU	0.046	0.064	0.717	0.473	0.045
UB	←	EL	−0.020	0.035	−0.570	0.569	−0.039
UB	←	UA	−0.202	0.067	−30.030	0.002	−0.195
UB	←	US	0.028	0.040	0.708	0.479	0.053

Source: Authors'calculation.

Implementation of Bootstrap method and repeated sampling of N = 1200 was used to estimate summary statistics and gave reliable results with C.R < 1.96 deducing p-value > 5% as can be shown in **Table 8**.

Table 8. Bootstrap method on SEM.

Parameter			SE	SE−SE	Mean	Bias	SE−Bias	C.R = Bias/SE−Bias
BI	←	PE	0.039	0.001	−0.095	−0.001	0.001	−1.0
BI	←	EE	0.043	0.001	0.095	−0.001	0.001	−1.0
BI	←	SI	0.048	0.001	0.135	0.001	0.001	1.0
BI	←	FC	0.047	0.001	−0.080	0.000	0.001	0
BI	←	HM	0.044	0.001	0.129	0.001	0.001	1.0
BI	←	PV	0.056	0.001	−0.073	−0.001	0.001	−1.0
BI	←	HA	0.055	0.001	0.099	0.000	0.001	0
BI	←	UP	0.077	0.001	0.243	0.001	0.002	0.5
BI	←	PU	0.078	0.001	0.099	0.003	0.002	1.5
BI	←	EL	0.041	0.001	−0.027	0.000	0.001	0
BI	←	UA	0.080	0.001	0.033	−0.002	0.002	1.0
BI	←	US	0.055	0.001	0.137	0.003	0.001	1.5
UB	←	FC	0.039	0.001	0.107	0.000	0.001	0
UB	←	HA	0.055	0.001	−0.097	−0.001	0.001	−1.0
UB	←	BI	0.058	0.001	0.234	0.001	0.001	1.0
UB	←	UP	0.067	0.001	−0.076	−0.003	0.002	−1.5
UB	←	PU	0.072	0.001	0.047	0.001	0.002	0.5
UB	←	EL	0.040	0.001	−0.020	0.000	0.001	0
UB	←	UA	0.077	0.001	−0.212	−0.001	0.002	−0.5
UB	←	US	0.051	0.001	0.032	0.001	0.001	1.0

Source: Calculation from AMOS 24.0.

5. Discussions

5.1. Factors influencing behavioral intention

Vietnamese consumers' behavioral intention to use ECAs is negatively influenced by Performance Expectations. This finding is not consistent with the hypotheses according to the study of Venkatesh et al. (2012), Cabrera-Sánchez et al.

(2020), Chatsirichai et al. (2022), Ezennia and Marimuthu (2022). This result is because e-commerce regulations in Vietnam still need to be amended, supplemented and completed. Distribution and retail networks remain the major challenges for e-commerce service providers, which has influenced the use of ECAs by Vietnamese consumers.

Vietnamese consumers' behavioral intention to use ECAs is positively influenced by Effort Expectancy. These findings are related and consistent with the studies of Venkatesh et al. (2012), Hungilo and Setyohadi (2020), Chatsirichai et al. (2022), Ezennia and Marimuthu (2022), Ha (2023). These results show that consumers' clear understanding of using ECAs can improve product quality and positively impact customers' behavioral intentions.

Social influence and behavioral intention to use ECAs of Vietnamese consumers are related to each other. This result coincides with the studies conducted by researchers Venkatesh et al. (2012), Chen et al. (2021), Ezennia and Marimuthu (2022), Ha (2023). This shows that consumers pay great attention to the recommendations and motivations of friends, colleagues, family and neighbors in forming behavioral intention to use ECAs.

Vietnamese consumers' behavioral intention to use ECAs is positively affected by Hedonic Motivation. This result is compatible with the findings of Venkatesh et al. (2012), Ezennia and Marimuthu (2022), Kamalia et al. (2022), Ha (2023). This reflects that customers feel comfortable, excited, lucky and happy when using ECAs, which can motivate Vietnamese customers to have behavioral intention to use ECAs.

Proficient use and behavioral intention to use ECAs of Vietnamese consumers are also related to each other. ECAs include many different structures and software to carry out processes for customers' online shopping. Therefore, proficient use of ECAs can motivate Vietnamese customers to increase their behavioral intention in using ECAs.

User skills have a positive impact on the behavioral intention of using the ECAs by Vietnamese consumers. This is similar to the proposed hypotheses. User skills for using ECAs, such as understanding the e-commerce landscape, product selection, transaction security compliance, etc. This suggests that these skills will contribute to a heightened sense of behavioral intention and help users meet their online shopping needs.

5.2. Factors influencing use behavioral

Vietnamese consumers' behavior in using ECAs is positively influenced by Favorable Conditions. This finding is not consistent with the hypotheses according to the study of Venkatesh et al. (2012), Pobee (2021). This shows that consumers have many technical knowledge and resources, installation and internet data connection and other favorable conditions, which will contribute to motivating Vietnamese consumers to increase their behavior in using ECAs.

Behavioral intention and ECAs usage behavior of Vietnamese consumers have a complementary relationship. These results coincide with studies conducted by researchers by Venkatesh et al. (2012), Ha (2023), Ha and Nguyen (2022). This describes appropriate behavioral intentions that influence Vietnamese consumers'

behavior in using ECAs. The more consumers' behavioral intention is always towards using ECAs, the greater their behavior towards using ECAs.

The consumers' behavior of using ECAs is negatively influenced by User Autonomy. This result is not compatible with study conducted by Fan and Liu (2022), Ha (2023). This indicates that the trend of online shopping through ECAs is gradually becoming a popular trend in Vietnam. However, some consumers need time to get used to business transactions via ECAs for online shopping to proactively approach and prefer online shopping.

6. Conclusions and recommendations

The UTAUT2 model has been inherited and supplemented with other related consumer structures such as Platform Usability, User Autonomy to objectively consider the intention and behavior of using ECAs in consumers' online purchasing in Vietnam. This study shows that Behavioral Intention are positively influenced by Social Influence, Use Proficiently, Hedonic Motivation, User Skills, Effort Expectancy. While Behavioral Intention is negatively affected by Performance Expectancy. Behavioral Intentions and Favorable Conditions have a positive impact on Use Behavior, and User Autonomy has a negative impact on Use Behavior in Vietnam.

The addition of other factors such as Platform Usability, User Autonomy to determine the behavioral intentions and behaviors of online shoppers using ECAs in Vietnam is one of the novel contributions of this study. From the newly proposed research model, in addition to the factors that affect Behavioral Intention similar to previous studies, including Social Influence, Hedonic Motivation, Effort Expectancy, Performance Expectancy, as well as the factors that affect Usage Behavior consistent with previous studies such as Behavioral Intention and Facilitating Conditions, there are also new factors compared to previous studies such as Proficiency, User Skills affecting Behavioral Intention. In addition, the factor User Autonomy negatively affects Use Behavior, which is also a finding consistent with the research context in Vietnam.

These results have some recommendations. It is proposed to stakeholders, to help managers and the providers of ECAs by online shopping identify factors that affect the use of ECAs through consumers' online shopping by Vietnamese as follows:

- Behavioral intentions to use ECAs were positively influenced by social influence. Therefore, ECAs providers need to implement marketing campaigns, promote brand building and professional customer care and employ public influencers, etc. Investing in after-sales activities will play an important role in attracting more new customers from positive reviews from loyal customers and influencers. ECAs are more widely known and used and attract a larger customer base.
- ECAs provider increase customer purchase intention by providing accurate and complete information about the product, location, and delivery time to customers. Suppliers should improve and develop highly compatible ECAs with friendly interfaces, helping customers find products that best suit their needs and contributing to increased trust. of customers when shopping online.

- ECAs provider and managers should pay attention to customers' behavioral intention to use ECAs is affected by hedonic motivation. Suppliers need to perfect their information technology infrastructure to meet all consumer needs, helping customers feel comfortable and happy when using ECAs for online shopping. Suppliers should also clearly understand consumers' needs to provide timely customer care, thereby increasing customers' behavioral intention to use ECAs more and more.
- ECAs provider should create conditions for customers to proficiently use and promote the platform usability. Through connecting with available means from smart devices as well as fully installing information, technology, and techniques to ensure adaptation, it will promote the behaviour intention using ECAs to customers' online purchasing.
- User autonomy plays an important role in behavioral intention to use ECAs. Therefore, ECAs providers need to improve shopping transactions as well as innovate and make efforts to increase user autonomy. Suppliers help users choose products easier and more effectively, contributing to enhancing users' sense of autonomy and improving their behavioral awareness of using ECAs in Vietnam.
- ECAs provider need to improve their ECAs, focusing on information to diversify products and services, ensuring online transactions at reasonable prices. These are the best ways for suppliers to meet customer needs, enhance behavioral intention, and contribute to promoting customers' ECAs use behavior in Vietnam.

The main contributions to this study are the new research model, which is the UTAUT2 model integrated with Platform Usability, User Autonomy. The research results have discovered many new factors such as Proficiency, User Skills, User Autonomy that have an influence on the model. The new research model and the new factor findings help to expand the theoretical basis for further research. In addition, this research result also makes an important contribution to practical applications, such as ECAs providers need to implement marketing campaigns, promote branding and professional customer care, improve and develop highly compatible ECAs with a friendly interface, help customers find the most suitable products, improve their information technology infrastructure to meet all consumer needs, create conditions for customers to use proficiently and promote platform usability, etc.

The results of this study contribute to a broader theoretical understanding of e-commerce adoption and technology acceptance from the new research model, reveal some new factors to the theoretical model, as well as contribute to e-commerce adoption and technology acceptance through recommendations from the research results.

However, this study has some limitations, such as not studying the behavioral intentions and behaviors of customers who are not only individuals but also online shopping organizations using ECAs in Vietnam, as well as adding many other factors to the model. In the future, this study will be expanded to study the behavioral intentions and behaviors of customers who are online shopping organizations using ECAs in Vietnam. At the same time, the study will add many new factors suitable for the research context related to e-commerce development in Vietnam.

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