

The Role of Technology and Environment in E-Commerce Adoption among MSMEs in Semarang City

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Abstract

The rapid advancement of technology has enabled individuals to conveniently perform various activities anytime and anywhere, such as exchanging data and information, communicating with others, and engaging in buying and selling transactions without geographical or temporal constraints. This study adopts an explanatory research design. The research population comprises micro-scale MSMEs located in the city of Semarang. The study employed purposive sampling, resulting in a sample size of 41 respondents. A quantitative method was adopted, with questionnaires serving as the primary instrument for gathering data, which were then processed using IBM SPSS version 25. The findings reveal that both technological and environmental factors, individually and collectively, exert a significant influence on e-commerce adoption, accounting for 43.8% of the variance.

Keywords: *Technology, Environment, E-Commerce Adoption, Micro-Scale MSMEs*

INTRODUCTION

The rapid advancement of technology has enabled individuals to efficiently perform a wide range of activities anytime and anywhere, such as exchanging data and information, communicating with others, and conducting buying and selling transactions without geographical constraints. According to data from Statistics Indonesia ([Badan Pusat Statistik, 2022](#)) and the Ministry of Cooperatives and SMEs ([KemenKopUKM, 2023](#)), the number of micro, small, and medium enterprises (MSMEs) in Indonesia that have adopted digital platforms ("go-digital") has shown consistent annual growth from 2019 to 2023. In 2019, there were approximately 8 million MSMEs that had gone digital, and this number increased significantly to 21.8 million by 2023. Based on data from [Katadata \(2022\)](#), e-commerce businesses in Indonesia are predominantly concentrated on the island of Java, occupying the top three positions nationally, as illustrated in the following chart:

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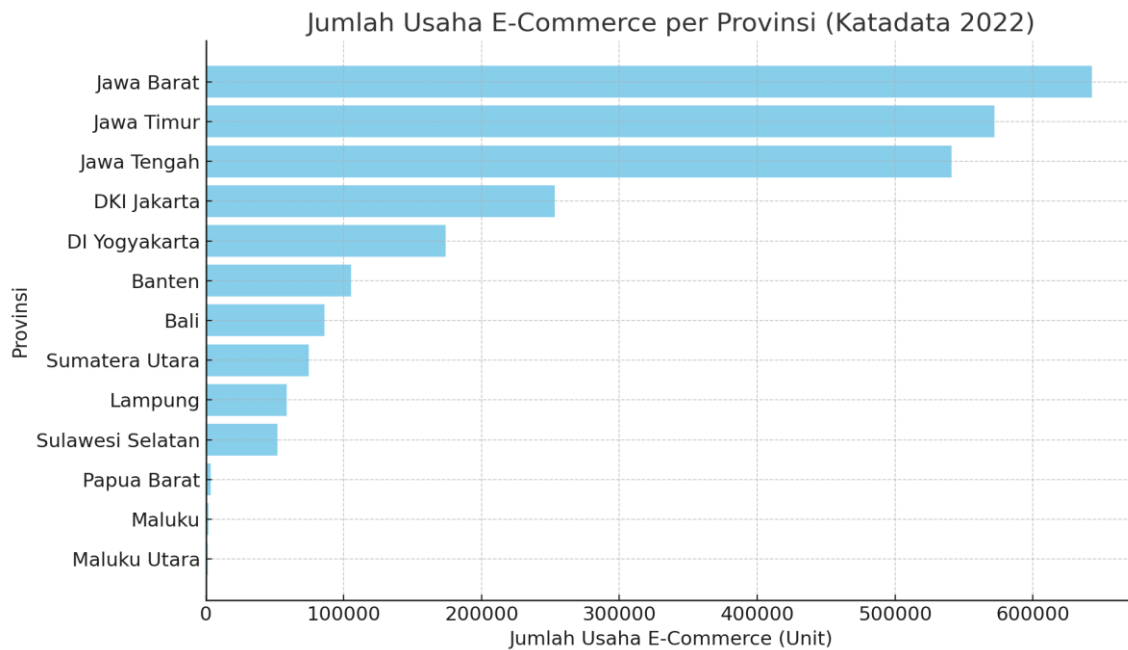


Figure 1. E-Commerce Adoption by Province
Source: [Katadata \(2022\)](#)

As shown in Figure 1, the number of businesses utilizing e-commerce is predominantly concentrated on the island of Java. In 2022, Central Java ranked third in terms of the highest number of businesses adopting e-commerce. According to Law of the Republic of Indonesia No. 20 of 2008, MSMEs are classified into several categories based on their scale, namely micro, small, and medium enterprises. Data from [Pemerintah Kota Semarang \(2023\)](#) indicate that there are 29,752 registered MSME actors in Semarang City, of which 7,679 fall under the micro-scale category.

Electronic commerce (e-commerce), according to [Nurhadi \(2015\)](#), refers to business activities conducted electronically through computer networks to meet trading and information needs in a digital format. E-commerce adoption, as defined by [Nurhadi \(2015\)](#), is the process of integrating e-commerce technology into MSMEs through the use of both hardware and software. The adoption of e-commerce by MSMEs is influenced not only by technical or technological factors but also by internal organizational factors and external environmental factors, which are commonly conceptualized within the Technology–Organization–Environment (TOE) framework.

The study conducted by [Hanum et al. \(2017\)](#) found that technological factors have a positive and significant effect on e-commerce adoption, whereas environmental factors, when examined partially, have a positive but not significant effect. Research by [Kurniasih et al. \(2022\)](#) revealed that technology exerts a positive and significant influence on e-commerce adoption among female entrepreneurs in Pekanbaru. Similarly, the findings of [Harfi and Lastiati \(2022\)](#) demonstrated that both technological and environmental factors, when assessed partially, have a positive and significant impact on e-commerce adoption.

LITERATURE REVIEW

Technology

Definition of Technology

According to [Nurhadi \(2015\)](#), in the context of e-commerce adoption, technology refers to the availability and readiness of information technology infrastructure that can be utilized by organizations to implement e-commerce systems. This includes hardware, software, internet

networks, and other supporting systems such as e-commerce applications, digital payment systems, and customer data analytics tools.

Indicators of Technology

The technological factor indicators, according to Venkatesh et al., as cited in [Nurdin et al. \(2024\)](#), based on the Unified Theory of Acceptance and Use of Technology (UTAUT), a comprehensive theory that explains the factors influencing individuals or organizations in accepting and using technology within the TOE framework, include the following indicators:

- 1) Relative Advantage
Relative Advantage refers to business actors' perception that technology provides greater benefits compared to traditional methods.
- 2) Perceived Ease of Use
Perceived ease of use refers to the degree of ease in learning and using technology.
- 3) Compatibility & Technological Infrastructure
The degree to which the e-commerce system aligns with existing business needs and processes.
- 4) Implementation Cost
The perception of business actors regarding the affordability of adopting and operating e-commerce.

Environment

- 1) Definition of Environment
Environment refers to external factors that can influence an organization's (such as MSMEs) decision to adopt technology, including competitive pressure, customers, suppliers, and government regulations. The environment can be defined as the external conditions of an organization, encompassing competitive pressure, support from partners, and government policies that may either encourage or hinder e-commerce adoption.
- 2) Environmental Indicators
According to [Nurhadi \(2015\)](#), the indicators of environmental factors include:
 - 1) Competitive Pressure
The presence of environmental changes requires MSMEs to maintain their business sustainability.
 - 2) Regulation
Rules and regulations governing the use of technology, online transactions, and consumer protection, both by government entities and businesses.
 - 3) Government Support
Physical and/or other forms of contribution provided by the government to support MSMEs.
 - 4) Internal Support
The provision of assistance, goodwill, and care directed toward oneself or the organization.
 - 5) External Support
Direct or indirect assistance provided by third parties, such as logistics service providers, business communities, partners, platform providers, and others.

E-Commerce

1) Definition of E-Commerce

According to [Nurhadi \(2015\)](#), e-commerce refers to business activities conducted electronically through computer networks to meet trading and information needs in digital form. These activities include the purchase, sale, and exchange of goods, services, and information via electronic media. E-commerce adoption, as defined by [Nurhadi \(2015\)](#), is the process of integrating e-commerce technology into MSMEs through the use of both hardware and software.

2) Factors Influencing E-Commerce Adoption ([Nurhadi, 2015](#))

E-commerce adoption by MSMEs is influenced not only by technical or technological factors but also by internal organizational factors and external environmental factors, commonly known as the Technology–Organization–Environment (TOE) framework.

1) Technology

Refers to the technological capabilities available and business actors' perceptions regarding the benefits and ease of use of the technology.

2) Organization

Covers internal resources such as human resources, management support, organizational structure, and readiness to adopt technology.

3) Environment

Encompasses external elements influencing adoption decisions, such as market and competitive pressures, changing customer needs, support from government and other institutions, as well as infrastructure such as internet networks and logistics.

E-Commerce Indicators

According to [Sawhani et al. \(2021\)](#), the indicators for e-commerce utilization include:

1) Internet Access

The speed of internet access adds value to a company's competitiveness. Faster access can attract customers with improved service quality, encouraging them to purchase the products offered.

2) Ease of Information

With technological advancements, the volume of available information increases, enabling human resources to utilize such information to better understand e-commerce and create more attractive innovations.

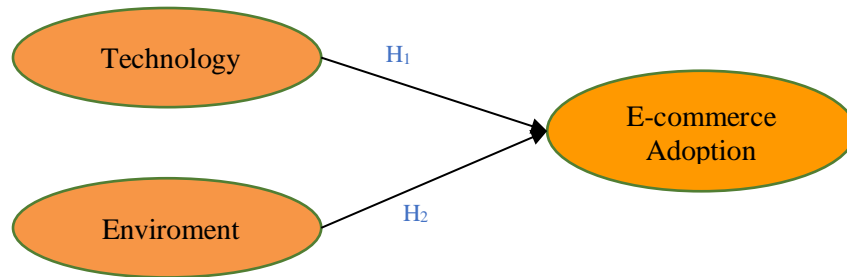
3) Human Resource Capability

Technological developments require human resources not only to operate but also to leverage extensive information technology related to consumer demand and production processes.

4) Managerial Responsibility

In building competitiveness, managerial responsibility is essential for maintaining and making decisions regarding the business processes to be implemented.

Framework



Hypotheses

Hypothesis 1: Technology has a significant effect on the utilization of e-commerce.

Hypothesis 2: Environment has a significant effect on the utilization of e-commerce.

RESEARCH METHOD

The study employs an explanatory quantitative research design. Data were gathered through an online survey distributed via Google Forms. The target population included micro-scale MSMEs in Semarang City utilizing e-commerce. Through purposive sampling, the study obtained responses from 41 participants.

FINDING AND DISCUSSION

To examine the research framework model, an F-test was conducted. Based on the F distribution table at a significance level of 0.05, with degrees of freedom $df1 = k - 1 = 3 - 1 = 2$ and $df2 = n - k = 41 - 3 = 38$, the F-table value obtained was 3.2448.

The decision criteria for the F-test are as follows:

1. If $F_{\text{calculated}} < F_{\text{table}}$ or $\text{Sig.} > 0.05$, then H_0 is accepted and H_a is rejected.
2. If $F_{\text{calculated}} > F_{\text{table}}$ or $\text{Sig.} < 0.05$, then H_0 is rejected and H_a is accepted.

The results of the F-test in this study, examining the influence of technology and environment on e-commerce adoption, are presented in Table 1.

Table 1. F-Test Results of E-Commerce Adoption

Model	df	F	Nilai Sig.
Regression	2	16,618	0,000
Residual	38		
Total	40		

As shown in Table 1, the F-test produced an F-calculated value of 16.618, which is greater than the F-table threshold of 3.2448, with a significance value less than 0.05. These findings suggest that H_a is accepted while H_0 is rejected, thereby validating the applicability of the conceptual framework model.

The t-test essentially indicates the extent to which an explanatory or independent variable individually influences the variations in the dependent variable (Ghozali, 2018). Referring to the t-table with a significance level of 0.05 and degrees of freedom (df) = $n - 2 = 41 - 2 = 39$, the t-table value obtained is 1.685. Based on the t-table value of 1.685, the decision-making criteria for the t-test are as follows:

1. If the t-calculated value < t-table value or the Sig. value > 0.05, then H0 is accepted and Ha is rejected.
2. If the t-calculated value > t-table value or the Sig. value < 0.05, then H0 is rejected and Ha is accepted.

The results of the t-test in this study regarding technology and environment on e-commerce adoption are presented in Table 2 as follows:

Table 2. Results of the t-Test on E-Commerce Adoption

Variabel	t _{count}	t _{table}	Sig. Value
Technology	3,349	1,685	0,002
Environment	3,215	1,685	0,003

Source: Primary Data Processed, 2025

The t-test results in Table 1 show that both the technology variable ($t = 3.349 > 1.685$, $p < 0.05$) and the environmental variable ($t = 3.215 > 1.685$, $p < 0.05$) significantly influence the adoption of e-commerce among micro-scale SMEs in Semarang City. Thus, Ha is accepted and H0 is rejected for both variables, confirming their partial effects on e-commerce adoption. The coefficient of determination results for the effect of technology and environment on e-commerce adoption is shown in Table 3 below:

Table 3. Results of the Coefficient of Determination Test for E-Commerce Adoption

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,683 ^a	,467	,438	,70852

a. Predictors: (Constant), Average Environment, Average Technology

b. Dependent Variable: Average E-Commerce Adoption

Source: Primary Data Processed, 2025

According to Table 3, the Adjusted R Square value of 0.438 indicates that technology and environmental factors account for 43.8% of e-commerce adoption, while the remaining 56.2% is determined by other factors not included in the model.

CONCLUSIONS

E-commerce adoption is defined as the process of integrating e-commerce technology into MSMEs through the use of both hardware and software. E-commerce encompasses business transactions carried out electronically through computer networks to fulfill trade and information needs in digital format. The t-test findings reveal that technological and environmental variables each exert a significant partial influence on e-commerce adoption, accounting for 43.8% of its variation. The adoption of e-commerce by MSMEs is influenced not only by technical or technological factors but also by internal organizational factors and external environmental factors,

commonly conceptualized within the Technology–Organization–Environment (TOE) framework.

LIMITATIONS & FURTHER RESEARCH

The limitation of this study lies in the fact that it did not examine the organizational variable as an independent factor, even though the organization plays an important role as a business driver. This variable was not included because the MSMEs studied did not yet have a formal organizational structure that could be analyzed. For future research, it is recommended to examine e-commerce adoption by including variables that were not addressed in this study, such as internal factors, including organizational aspects. It is also suggested that future studies be conducted on larger-scale MSMEs that already have a formal organizational structure.

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