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Developing Measurement Scales for Factors Influencing the Adoption of E-commerce by Small and Medium-sized Agricultural Enterprises in Vietnam

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Abstract
Through methods such as literature review, qualitative interviews, and preliminary quantitative surveys, this study proposes and refines measurement scales for factors influencing the adoption of e-commerce by small and medium-sized agricultural enterprises in Vietnam. The research findings serve as a foundation for further quantitative studies on the degree of influence of these factors. They provide a basis for evaluating and proposing solutions to promote e-commerce adoption among small and medium-sized agricultural enterprises, thereby enhancing business performance and fostering sustainable economic development.

Keywords: *Development of Measurement Scales for Influencing Factors; Small and Medium-sized Agricultural Enterprises; E-commerce.*

1. INTRODUCTION

E-commerce has emerged as a prominent trend in the digital era, offering new business opportunities and enhancing operational efficiency and competitiveness, particularly for small and medium-sized enterprises (SMEs). Agriculture, a vital sector of Vietnam's economy, stands to benefit significantly from integrating digital technologies like e-commerce. Such integration is anticipated to stimulate economic growth, improve social well-being, and alleviate poverty. Therefore, investigating the factors influencing e-commerce adoption among small and medium-sized agricultural enterprises (SMAEs) is a critical area of research.

This study aims to develop and refine a measurement scale to assess the impact of various factors on e-commerce adoption within SMAEs. Through a comprehensive literature review, qualitative interviews, and preliminary quantitative surveys, the research seeks to provide valuable insights into the determinants of e-commerce integration in the agricultural sector.

2. LITERATURE REVI

2.1. Literature Review

2.1. Factors Influencing E-Commerce Adoption

A review of the literature identifies six primary factors commonly discussed in studies on e-commerce adoption among SMAEs:

- Financial Resources, Infrastructure, and Human Capital: Rowe et al. (2012) suggest a positive influence, while Hoang et al. (2021) find no significant effect.

- Leadership: Mohtaramzadeh et al. (2018), Hoang et al. (2021), and Nguyen et al. (2022) report a positive impact, whereas Rowe et al. (2012) observe no effect.

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- Perceived Benefits of E-Commerce: Nguyen et al. (2022) note a positive influence, while Rowe et al. (2012) and Hoang et al. (2021) find no significant effect.

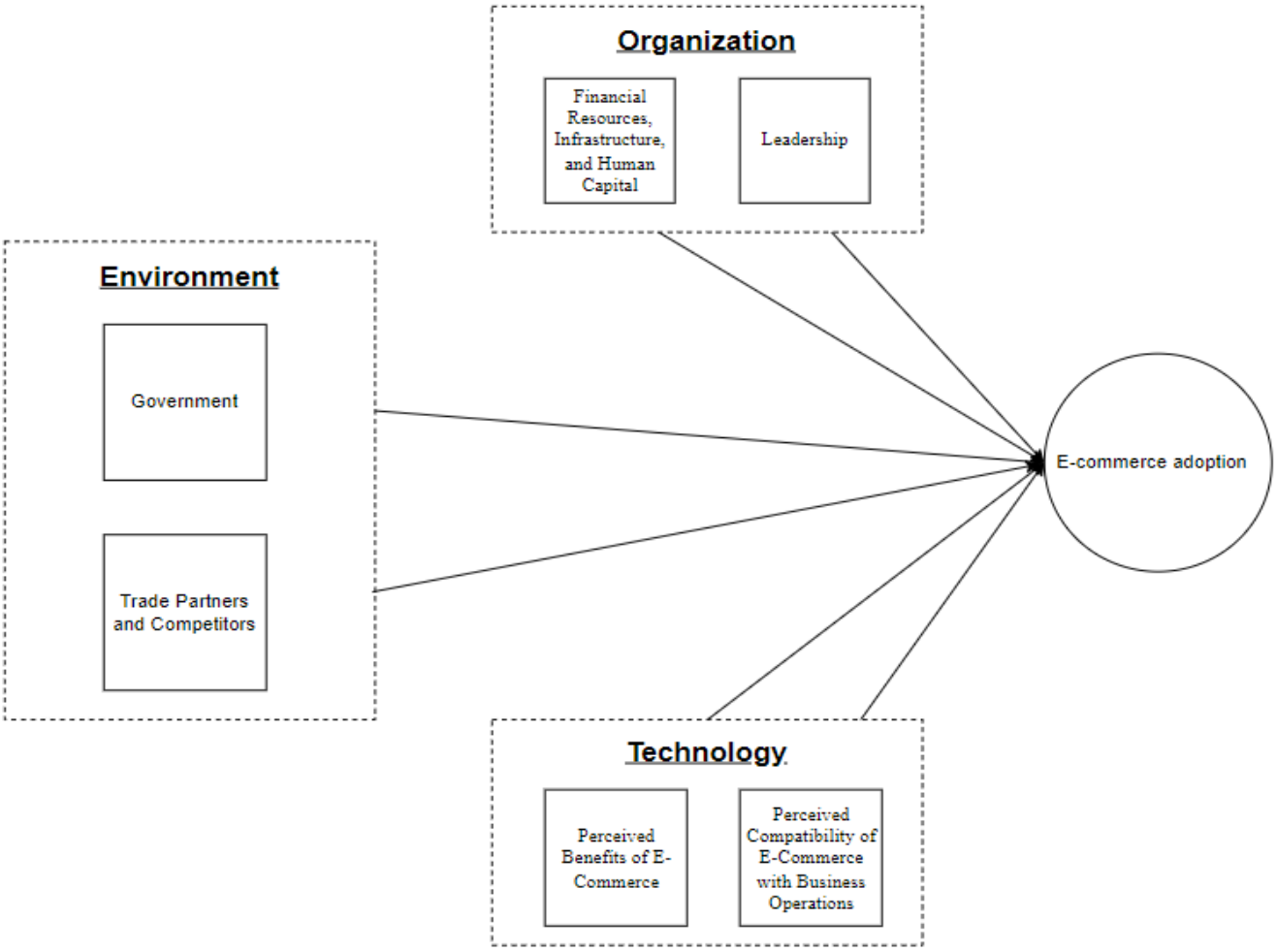
- Perceived Compatibility of E-Commerce with Business Operations: Rowe et al. (2012), Hoang et al. (2021), and Nguyen et al. (2022) all report a positive impact.

- Trade Partners and Competitors: Hoang et al. (2021) and Nguyen et al. (2022) observe a positive influence, while Ahmad et al. (2015) find no effect.

- Government: Mohtaramzadeh et al. (2018) and Hoang et al. (2021) report a positive impact.

Based on these findings, the proposed research model is as follows:

Figure1: Research Model on Factors Influencing E-Commerce Adoption among Small and Medium-Sized Agricultural Enterprises in Vietnam



Source: Author.

2.2. Development of Measurement Scales

The proposed research model comprises six independent variables and one dependent variable. Measurement scales for five variables—Perceived Benefits of E-Commerce Adoption, Perceived Compatibility of E-Commerce Applications, Financial Resources and Infrastructure, Leadership, and Trade Partners and Competitors—are primarily adapted from established scales in prior studies on e-commerce adoption among enterprises, including those by Rowe et al. (2012), Hoang et al. (2021), Mohtaramzadeh et al. (2018), Abed (2020), Nguyen et al. (2022), and Chiu et al. (2017).

Regarding the Government factor, while some studies have developed scales to assess governmental influence—such as those by Rowe et al. (2012), Hoang et al. (2021), and Mohtaramzadeh et al. (2018)—these scales are not comprehensive. This research aims to develop a new measurement scale based on secondary data, practical situations, and by refining and expanding upon observed variables related to the

Government factor previously mentioned but lacking in thoroughness. The proposed scale for the Government factor includes four first-order constructs:

- Development and Improvement of E-Commerce Infrastructure
- Promotion and Support for Enterprises Engaging in E-Commerce
- Protection and Support for Consumers Participating in E-Commerce
- Enhancement of E-Commerce Regulatory Capacity among Government Officials

Each first-order construct comprises three observed variables, resulting in a total of 12 observed variables for the second-order Government factor.

For the dependent variable, E-Commerce Adoption, the study refers to classification methods from UNCTAD and Vietnam Foreign Trade University (2013). The author proposes and adjusts the classification of e-commerce adoption levels among SMAEs in Vietnam into two main stages, with increasing levels of adoption:

- Stage 1: Informational E-Commerce Adoption
- Stage 2: Collaborative E-Commerce Adoption

This classification aims to provide a structured framework for assessing the extent of e-commerce integration within SMAEs in Vietnam.

3. Research Methodology

A preliminary 5-point Likert scale was proposed through a desk study of secondary data. This preliminary scale was further validated and refined through qualitative interviews, aiming to identify factors, assess relevance, and standardize language within the scale to ensure accuracy and clarity. Based on this, the official measurement scale was developed and refined through a preliminary quantitative survey targeting SMAEs in Vietnam. Using IBM SPSS Statistics 25, reliability analysis with Cronbach's alpha and exploratory factor analysis (EFA) were conducted to eliminate unsuitable observed variables and finalize the official measurement scale.

4. Research Results

4.1. Qualitative Interview Findings

The author conducted interviews with six leaders of SMAEs and two department heads from the Department of Industry and Trade and the Department of Information and Communications. Semi-structured interviews were employed, and data were analyzed using thematic analysis. The interview results were consistent and confirmed the appropriateness of the developed measurement scale, providing a solid foundation for proceeding with the preliminary quantitative study.

4.2. Preliminary Quantitative Study Findings

The questionnaire utilized 28 observed variables for EFA; thus, the minimum sample size recommended by Hair (2013) is 140. Data collection occurred from February to March 2024, distributing 215 questionnaires and receiving 203 valid responses. Data analysis using IBM SPSS Statistics 25 revealed that all variables had Cronbach's alpha coefficients greater than 0.7 (ranging from 0.707 to 0.916), and corrected item-total correlations were above 0.3 (ranging from 0.343 to 0.844). Therefore, the dataset met the reliability criteria for the measurement scale, and no observed variables were excluded at this stage.

Exploratory factor analysis (EFA) was conducted. Although the data met the conditions for KMO and Bartlett's tests, total variance extracted, and Eigenvalue, the observed variable N.KH2 loaded onto five/seven extracted factors, with absolute values ranging from 0.156 to 0.355. Thus, N.KH2 did not meet the criterion that factor loadings should be ≥ 0.5, and the difference between the highest and any other factor loading should be ≥ 0.3 (Hair, 2013). After removing N.KH2 and renaming N.KH3 to N.KH2, a second EFA was performed, and the data met the required standards. Specifically, the KMO value was 0.839, exceeding the minimum of 0.5. Bartlett's test had a p-value less than 0.05, indicating statistical significance.

Factor loadings were all above 0.5, Eigenvalues were greater than 1, and the total variance extracted by the factors was 72.6%, meeting the validation criteria. The finalized measurement scale is detailed in the appendix.

5. Discussion of Research Results and Conclusions

In the initial hypothesis, the variable "Government" was considered a second-order factor measured by four first-order factors. However, through exploratory factor analysis (EFA), it was observed that three factors—Legal and Technological Infrastructure Enhancement (NHT), Business Support (NKH), and Consumer Support (NKH)—are closely correlated and collectively represent a characteristic of the "Government" variable. Consequently, these three factors were combined into a new factor named "Market and E-commerce Infrastructure Development" (NTH). Conversely, the factor "Enhancing the Enforcement Capacity of State Management Officials" (NQL) exhibited independence and distinct characteristics, thus retained as a separate factor in the model.

The refined "Government" variable now comprises two sub-factors, aligning with empirical research findings and theoretical frameworks. Specifically, previous studies have often conceptualized the "Government" variable as a first-order factor with a single dimension, as seen in the works of Rowe et al. (2012), Hoàng Đàm Lương Thúy et al. (2021), and Mohtaramzadeh et al. (2018). This approach is justifiable, as it is challenging to distinguish the government's influence when supporting market participants—including businesses, consumers, and shared infrastructure development—since such support is typically comprehensive and synergistic, benefiting all stakeholders collectively. Therefore, from both theoretical and practical perspectives, consolidating these aspects into a single factor representing the government's role in market and infrastructure development is appropriate.

The factor "Enhancing the Enforcement Capacity of State Management Officials" has been addressed in qualitative studies but not quantitatively. Through EFA, it was identified as an independent factor requiring separate measurement and empirical evaluation. This represents a novel contribution of this research, as it develops and refines a measurement scale for the government's influence on e-commerce adoption.

After refinement, the measurement scale for the independent factors in the model consists of six factors with 27 observed variables, with the "Government" factor comprising two sub-factors. The official questionnaire is now suitable for use in formal quantitative surveys. Future research can build upon this scale and incorporate additional related studies to expand the questionnaire with new attributes. It is recommended that future sampling processes have broader coverage and include a wider range of survey subjects, such as cooperatives and agricultural production households, as the current questionnaire focuses primarily on small and medium-sized agricultural enterprises.

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Appendix:

The measurement scale for factors influencing the adoption of e-commerce by small and medium-sized agricultural enterprises in Vietnam

No.	Factor symbol 1	Factor name	Factor symbol 2	Observation Variable Name
Independent Variable (Scale 1-5)				
1	CLI	Perception of benefits from e-commerce adoption	C.LI1	E-commerce adoption helps expand market, market share, or increase revenue
			C.LI2	E-commerce adoption helps optimize processes, reduce costs
			C.LI3	E-commerce adoption helps improve customer relationships
2	CTT	Perception of the compatibility of e-commerce adoption with business operations	C.TT1	The business does not need to adjust its business processes after adopting e-commerce
			C.TT2	Customers are satisfied as business operations become more compatible with e-commerce adoption
			C.TT3	E-commerce is compatible with the behavior of other businesses in the same industry or field
3	TNL	Financial resources and infrastructure of the business	T.NL1	High employee understanding of e-commerce helps in the effective implementation of e-commerce adoption in the business
			T.NL2	Employee readiness to learn new technologies helps in the effective implementation of e-commerce adoption in the business
			T.NL3	Employees' proficiency with computers helps in the effective implementation of e-commerce adoption
			T.NL4	The business has the infrastructure or financial resources necessary for the effective implementation of e-commerce adoption
4	TLD	Leadership of the business	T.LD1	The effectiveness of e-commerce adoption is enhanced when business leaders recognize and prioritize e-commerce adoption
			T.LD2	Leaders' understanding of e-commerce facilitates the business in implementing e-commerce adoption
			T.LD3	E-commerce adoption is promoted when leaders have an open attitude towards improvements
5	MDT	Trade partners and competitors	M.DT1	Customers appreciate the business's e-commerce adoption as it meets the demand for online transactions
			M.DT2	Suppliers give positive feedback when the business adopts e-commerce because it meets business transaction needs
			M.DT3	The business perceives an improvement in its competitiveness compared to competitors through e-commerce adoption
6	NN	Government (comprising two sub-factors: NTH and NQL)		
6.1	NTH	Market development (businesses, consumers) and infrastructure (legal infrastructure, technological infrastructure, and support services)	N.HT1	The effectiveness of e-commerce implementation in businesses is enhanced when there is a good mechanism, policy, and legal environment.
			N.HT2	Businesses benefit from e-commerce adoption due to the development of digital infrastructure supported by the government (internet, telecommunications).
			N.HT3	The transportation and delivery infrastructure invested by the government helps businesses better meet e-commerce transaction needs.

No.	Factor symbol 1	Factor name	Factor symbol 2	Observation Variable Name
Independent Variable (Scale 1-5)				
			N.DN1	The government builds and effectively implements programs to support and train organizations in digital transformation and brand building.
			N.DN2	Businesses appreciate the government's solutions in promoting cashless payments to facilitate e-commerce adoption.
			N.DN3	Government-led e-commerce training programs help businesses improve their e-commerce capabilities.
			N.KH1	Consumers perceive e-commerce adoption as common and necessary through government programs for e-commerce promotion.
			N.KH2	The government conducts activities to warn against counterfeit goods and protect consumers.
6.2	NQL	Enhancing the execution capacity of the state management staff on e-commerce	N.QL1	Business satisfaction with government officials when interacting or seeking clarification on e-commerce adoption.
			N.QL2	Businesses do not spend much time on administrative procedures regarding e-commerce.
			N.QL3	Businesses perceive a fair competitive e-commerce environment due to the government effectively implementing anti-counterfeit and trade fraud solutions.
Dependent Variable (Scale from 1-3)				
	UDTMDT	Current state of e-commerce adoption		