



Applying e-commerce by Vietnamese SMEs: A critical analysis

Dang Thai Binh¹

Ho Thi Hoa²

Pham Van Hieu³

Bui Van Can⁴

Do Hai Hung⁵

Nguyen Huu
Phuoc Dai^{6,7+}

¹Institute for Indian and Southwest Asian Studies, Vietnam Academy of Social Sciences, Vietnam.

²Email: dangthaibinh1985@gmail.com

³Academy of Finance, Vietnam.

⁴Email: Hothihoa@hvtc.edu.vn

^{5,6}Hanoi University of Business and Technology, Vietnam.

⁷Email: hieukinh836@gmail.com

⁸Email: burvancan03@gmail.com

⁹Hanoi University of Industry, Vietnam.

¹⁰Email: dohaihung@hau.edu.vn

¹¹Doctoral School on Safety and Security Sciences, Óbuda University, Hungary

¹²Can Tho Technical Economics College, Vietnam.

¹³Email: phuocdaitt@gmail.com



(+ Corresponding author)

ABSTRACT

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Small and medium-sized enterprises (SMEs) play a crucial role in many countries' economic growth and development, particularly in Vietnam. Vietnamese SMEs have been instrumental in creating job opportunities, especially for low-skilled laborers, and are increasingly contributing to the stability and progress of the national economy. However, the rise of globalization and the integration of economies at the international and regional levels have exposed SMEs to severe local and global competition. To sustain and develop their essential role in the face of rising competition, SMEs must innovate and adopt new technologies, with e-commerce being one of the essential solutions. The integration of e-commerce within Vietnamese Small and medium-sized enterprises (SMEs) has posed a significant challenge, making it crucial to identify the key factors that impact its implementation. A quantitative method was used to determine the four factors (Technology, Organizational, Environmental, and Management) influencing the adoption of e-commerce by Vietnamese SMEs. The study found that technology has the most significant impact on the adoption of e-commerce by Vietnamese SMEs, followed by organizational, management, and environmental factors. Technology is considered the most critical factor because e-commerce is primarily a technological solution, and SMEs need to invest in advanced technologies to keep up with their competitors.

Contribution/Originality: This research identifies the critical factors that influence the adoption of e-commerce by Vietnamese SMEs. While previous research in Vietnam has highlighted the importance of e-commerce for SMEs, this study's quantitative method provides a more nuanced understanding of the specific factors that affect its adoption.

1. INTRODUCTION

E-commerce has grown enormously and has become a business trend worldwide (Kshetri & Dholakia, 2002; Nair, 2017). Applying e-commerce helps businesses achieve their goals, and E-commerce also provides a broader market for companies. E-commerce offers various information related to products, prices, models, and other utilities. In addition, e-commerce brings many advantages to SMEs, such as reducing production, management, and

transaction costs and saving time (Nguyen & Dang, 2017; Rahayu & Day, 2015). Besides, e-commerce provides direct links between customers, sellers, and distributors, facilitating business through convenient information transfer, especially since e-commerce brings logistical value to customers (Kawa & Światowiec-Szczepańska, 2021; Kaynak, Tatoglu, & Kula, 2005). Its characteristics made its use exponential.

Due to technological advantage, mobile technology, and globalization, software facilities, and web page formation have become cost-effective and easy to use. E-commerce has long been recognized as a critical tool to gain information and communication technology (ICT) to enhance social and economic development (Esselaar & Miller, 2001; Gbadegeshin et al., 2019; Santoleri, 2015) and to help in the eradication of poverty (Chao, Biao, & Zhang, 2021; Kareen, Purwandari, Wilarso, & Pratama, 2018; Oreku, Mtenzi, & Ali, 2013). The government has to provide incentives and industrial partners, and the researcher should encourage SMEs to adopt new ICTs like E-commerce, which helps them be competitive in the market and more sustainable (Ashrafi & Murtaza, 2008). Small organizations (SMEs), which have small capacities in finance, capital, and market accessibility, have the facility to connect with the world of opportunity. However, environmental, technical, managerial, and organizational factors usually affect e-commerce adoption. Environmental factors that restrict SMEs from adopting e-commerce and institutionalizing it include market readiness, institutional readiness, and industry and financial institution support for e-commerce (Ahmad, Abu Bakar, Faziharudean, & Mohamad Zaki, 2015; Kabanda & Brown, 2017; Molla & Licker, 2005). Technical barriers like Internet security, legal and regulatory barriers, and limited use of Internet banking are obstacles (Nazir & Roomi, 2020; Ndyali, 2013). A web page can provide a national and international presence (Karakaya & Karakaya, 1998; Singh, Toy, & Wright, 2009). E-commerce has contributed to a remarkable shift in consumer spending from traditional physical retail in the neighborhood to online vendors (OECD, 2020). The organizations (SMEs) studied successfully competed in their traditional market segments but reported additional benefits after adopting e-commerce. It examines the perspectives of firms that have been using e-commerce for at least the previous 4-5 years and their assessments of the advantages of e-commerce on both an operational and strategic level. This would illuminate the motives for embracing e-commerce in conventional brick-and-mortar businesses and allow for re-evaluating those motivations.

The private sector, of which the majority are SMEs, is considered the driving force of Vietnam's economy (Vu Hung, 2016). However, Vietnamese SMEs are increasingly facing many difficulties and challenges, especially the change in models and ways of production and business due to the boosting of information technology and the development of the industrial era. E-commerce plays a crucial role in fostering the growth of SMEs in Vietnam. For SMEs to thrive and flourish, they must efficiently invest and use resources. However, the application of e-commerce by SMEs is still at a low level and faces many difficulties and challenges that hinder their growth. Therefore, this paper focuses mainly on exploring the factors affecting the adoption of e-commerce by Vietnamese SMEs. On that basis, the authors propose some solutions to promote the effective application of e-commerce by small Vietnamese businesses.

2. THEORETICAL FRAMEWORK

In this context, an international perspective on E-commerce is adopted, i.e., it is about not only buying and selling on the Internet but also customer service, collaborating with business partners, and conducting business internally within the organization (Efrain, David, Jae, Merrill, & Michael, 2002). This description facilitates the identification of three distinct levels of e-commerce. (i) Intra-organizational electronic commerce, also known as e-commerce conducted within a company, primarily involves the utilization of the Internet and internal email systems. (ii) Inter-organizational business, referring to business activities carried out with other organizations, predominantly relies on the use of extranets. Lastly, the third stakeholder in the business-customer relationship is the general public, as the Internet serves as a public network accessible to all individuals. Lawrence and Brodman (2000) described e-commerce as a collection of networks using the same concept. The intranet is exclusive to the

company; the extranet is also exclusive to business partners; and the Internet is a public and worldwide network available to everyone. In particular, Tornatzky, Fleischer, and Chakrabarti (1990) built the Technology, Organization, and Environment (TOE) Framework to study the adoption of technological advancement. TOE is the basic foundation for applying technical advantages such as e-commerce. Based on the TOE research framework of Tornatzky et al. (1990), which included three factors, Van Huy, Rowe, Truex, and Huynh (2012) added the Managerial factor influencing the adoption of e-commerce. Their observation is that the adoption of e-commerce has four aspects.

- a. Technological aspect: The existing and emerging technologies relevant to the firm.
- b. Organizational aspects: Firm, size, scope, managerial structure, and internal resources.
- c. Environmental aspect: Area in which an organization conducts business, industry, competitors, and government policies.
- d. Managerial factors: Reduce costs; level of risk tolerance; attitudes towards innovation and creativity; knowledge.

3. THE BENEFITS OF E-COMMERCE

The literature shows a broad spectrum of different motivators and advantages for e-commerce. Maloff identified four areas or categories of benefit (Maloff, 1996). The first category concerns benefits from reducing external and internal communication expenses, e.g., speeding up business processes and reducing administrative tasks. The second element is revenue, which might come from existing companies or new projects. The third benefit is concrete, such as lower expenses and more flexible working habits, while the fourth is intangible, such as more robust competitive positioning and customer connections. Other research discovered some of the same advantages and some new ones. For example, an analysis of three organizations (Dell, Cisco, and FedEx) noted decreased sales and marketing expenditures, lower service and support costs, and stronger customer connections (Currie, 2000). A list of 33 motivators and benefits tested in a survey was produced using factor analysis of the 33 benefits (Lederer, Mirchandani, & Sims, 1996). Moreover, they made lists of critical themes: Information, Cost savings, Competitiveness, productivity, Control, and New applications. This list was utilized by Zhuang and Lederer (2003) to quantify the commercial advantages of e-commerce in the retail sector, indicating some distinct extra benefits peculiar to that industry.

4. RESEARCH METHODOLOGY

4.1. Research Model

This study examines the adoption of e-commerce in Vietnamese SMEs, drawing on the TOE framework proposed by Tornatzky et al. (1990) and the research conducted by Van Huy et al. (2012). The findings of this paper indicate that the adoption of e-commerce in Vietnamese SMEs is influenced by key factors such as technological, organisational, managerial, and environmental variables.

Technological Factors: In the context of constantly changing and developing technology, when applying e-commerce to business activities, businesses will first pay attention to the values that e-commerce brings. Next, companies are interested in the compatibility of e-commerce technology and the cost of applying e-commerce to their business activities. According to the studies by Evelina (2022); Cui, Mou, Cohen, and Liu (2019); Rahayu and Day (2015); and Oliveira and Martins (2010), the benefit of applying e-commerce to businesses is the recognition of its advantages. Thereby helping companies effectively manage resources through e-commerce and allocate resources for using e-commerce technology (Iacovou, Benbasat, & Dexter, 1995; Ordanini & Rubera, 2010; Sutanonpaiboon & Pearson, 2006). In addition, the compatibility of e-commerce technology with infrastructure, corporate culture, and processes will bring high efficiency in the application of e-commerce (Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Kurnia, Choudrie, Mahbubur, & Alzougool, 2015; Park & Kim, 2020). Moreover,

the quality of technology applied to e-commerce will have long-term benefits, determining the competitiveness and growth of enterprises in the industry (Pontikakis, Lin, & Demirbas, 2006).

Organizational Factor: Like the technology factor, the organization is an essential factor with business characteristics that affect the application of e-commerce. These characteristics are the readiness of technology, such as infrastructure and technology resources, to help the application of e-commerce achieve high efficiency. Technology readiness is related to how the technological infrastructure, relevant systems, and technical business skills can support e-commerce adoption (Nurlinda et al., 2020; Rahayu & Day, 2015; Zhu, Kraemer, & Xu, 2006). Technological readiness refers to specialized infrastructure and human resources (Zhu & Kraemer, 2005). This prerequisite is essential for e-commerce applications and achieving a competitive advantage. The other factors that affect adoption are lack of management support, SMEs' low adoption of online banking and web portals due to organizational reluctance to change, etc. (Hussain, Shahzad, & Hassan, 2020; Zaied, 2012).

Environmental Factor: Environmental factors are external influences on enterprises' adoption of e-commerce, such as government policies, the macroeconomic environment, infrastructure, or competitive pressures in the industry (Adam & Alarifi, 2021; Anuj, Fayaz, & Kapoor, 2018; Duan, Deng, & Corbitt, 2012; Zhu, 2004; Zhu & Kraemer, 2005). Therefore, businesses are forced to apply technologies that bring many benefits and competitive advantages, such as e-commerce.

Managerial Factor: In Vietnam, like in other developing nations, the management or owner of a small business makes a strategic choice. Therefore, the company owner heavily influences the decision to use e-commerce technology. Furthermore, because SMEs are structured to function in a specific field, owners and managers play a critical role in decision-making (Awiagah, Kang, & Lim, 2016; Nguyen & Waring, 2013). Therefore, the level of risk tolerance, the attitude towards innovation, and the managers' creativity will significantly affect enterprises' adoption of e-commerce (Lestari, 2019; Van Huy et al., 2012). Besides, applying new technologies such as e-commerce will only be possible with organizational knowledge, especially managers' technology (Badamas, 2009; Xin, Miao, Chen, & Shang, 2022). Furthermore, cost reduction is essential for SMEs in the face of ever-increasing competition. Therefore, in management activities, cutting costs through valuable tools such as e-commerce has always interested SMEs managers (Sedighi, Sirang, & Azerbaijan, 2018).

This study identifies technological, organizational, environmental, and managerial factors influencing the adoption of e-commerce Figure 1.

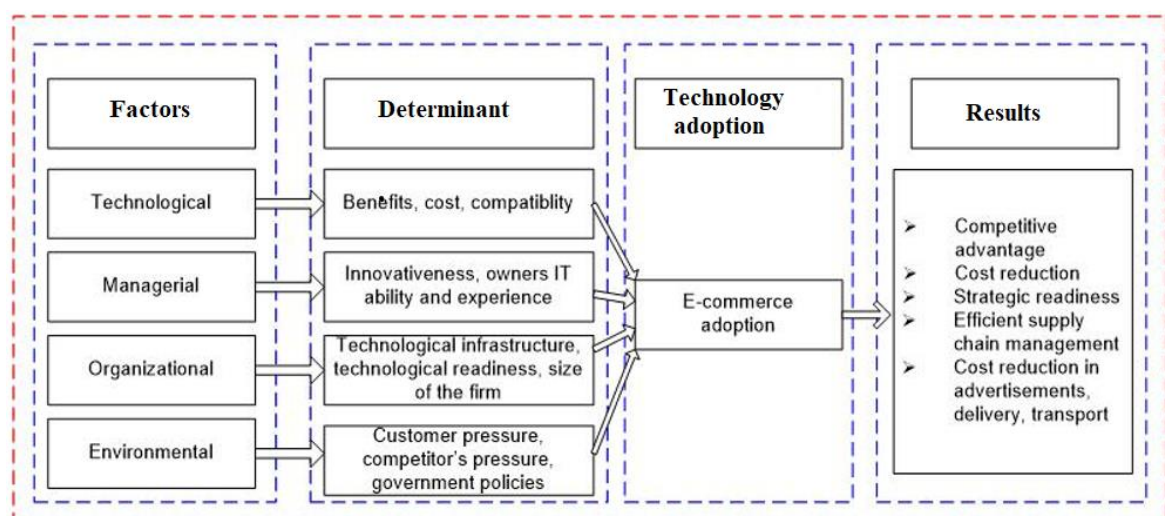


Figure 1. Factors determinant technology result adoption.

The indicated research method involved a survey of Chief Executive Officers (CEOs) or managers among SMEs in Vietnam to investigate the impact of factors in adopting e-commerce.

Based on the research framework above, the research hypothesis is set up as follows:

Hypothesis H1: Technological factors positively affect the application of e-commerce by Vietnamese SMEs.

Hypothesis H2: Managerial has a positive influence on the application of e-commerce by Vietnamese SMEs.

Hypothesis H3: Organizational factors positively affect the application of e-commerce by Vietnamese SMEs.

Hypothesis H4: Environmental factors have a positive influence on the application of e-commerce by Vietnamese SMEs.

4.2. Questionnaire and Data Collection

The research team mainly relied on the research model constructed above to build the questionnaire for this study. First, in-depth interviews were conducted by the research team with some managers at SMEs and e-commerce experts to get a complete questionnaire. Questionnaires were designed to cover all the factors and target small-scale enterprises. Then, the questionnaire was distributed to the respondent to assess how all four factors influenced the adoption of e-commerce in the organization. In addition, however, some questionnaires were distributed personally. The survey collected data conveniently from CEOs or managers of SMEs in three cities representing three regions of North, Central, and South Vietnam.

The questionnaire used a Likert scale (1. Strongly disagree; 2. Disagree; 3. Normal; 4. Agree; 5. Strongly agree). The total number of questionnaires was issued to 715 SMEs, and after removing the inappropriate answers, the research team obtained 700 questionnaires.

4.3. Data Analysis

The information collected from the questionnaire will be encrypted and analyzed using SPSS 22.0 software. First, the author conducted a Cronbach's Alpha analysis to measure reliability. At the same time, the authors used Exploratory Factor Analysis (EFA) to test the unidirectional scales. Finally, the authors use multivariate regression to estimate the influence of four factors (Technology, Organizational, Environmental, and Management) on the application of e-commerce by Vietnamese SMEs.

5. RESEARCH RESULTS

5.1. Verify the Reliability of the Scale

The reliability of the scales in this study was checked through Cronbach's Alpha coefficient. Cronbach's Alpha coefficient for four groups of factors affecting the application of e-commerce is guaranteed to be greater than 0.6 (Appendix 1). At the same time, all observed variables in these four groups have a correlated total of greater than 0.4. Therefore, all the scales in this study are satisfactory for exploratory factor analysis.

According to the findings of the EFA, the value of KMO (Kaiser-Meyer-Olkin) is $0.884 > 0.6$. Moreover, Bartlett's test with the Sig is $0.00 < 0.05$. Therefore, factor analysis is compatible with the data from the investigation. Table 1 presents the results of EFA's factors and an evaluation of the reliability of the scale.

The value of Eigenvalues = $1.432 > 1$, which points out that the number of factors extracted is suitable. According to the research results, the total Variance Explained is 63.45%; therefore, the extracted factors can explain 63.45% of the observed variables.

5.2. Regression Analysis

The adjusted R Square for regression analysis is 0.673, indicating that independent variables can explain 67.3% of the dependent variable, "The application of e-commerce by Vietnamese SMEs." The value of $F = 360.497$ with the statistical significance Sig = $0,000 < 0.05$ was obtained from ANOVA results. It indicates relationships between independent and dependent variables, and the model used in this study ensures consistency.

Table 2 displays the results of multiple regressions. The research findings also show that the Sig value of all variables is 0.05, indicating that all hypotheses are accepted.

Table 1. The results of EFA's factors and evaluation of the reliability of the scale.

Factors	Factor loading			
	1	2	3	4
OR02	0.816			
OR05	0.793			
OR04	0.788			
OR01	0.773			
OR03	0.766			
MA03		0.785		
MA01		0.769		
MA04		0.746		
MA02		0.728		
TE02			0.811	
TE04			0.804	
TE01			0.781	
TE03			0.775	
EN06				0.811
EN05				0.793
EN01				0.627
EN02				0.626
EN03				0.592

The following is the regression model of factors influencing Vietnamese SMEs' e-commerce applications:

$$AD = 0.231 + 0.196*OR + 0.528*TE + 0.081*EN + 0.137*MA.$$

Table 2. Regression analysis.

Coefficients ^a								
Model		Unstandardized coefficients		Standardized coefficients	T	Sig.	Collinearity statistics	
		B	Std. error	Beta			Tolerance	VIF
1	(Constant)	0.231	0.098		2.359	0.019		
	OR	0.196	0.021	0.229	9.441	0.000	0.796	1.256
	TE	0.528	0.020	0.608	25.832	0.000	0.844	1.185
	EN	0.081	0.024	0.085	3.417	0.001	0.751	1.332
	MA	0.137	0.023	0.156	6.070	0.000	0.708	1.413

Note: a. Dependent variable: AD (e-commerce adoption by SMEs).
Predictors: (Constant), MA (Managerial), TE (Technological), OR (Organizational), EN (Environmental).
VIF: Variance inflation factor.

5.2.1. Dependent Variables

The dependent variable is e-commerce adoption, which is determined by the scope of e-commerce employed by SMEs, which includes many activities throughout the value chain, such as marketing, sales, procurement, services, support, and integration of e-commerce technology (Gibbs & Kraemer, 2004; Iacovou et al., 1995).

6. ANALYSIS AND DISCUSSION

According to the study, four factors (technological, organizational, managerial, and environmental) influence Vietnamese SMEs' adoption of e-commerce. The results in Table 2 show that technical factors have the most significant impact on the application of e-commerce by Vietnamese SMEs (Beta unstandardization factor =0.528). Organizational and managerial factors have a lower influence on the e-commerce applications of Vietnamese SMEs (Beta unstandardization factor =0.196 and 0.137). Finally, the environmental factor has the most negligible impact on the application of e-commerce by Vietnamese SMEs (Beta unstandardization factor =0.081).

Four variables in the technological factor impact the adoption of e-commerce by SMEs. These are readiness of information technology infrastructure, website, perceived compatibility, cost (other tools and technologies suitable for e-commerce), and enthusiasm for information technology human resources for the application of e-commerce. According to the study, perceived benefits positively and significantly correlate with e-commerce adoption, implying that it is a determining factor in SMEs' e-commerce adoption. It also shows that the more awareness of

the owner's benefits and innovation increases, the more businesses will increase their ability to apply e-commerce to SMEs. However, in Vietnam, SMEs operate strongly in areas with modest profit margins and low technology because they do not have the advantages of scale, financial potential, and market share.

Furthermore, business owners' capacity, management experience, and relationships significantly impact enterprises' production and business activities. According to the survey results of the [Vietnam E-Commerce Association \(2020\)](#), SMEs have started to pay average attention to e-commerce. However, they do not understand the content, benefits, and development trends of e-commerce worldwide or in Vietnam.

On the other hand, the COVID-19 pandemic also affects the operations of SMEs and changes consumers' shopping habits. Furthermore, e-commerce consumption will become increasingly popular in the coming years. As a result, SMEs must raise awareness about the benefits of e-commerce and invest in technology platforms to implement e-commerce.

Organizational factors such as technology readiness, information technology experience, firm size, support and encouragement for employees to use e-commerce, export orientation, and market expansion are critical to the use of e-commerce by SMEs. In which technology readiness is one of the factors influencing SMEs' adoption of e-commerce technology. This finding is similar to previous research, including [Azizan and Binti \(2015\)](#), [Mazzarol \(2015\)](#), [Boumediene Ramdani, Chevers, and Williams \(2013\)](#), [Oliveira and Martins \(2010\)](#), and [Iacovou et al. \(1995\)](#). However, according to the survey of the [Vietnam E-Commerce Association \(2020\)](#), more than 70% of SMEs do not have personnel specialized in e-commerce. Additionally, only about 40% of companies have websites, despite the fact that these websites are the most resilient for organisations in the internet world and are consistently viewed as crucial channels for affirmation and value.

Except for EN04: Supporting policies from the government in promoting e-commerce development (financial, technology, infrastructure, etc.), the remaining variables (customer/supplier pressure, competitor pressure, and external support) significantly correlate with e-commerce adoption. With e-commerce's rapid growth, the Vietnamese market has seen a race between businesses investing in e-commerce technology and developing online sales channels. The appearance of international retail companies and brands makes the Vietnamese market more competitive and puts pressure on small and medium-sized businesses. As a result of competitive pressure from customers and suppliers, SMEs will be more motivated to implement e-commerce and effectively use this tool in production and trade. IT experience, knowledge, and innovation of the owner are the determinant factors influencing SMEs to adopt e-commerce in the managerial aspect. All three variables have a positive and significant correlation with e-commerce adoption. This study is consistent with previous studies such as [Xin et al. \(2022\)](#), [Ghobakhloo and Tang \(2013\)](#), [Lip-Sam and Hock-Eam \(2011\)](#), [Ramdani, Kawalek, and Lorenzo \(2009\)](#), and [Thong \(1999\)](#). Switching to an e-commerce business model is inevitable for small and medium enterprises. However, SMEs are often quite hesitant to expand e-commerce distribution channels, stemming from three "fears": fear of not being able to sell, fear of not being able to manage, and fear of "Spending money and only getting worse" ([Ha, 2020](#)). These concerns are that the knowledge about IT, e-commerce, and business on e-commerce platforms is quite limited due to the transformation from the traditional model to the online business model, which requires companies to change their inherent business thinking flexibly. While SMEs are still quite confused about the transformation process because they still face many difficulties and challenges.

7. OBSTACLE

The adoption of e-commerce by SMEs necessitates a high level of technical and organizational expertise to ensure a smooth transition. Complex technology creates hurdles in adopting e-commerce, and this platform has unpredictable results that sometimes turn out differently than expected.

8. CONCLUSION AND RECOMMENDATION

This study thus focuses on the factors influencing SMEs' adoption of e-commerce in Vietnam. The study employed exploratory factor analysis (EFA) and simple regression for statistical analysis, with data on Vietnamese SMEs collected via questionnaires. The questionnaires were filled out by 700 Vietnamese SMEs from the North, Central, and South regions of Vietnam. Most respondents work in the consumer, health and beauty, agriculture, services, construction, and furniture and home decor industries. According to research findings, perceived benefits, technology readiness, owner innovation, and IT experience are all factors that influence SMEs' adoption of e-commerce in Vietnam. E-commerce has received wide acceptance due to its ease of use and extensive market access compared to traditional brick-and-mortar businesses. It has changed business procedures, abolished geographic and time barriers, accelerated business processes, changed supply chain management, and accelerated competition. It will also improve communication with customers, suppliers, and employees, opening up new opportunities for promotional mechanisms. There is statistical evidence that SMEs using e-commerce obtain intermediate benefits from it. Moreover, a strong relationship exists between commerce adoption and SMEs in Vietnam.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Data Availability Statement: The corresponding author can provide the supporting data of this study upon a reasonable request.

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Authors' Contributions: Giving ideas, creating research models and methodology, analyzing models, writing draft, D.T.B.; collecting data, writing draft, H.T.H.; collecting data and answers, searching documents, design tables, P.V.H.; collecting data, draw figures, B.V.C.; collecting data, checking format, D.H.H.; writing draft, making questions, correcting grammar, managing team members, responding to editors, N.H.P.D. All authors have read and agreed to the published version of the manuscript.

REFERENCES

- Adam, N. A., & Alarifi, G. (2021). Innovation practices for survival of small and medium enterprises (SMEs) in the COVID-19 times: The role of external support. *Journal of Innovation and Entrepreneurship*, 10(1), 1-22. <https://doi.org/10.1186/s13731-021-00156-6>
- Ahmad, S. Z., Abu Bakar, A. R., Faziharudean, T. M., & Mohamad Zaki, K. A. (2015). An empirical study of factors affecting e-commerce adoption among small and medium-sized enterprises in a developing country: Evidence from Malaysia. *Information Technology for Development*, 21(4), 555-572. <https://doi.org/10.1080/02681102.2014.899961>
- Anuj, K., Fayaz, F., & Kapoor, N. (2018). Impact of e-commerce in Indian economy. *Journal of Business and Management*, 20(5), 59-71.
- Ashrafi, R., & Murtaza, M. (2008). Use and impact of ICT on SMEs in Oman. *Electronic Journal of Information Systems Evaluation*, 11(3), 171-184.
- Awiagah, R., Kang, J., & Lim, J. I. (2016). Factors affecting e-commerce adoption among SMEs in Ghana. *Information Development*, 32(4), 815-836. <https://doi.org/10.1177/0266666915571427>
- Azizan, M. D. N. A. B., & Binti, N. A. (2015). The impact of firm size and e-commerce usage on business performance on hospitality industry: A case of Libya. *International Journal of Computers & Technology*, 13(3), 4265-4275. <https://doi.org/10.24297/ijct.v13i3.2757>
- Badamas, M. A. (2009). Knowledge management and information technology: Enablers of e-commerce development. *Communications of the IIMA*, 9(4), 5. <https://doi.org/10.58729/1941-6687.1121>
- Chao, P. E. N. G., Biao, M. A., & Zhang, C. (2021). Poverty alleviation through e-commerce: Village involvement and demonstration policies in rural China. *Journal of Integrative Agriculture*, 20(4), 998-1011. [https://doi.org/10.1016/s2095-3119\(20\)63422-0](https://doi.org/10.1016/s2095-3119(20)63422-0)

- Cui, Y., Mou, J., Cohen, J., & Liu, Y. (2019). Understanding information system success model and valence framework in sellers' acceptance of cross-border e-commerce: A sequential multi-method approach. *Electronic Commerce Research*, 19(4), 885-914. <https://doi.org/10.1007/s10660-019-09331-0>
- Currie, W. (2000). *The global information society*. Chichester: John Wiley.
- Duan, X., Deng, H., & Corbitt, B. (2012). Evaluating the critical determinants for adopting e-market in Australian small-and-medium sized enterprises. *Management Research Review*, 35(3/4), 289-308. <https://doi.org/10.1108/01409171211210172>
- Efrain, T., David, K., Jae, L., Merrill, W., H., & Michael, C. M. C. (2002). *Electronic commerce 2002: A managerial perspective* (2nd ed.). New Jersey: Pearson Prentice Hall.
- Esselaar, P., & Miller, J. (2001). Towards electronic commerce in Africa: A perspective from three country studies. *The Southern African Journal of Information and Communication*, 2001(2), 1-19. <https://doi.org/10.23962/10539/19834>
- Evelina, T. Y. (2022). The effect of perceived benefits on customer satisfaction and customer retention on Indonesian e-commerce sites. *International Journal of Electronic Commerce Studies*, 13(2), 099-118.
- Gbadegeshin, S. A., Oyelere, S. S., Olaleye, S. A., Sanusi, I. T., Ukpabi, D. C., Olawumi, O., & Adegbite, A. (2019). Application of information and communication technology for internationalization of Nigerian small-and medium-sized enterprises. *The Electronic Journal of Information Systems in Developing Countries*, 85(1), e12059. <https://doi.org/10.1002/isd2.12059>
- Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management & Data Systems*, 111(8), 1238-1269.
- Ghobakhloo, M., & Tang, S. H. (2013). The role of owner/manager in adoption of electronic commerce in small businesses: The case of developing countries. *Journal of Small Business and Enterprise Development*, 20(4), 754-787. <https://doi.org/10.1108/jsbed-12-2011-0037>
- Gibbs, J. L., & Kraemer, K. L. (2004). A cross-country investigation of the determinants of scope of e-commerce use: An institutional approach. *Electronic Markets*, 14(2), 124-137. <https://doi.org/10.1080/10196780410001675077>
- Ha, K. (2020). *Why are SME businesses "afraid" to do business on e-commerce platforms?* Retrieved from <https://hotrodoanhngghiep.hanoi.gov.vn/tin-tuc/vi-sao-doanh-ngghiep-sme-e-de-Kinh-doanh-tren-san-thuong-mai-dien-tu-qzw0j6r76n>
- Hussain, A., Shahzad, A., & Hassan, R. (2020). Organizational and environmental factors with the mediating role of e-commerce and SME performance. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), 196. <https://doi.org/10.3390/joitmc6040196>
- Iacovou, C., Benbasat, I., & Dexter, A. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. *MIS Quarterly: Management Information Systems*, 19(4), 465-485. <https://doi.org/10.2307/249629>
- Kabanda, S., & Brown, I. (2017). A structuration analysis of small and medium enterprise (SME) adoption of e-commerce: The case of Tanzania. *Telematics and Informatics*, 34(4), 118-132. <https://doi.org/10.1016/j.tele.2017.01.002>
- Karakaya, F., & Karakaya, F. (1998). Doing business on the Internet. *SAM Advanced Management Journal*, 63, 10-14.
- Kareem, P., Purwandari, B., Wilarso, I., & Pratama, M. O. (2018). *E-commerce adoption in SME: A systematic review*. Paper presented at the 2018 6th International Conference on Cyber and IT Service Management (CITSM) IEEE.
- Kawa, A., & Światowicz-Szczepańska, J. (2021). Logistics as a value in e-commerce and its influence on satisfaction in industries: A multilevel analysis. *Journal of Business & Industrial Marketing*, 36(13), 220-235. <https://doi.org/10.1108/jbim-09-2020-0429>
- Kaynak, E., Tatoglu, E., & Kula, V. (2005). An analysis of the factors affecting the adoption of electronic commerce by SMEs: Evidence from an emerging market. *International Marketing Review*, 22(6), 623-640. <https://doi.org/10.1108/02651330510630258>
- Kshetri, N., & Dholakia, N. (2002). Determinants of the global diffusion of B2B e-commerce. *Electronic Markets*, 12(2), 120-129. <https://doi.org/10.1080/10196780252844562>
- Kurnia, S., Choudrie, J., Mahbubur, R. M., & Alzougool, B. (2015). E-commerce technology adoption: A Malaysian grocery SME retail sector study. *Journal of Business Research*, 68(9), 1906-1918. <https://doi.org/10.1016/j.jbusres.2014.12.010>

- Lawrence, J., & Brodman, J. (2000). Linking communities to global policymaking: A new electronic window on the United Nations. In *Community Informatics: Enabling Communities with Information and Communications Technologies*. In (pp. 470–493). Pennsylvania, United States: IGI Global.
- Lederer, A. L., Mirchandani, D. A., & Sims, K. (1996). *Electronic commerce: A strategic application?* Paper presented at the Proceedings of the 1996 ACM SIGCPR/SIGMIS Conference on Computer Personnel Research.
- Lestari, D. (2019). Measuring e-commerce adoption behaviour among gen-Z in Jakarta, Indonesia. *Economic Analysis and Policy*, 64, 103-115. <https://doi.org/10.1016/j.eap.2019.08.004>
- Lip-Sam, T., & Hock-Eam, L. (2011). Estimating the determinants of B2B e-commerce adoption among small & medium enterprises. *International Journal of Business & Society*, 12(1), 15-30.
- Maloff, J. H. (1996). *Measuring the value of the internet for business. The internet strategy handbook*. Boston, MA: Harvard Business School Press.
- Mazzarol, T. (2015). SMEs engagement with e-commerce, e-business and e-marketing. *Small Enterprise Research*, 22(1), 79-90. <https://doi.org/10.1080/13215906.2015.1018400>
- Molla, A., & Licker, P. S. (2005). Perceived e-readiness factors in e-commerce adoption: An empirical investigation in a developing country. *International Journal of Electronic Commerce*, 10(1), 83-110. <https://doi.org/10.1080/10864415.2005.11043963>
- Nair, K. S. (2017). Impact of e-commerce on global business and opportunities—a conceptual study. *International Journal of Advanced Engineering and Management Research*, 2(2), 324-336.
- Nazir, M. A., & Roomi, M. A. (2020). Barriers to adopting electronic commerce for small and medium-sized enterprises in emerging economies. *Emerging Markets Journal*, 10(2), 43-55. <https://doi.org/10.5195/emaj.2020.203>
- Ndyali, L. (2013). Adaptation and barriers of e-commerce in Tanzania small and medium enterprises. *Developing Country Studies*, 3(4), 1-7.
- Nguyen, H. P. D., & Dang, T. B. (2017). The impact of e-commerce in Vietnamese SMEs. *European Journal of Business Science and Technology*, 3(2), 90–95. <https://doi.org/10.11118/ejobsat.v3i2.106>
- Nguyen, T. H., & Waring, T. S. (2013). The adoption of customer relationship management (CRM) technology in SMEs: An empirical study. *Journal of Small Business and Enterprise Development*, 20(4), 824-848. <https://doi.org/10.1108/jsbed-01-2012-0013>
- Nurlinda, N., Napitupulu, I., Wardayani, W., Azlina, A., Andina, A., Ulfah, A., & Supriyanto, S. (2020). *Can E-commerce adoption improve SME's performance? (Case Studies on Micro, Small and Medium Enterprises with Gojek Services in Indonesia)*. Paper presented at the Proceedings of the Third Workshop on Multidisciplinary and Its Applications, WMA-3 2019, 11-14 December 2019, Medan, Indonesia.
- OECD. (2020). *OECD policy responses to coronavirus (COVID-19) E-commerce in the time of COVID-19*. Retrieved from <https://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/>
- Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems*, 110(9), 1337-1354. <https://doi.org/10.1108/02635571011087428>
- Ordanini, A., & Rubera, G. (2010). How does the application of an IT service innovation affect firm performance? A theoretical framework and empirical analysis on e-commerce. *Information & Management*, 47(1), 60-67. <https://doi.org/10.1016/j.im.2009.10.003>
- Oreku, G. S., Mtenzi, F. J., & Ali, A.-D. (2013). A viewpoint of Tanzania e-commerce and implementation barriers. *Computer Science and Information Systems*, 10(1), 263-281. <https://doi.org/10.2298/csis110725002o>
- Park, J., & Kim, R. B. (2020). The effect of app quality and compatibility on consumers' omnichannel (OC) app adoption and loyalty: Comparison of US and Korean consumers. In *Advances in Digital Marketing and eCommerce*. In (pp. 163-178). Cham: Springer.
- Pontikakis, D., Lin, Y., & Demirbas, D. (2006). History matters in Greece: The adoption of internet-enabled computers by small and medium sized enterprises. *Information Economics and Policy*, 18(3), 332-358. <https://doi.org/10.1016/j.infecopol.2006.03.004>
- 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, 142-150. <https://doi.org/10.1016/j.sbspro.2015.06.423>

- Ramdani, B., Chevers, D., & Williams, D. A. (2013). SMEs' adoption of enterprise applications: A technology-organisation-environment model. *Journal of Small Business and Enterprise Development*, 20(4), 735-753. <https://doi.org/10.1108/JSBED-12-2011-0035>
- Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management*, 22(1/2), 10-24. <https://doi.org/10.1108/17410390910922796>
- Santoleri, P. (2015). Diversity and intensity of information and communication technologies use and product innovation: Evidence from Chilean micro-data. *Economics of Innovation and New Technology*, 24(6), 550-568. <https://doi.org/10.1080/10438599.2014.946313>
- Sedighi, A., Sirang, B., & Azerbaijan, I. (2018). The effect of e-commerce on SME performance. *International Journal of Applied Research in Management and Economics*, 1(2), 71-81.
- Singh, N., Toy, D. R., & Wright, L. K. (2009). A diagnostic framework for measuring web-site localization. *Thunderbird International Business Review*, 51(3), 281-295. <https://doi.org/10.1002/tie.20265>
- Sutanonpaiboon, J., & Pearson, A. M. (2006). E-commerce adoption: Perceptions of managers/owners of small-and medium-sized enterprises (SMEs) in Thailand. *Journal of Internet Commerce*, 5(3), 53-82. https://doi.org/10.1300/j179v05n03_03
- Thong, J. Y. (1999). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems*, 15(4), 187-214. <https://doi.org/10.1080/07421222.1999.11518227>
- Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *Processes of technological innovation*. Lexington: Lexington Books.
- Van Huy, L., Rowe, F., Truex, D., & Huynh, M. Q. (2012). An empirical study of determinants of E-commerce adoption in SMEs in Vietnam: An economy in transition. *Journal of Global Information Management*, 20(3), 23-54. <https://doi.org/10.4018/jgim.2012070102>
- Vietnam E-Commerce Association. (2020). *Vietnam e-business index (EBI) 2020 report*. Retrieved from <https://vecom.vn/bao-cao-chi-so-thuong-mai-dien-tu-viet-nam-2020>
- Vu Hung, C. (2016). Private economy - an important and basic driving force of economic growth and development in Vietnam. *Social Sciences Information Review*, 11(2), 1-17.
- Xin, X., Miao, X., Chen, Q., & Shang, T. (2022). User participation, knowledge management capability and service innovation: E-commerce enterprises in the digital age. *Asia Pacific Journal of Marketing and Logistics*, 34(4), 629-646. <https://doi.org/10.1108/apjml-10-2020-0724>
- Zaied, A. N. H. (2012). Barriers to e-commerce adoption in Egyptian SMEs. *International Journal of Information Engineering and Electronic Business*, 4(3), 9-18. <https://doi.org/10.5815/ijieeb.2012.03.02>
- Zhu, K. (2004). The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value. *Journal of Management Information Systems*, 21(1), 167-202. <https://doi.org/10.1080/07421222.2004.11045794>
- Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*, 16(1), 61-84. <https://doi.org/10.1287/isre.1050.0045>
- Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business. *Management Science*, 52(10), 1557-1576. <https://doi.org/10.1287/mnsc.1050.0487>
- Zhuang, Y., & Lederer, A. L. (2003). An instrument for measuring the business benefits of e-commerce retailing. *International Journal of Electronic Commerce*, 7(3), 65-99. <https://doi.org/10.1080/10864415.2003.11044274>

APPENDIX

Appendix 1. Cronbach's Alpha for independent variables.

Technology factor (TE)

Reliability statistics	
Cronbach's alpha	N of items
0.831	4

Item-total statistics				
	Scale mean if the item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if the item deleted
TE01	10.53	4.052	0.656	0.787
TE02	10.52	3.947	0.681	0.776
TE03	10.56	4.090	0.647	0.791
TE04	10.57	4.131	0.648	0.791

Organizational factors (OR)

Reliability statistics	
Cronbach's alpha	N of items
0.871	5

Item-total statistics				
	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
OR01	14.02	7.372	0.680	0.847
OR02	14.04	7.190	0.716	0.838
OR03	14.00	7.330	0.677	0.848
OR04	14.00	7.243	0.699	0.843

Environmental factor (EN)

Reliability statistics	
Cronbach's Alpha	N of items
0.819	6

Item-total statistics				
	Scale means if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
EN01	17.76	9.105	0.593	0.789
EN02	17.65	8.977	0.659	0.775
EN03	17.81	8.578	0.643	0.778
EN04	17.82	8.978	0.576	0.793
EN05	17.78	9.823	0.506	0.806
EN06	17.75	9.673	0.531	0.802

Management factor (MA)

Reliability statistics	
Cronbach's alpha	N of items
0.807	4

Item-total statistics				
	Scale means if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
MA01	10.64	3.611	0.666	0.738
MA02	10.77	4.019	0.592	0.774
MA03	10.47	4.061	0.654	0.745
MA04	10.51	4.270	.591	0.774

Appendix 2 shows Cronbach's Alpha for dependent variable -application e-commerce of Vietnamese SMEs (AD).

Appendix 2. Cronbach's Alpha for Dependent variable -Application e-commerce of Vietnamese SMEs (AD).

Reliability statistics	
Cronbach's alpha	N of items
0.868	5

Item-total statistics				
	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
AD01	14.18	5.427	0.663	0.847
AD02	14.16	5.316	0.689	0.841
AD03	14.18	5.356	0.675	0.844
AD04	14.17	5.179	0.713	0.834
AD05	14.17	5.271	0.713	0.835

Appendix 3 shows EFA for independent variables.

Appendix 3. EFA for Independent variables.

First EFA

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.884
Bartlett's test of sphericity	Approx. Chi-Square	5590.744
	df	171
	Sig.	0.000

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	5.948	31.307	31.307	5.948	31.307	31.307	3.342	17.589	17.589
2	2.604	13.704	45.011	2.604	13.704	45.011	3.046	16.029	33.618
3	1.890	9.949	54.960	1.890	9.949	54.960	2.790	14.684	48.302
4	1.432	7.539	62.499	1.432	7.539	62.499	2.697	14.197	62.499
5	0.871	4.583	67.082						
6	0.769	4.047	71.129						
7	0.529	2.782	73.911						
8	0.518	2.726	76.637						
9	0.494	2.602	79.239						
10	0.472	2.483	81.722						
11	0.466	2.451	84.173						
12	0.444	2.337	86.510						
13	0.425	2.239	88.749						
14	0.403	2.122	90.872						
15	0.389	2.045	92.916						
16	0.375	1.973	94.890						
17	0.360	1.897	96.787						
18	0.329	1.730	98.517						
19	0.282	1.483	100.000						

Note: Extraction method: Principal component analysis.

Rotated component matrix ^a				
	Component			
	1	2	3	4
OR02	0.815			
OR05	0.793			
OR04	0.788			
OR01	0.772			
OR03	0.766			
MA03		0.776		
MA01		0.767		
MA04		0.738		
MA02		0.725		
EN06			0.802	
EN05			0.778	
EN01			0.628	
EN02			0.625	
EN03			0.609	
EN04				
TE02				0.811
TE04				0.804
TE01				0.781
TE03				0.774

Note: Extraction Method: Principal component analysis.
Rotation Method: Varimax with kaiser normalization.
a. Rotation converged in 5 iterations.

Second EFA

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.874
Bartlett's test of sphericity	Approx. chi-square	5200.168
	df	153
	Sig.	0.000

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	5.608	31.154	31.154	5.608	31.154	31.154	3.334	18.520	18.520
2	2.491	13.836	44.990	2.491	13.836	44.990	2.834	15.745	34.265
3	1.890	10.502	55.492	1.890	10.502	55.492	2.694	14.966	49.231
4	1.432	7.958	63.450	1.432	7.958	63.450	2.559	14.219	63.450
5	0.871	4.838	68.287						
6	0.702	3.902	72.189						
7	0.520	2.888	75.077						
8	0.495	2.747	77.825						
9	0.472	2.625	80.450						
10	0.466	2.589	83.038						
11	0.450	2.499	85.538						
12	0.426	2.365	87.902						
13	0.423	2.350	90.252						
14	0.396	2.200	92.452						
15	0.377	2.093	94.545						
16	0.364	2.020	96.565						
17	0.334	1.856	98.421						
18	0.284	1.579	100.000						

Note: Extraction method: Principal component analysis.

Rotated component matrix ^a				
	Component			
	1	2	3	4
OR02	0.816			
OR05	0.793			
OR04	0.788			
OR01	0.773			
OR03	0.766			
MA03		0.785		
MA01		0.769		
MA04		0.746		
MA02		0.728		
TE02			0.811	
TE04			0.804	
TE01			0.781	
TE03			0.775	
EN06				0.811
EN05				0.793
EN01				0.627
EN02				0.626
EN03				0.592

Note: Extraction method: Principal component analysis.
Rotation Method: Varimax with kaiser normalization.
a. Rotation converged in 5 iterations.

Appendix 4 expresses EFA for dependent variable.

Appendix 4. EFA for Dependent variable.

KMO and Bartlett's test						
Kaiser-Meyer-Olkin measure of sampling adequacy.					0.876	
Bartlett's Test of Sphericity	Approx. chi-square				1526.075	
	df				10	
	Sig.				0.000	
Total variance explained						
Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.272	65.437	65.437	3.272	65.437	65.437
2	0.484	9.671	75.108			
3	0.460	9.201	84.309			
4	0.409	8.178	92.487			
5	0.376	7.513	100.000			

Note: Extraction method: Principal component analysis.

Component matrix ^a	
	Component
	1
AD05	0.826
AD04	0.826
AD02	0.808
AD03	0.797
AD01	0.787

Note: Extraction method: Principal component analysis.
a. 1 components extracted.

Appendix 5 describes correlations.

Appendix 5. Correlations.

Correlations		AD	TC	CN	MT	QL
AD	Pearson correlation	1	0.524**	0.750**	0.360**	0.435**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	700	700	700	700	700
OR	Pearson correlation	0.524**	1	0.358**	0.264**	0.348**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	700	700	700	700	700
TE	Pearson correlation	0.750**	0.358**	1	0.228**	0.260**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	700	700	700	700	700
EN	Pearson correlation	0.360**	0.264**	0.228**	1	0.482**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	700	700	700	700	700
MA	Pearson correlation	0.435**	0.348**	0.260**	0.482**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	700	700	700	700	700

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

Appendix 6 presents ANOVA and regression.

Appendix 6. ANOVA and regression.

ANOVA ^a						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	151.528	4	37.882	360.497	0.000 ^b
	Residual	73.032	695	0.105		
	Total	224.560	699			

Note: a. Dependent Variable: AD

b. Predictors: (Constant), MA, TE, OR, EN

Model summary ^b					
Model	R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson
1	0.821 ^a	0.675	0.673	0.3242	2.075

Note: a. Predictors: (Constant), MA, TE, OR, EN

b. Dependent Variable: AD.

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