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The Influence of Technology, Organization, And Environment on MSMEs' Adoption of Digital Services in West Java: A Toe Model Analysis

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Abstract - *Digital applications have emerged as instrumental tools in driving the growth and sustainability of enterprises across various sectors. One of the sectors that has benefited is Micro, Small and Medium Enterprise (MSMEs). One of the telecommunication companies had assisted MSMEs promote digital transformation in Indonesia through their digital product. This research aimed to determine what factors influenced MSMEs companies in choosing and adopting digital products using Technology Organization - Environment (TOE) model. Data collection was performed using purposive sampling quantitative methods with a 4-point Likert scale. The respondents of the research were 139 respondents from Micro, Small, and Medium Enterprise (MSMEs) companies that were assisted by telecommunication companies based in West Java, Indonesia. The author concludes that the factors which had a significant contribution to MSMEs digital adoption in West Java were SMEs' firm sustainability, environment, and technology.*

Keywords - *Digital Transformation, MSMEs, TOE Model, Digital Adoption, Firm Sustainability*

I. INTRODUCTION

In today's dynamic business environment, digital applications have become indispensable tools for driving growth and ensuring sustainability across various sectors. This is particularly relevant for Micro, Small, and Medium Enterprises (MSMEs), which stand to gain significantly from integrating digital technologies into their operations. As the backbone of many global economies, MSMEs play a pivotal role in fostering innovation, creating employment opportunities, and promoting economic development. By adopting digital applications, these enterprises can enhance operational efficiency, expand market reach, improve financial management, foster innovation, promote sustainability, and build resilience against disruptions. These improvements not only contribute to the long-term sustainability of MSMEs but also empower them to thrive in an increasingly digitized economy.

Indonesia, the world's fourth most populous nation, has experienced rapid advancements in digital technology adoption. The widespread availability of smartphones, expanding internet access, and rising digital literacy have transformed how Indonesians engage with technology, leading to extensive use of digital applications across various sectors. Reference [1] shows that internet penetration in Indonesia has reached 78.19%, meaning nearly 78 out of every 100 Indonesians used the internet in that year. This sustained increase in digital platform usage, especially post-pandemic, has positively impacted economic activities, particularly benefiting the SME and MSME sectors, as highlighted in [9].

In 2023, data from the Indonesian Chamber of Commerce and Industry (KADIN Indonesia) revealed that approximately 66 million MSMEs business actors contribute 61% to Indonesia's Gross Domestic Product (GDP), equivalent to IDR 9,580 trillion, and employ around 117 million workers, accounting for 97% of the total workforce as highlighted in [11]. Given this substantial market size, MSMEs represent a prime target market for digital applications, offering immense potential for growth in Indonesia's digital economy. West Java is the province with the largest number of MSMEs in Indonesia.

Although MSMEs in Indonesia face challenges such as limited access to finance, low digital literacy, and complex regulations, which hinder their sustainability and adaptation to market changes. Addressing these requires coordinated efforts to improve financial access, digital adoption, and capacity building. This research aimed to determine

what factors influenced MSMEs companies in choosing and adopting digital products using Technology Organization - Environment (TOE) model. While common technology acceptance research has often explored the barriers and facilitators of technology adoption in the MSMEs sector, this paper offers a novel perspective by determining what factors influence in choosing and adopting digital products for MSMEs that were assisted by telecommunication companies.

II. LITERATURE REVIEW

A. Literature Review

1. Digital Platform Usage and Economic Impact

The increase in use of digital platforms has continued after the pandemic, having a positive impact on economic activity, especially in the Small and Medium Enterprises (SME) and Micro, Small and Medium Enterprises (MSME) sectors. Reference [9] shows this continued growth in digital engagement has facilitated significant economic progress in these sectors.

Digital marketing has emerged as a significant trend among micro, small, and medium enterprises (MSMEs), as it enables them to reach a broader and more targeted market. Reference [16] highlights that e-commerce is rapidly growing as a commercial trend, fueled by the increasing availability of internet access and widespread smartphone adoption. According to [12], 77% of MSMEs believe that marketplaces play a crucial role in marketing their products and maintaining sales, even during periods of restricted interaction such as the COVID-19 pandemic. Additionally, 75% of MSMEs view marketplaces as vital for attracting consumers due to various promotional programs, such as free shipping, cashback, and discounts.

2. Factors Influencing Technology Adoption in SMEs

Research shows that technology adoption in SMEs is influenced by various factors categorized into technological context, organizational context, and environmental context, as in [18]. These factors increase the perceived usefulness and ease of use of digital technology, ultimately leading to adoption by SME entrepreneurs, as in [6]. Key determinants of technology adoption include relative advantage, complexity, visibility of benefits to others, perceived costs, top management support, top management innovation, competitive pressure, government support, as in [23]. However, several factors such as compatibility, trial perception, and organizational readiness do not significantly influence technology use in SMEs, as in [22].

3. Technology-Organization- Environment (TOE)

Based on the bibliometric analysis conducted by the author, it was found that TOE emerges as a frequently used keyword in research related to technology adoption in SMEs. Additionally, an analysis was performed using Litmaps. Litmaps is a visualization tool used to illustrate the relationships between concepts and the connections between topics in scientific literature. Through Litmaps, researchers can visualize the conceptual network formed from literature relevant to the TOE framework. Studies related to SMEs that incorporate the TOE framework, include those by reference [4], [13], [19], [20], and [27].

Overall, the combination of bibliometric analysis and Litmaps provides strong support for the use of the TOE framework in this research. Both methods help clarify the relevance, significance, and theoretical structure of the framework in the context of technology adoption and implementation within organizations.

4. Hypothesis

The research model proposed above was developed for a hypothesis based on Technology - Organization - Environment (TOE) framework. The author's study hypothesis primarily concerns identifying technology, organization, and environment to SMEs Firm Sustainability and Digital application adoption The research-based hypotheses and their respective relationships: are listed below:

H1: Technology positively influences SME Firm Sustainability

Technology is essential for SME sustainability, as it enhances competitiveness, operational efficiency, and market reach. Studies show that technology adoption helps SMEs reduce costs, streamline processes, and adapt to environmental pressures, which promotes resilience and growth, as in [14] and [7].

H2: Technology positively influences Digital Application Adoption

Technological readiness is a key factor in digital application adoption. Accessible digital infrastructure allows firms to adopt tools that optimize processes and improve customer engagement. The Technology - Organization - Environment (TOE) framework supports the link between technological capability and application adoption, as in [21] and [24].

H3: Organization positively influences Digital Application Adoption

Organizational resources, such as skilled employees and leadership, significantly influence digital adoption. A supportive culture and adaptable structure facilitate the integration of digital tools that align with business goals, as in [2] and [25].

H4: Environment positively influences Digital Application Adoption

External factors like market demands, competition, and regulations drive digital application adoption. Firms in competitive or regulated environments adopt digital solutions to enhance efficiency and meet standards, as supported by the TOE framework, as in [5] and [10].

H5: Digital Application Adoption positively influences SME Firm Sustainability

Adopting digital applications helps SMEs improve efficiency, reach broader markets, and respond better to customer needs, all of which contribute to sustainable growth. Tools like CRM systems and e-commerce platforms enhance resource management and competitiveness, as in [2], [3], and [14].

B. Research Framework

This study was conducted using an online survey, the questionnaire was developed based on the TOE framework which includes indicators for Technology, Organization, Environment, Digital Application Adoption, and SME Firm Sustainability. The model is employed because the three dimensions are believed to have a significant impact on the adoption and implementation of information technology within an organization to assess how digital services are adopted and utilized by MSMEs.
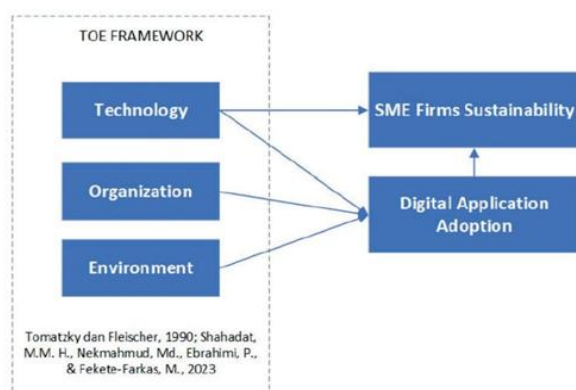

Figure 1 Research Framework of TOE

III. METHODOLOGY

This study was conducted over three months from January 2024 to March 2024 in West Java, involving MSMEs that have been assisted by telecommunication companies. According to West Java's Department of Cooperatives and Small Businesses (SME) data in 2023, it has been recorded that Based on 2023 data, the total projected number of MSMEs is 7,055,660 as shows in [17]. With the great potential of growth, West Java has been chosen as the target for the project research since it has a large number of SMEs (around six million), making it economically significant and representative. The region includes major industrial and trade centers and benefits from strong government support and infrastructure. The specific target of this study consisted of Indramayu, Karawang, Bandung Regency, West Bandung Regency, Cirebon Regency, Bandung, Cimahi City, Cirebon City - West Java.

The methodology for this study utilizes quantitative analysis, including validity and reliability testing, descriptive statistics, and an evaluation of the TOE model outcomes. The study commenced with the survey of exploration of Digital Application usage in various sectors, particularly those related to their activity in businesses. The survey questionnaire utilized likert scale 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree), included indicators such as technology, organization, environment, digital Application adoption, and SMEs firm sustainability. Prior to addressing the main indicators, initial questions were posed to identify respondent demographics, including business location, business segment, business duration, and number of employees. The following is the conceptual model developed for this research framework and the relationships between the variables.
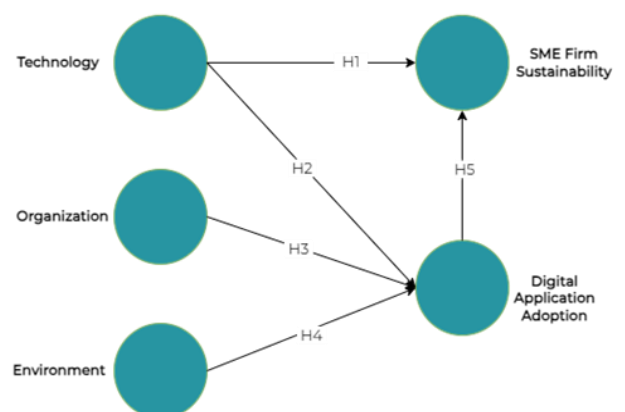

Figure 2 Proposed research model

Table I List of Proposed Hypothesis In the Research Model

Variable and Abbreviation	Hypotheses
Technology → SME Firm Sustainability	H1: Technology positively influences SME Firm Sustainability
Technology → Digital Application Adoption	H2: Technology positively influences Digital Application Adoption
Organization → Digital Application Adoption	H3: Organization positively influences Digital Application Adoption
Environment → Digital Application Adoption	H4: Environment positively influences Digital Application Adoption
Digital Application Adoption → SME Firm Sustainability	H5: Digital Application Adoption positively influences SME Firm Sustainability

The survey data will be analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS) to evaluate the effects of each indicator variable. If the p-value < 0.05, the correlation between the two variables is considered significant.

IV. FINDINGS AND DISCUSSION

A. Respondent Demography

This study gathered demographic information to provide an overview of the 139 respondents. According to the survey result, the majority of respondents are from Bandung Regency and Bandung City with smaller representations from other regions like Indramayu, Karawang, and Cirebon City. This distribution highlights a concentration of MSMEs in the Bandung area, which could be reflective of the region's economic activities and business environment.

B. SEM-PLS Result

This survey used the SEM-PLS 3.0 to identify the model, which includes functional value, emotional value, social value, trust, commitment, and collaboration.
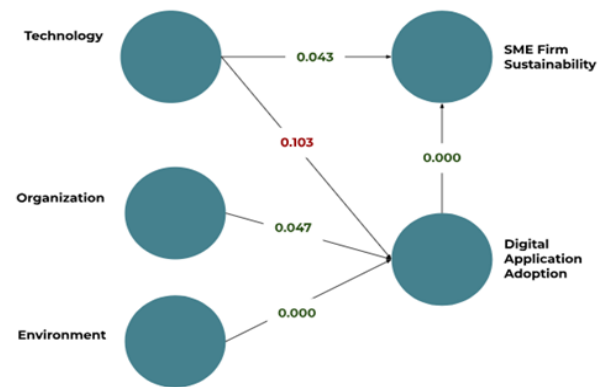

Figure 3 Research Model Result

C. Measurement Model

PLS was employed to identify causal relationships among latent variables, with SmartPLS 3.0 facilitating the modeling of Technology, SME Firm Sustainability, Organization, Environment, and Digital Application Adoption. This study adopts a reflective measurement approach, where reflective indicators provide a representative subset of all potential items within a construct's conceptual framework, as in [8]. Consequently, reflective indicators are interchangeable, exhibit strong correlations, and can be omitted without altering the construct's meaning, as in [8]. Reflective indicators were chosen here because changes in the latent construct are mirrored by changes in the manifest or observed variables.

In the reflective measurement model, several aspects must be assessed to ensure the model's fitness, including internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. The indicator reliability results are available in SmartPLS and can be observed through the 'outer loadings' values presented in Table II.

Table II Constructs and Indicators

Constructs and Indicators		Loading
Technology AVE = 0.537, CR = 0.870		
Adapting to implementing digital applications requires a short time	PC1	0.454
Easy implementation of digital applications in company activities	PC2	0.806
Information technology infrastructure is in line with the use of digital applications.	PCC1	0.834
The use of digital applications is very suitable for business operations	PCC2	0.880

Our company has a budget to adopt digital applications	FRA1	0.690
Our company, is financially ready and invested in the adoption of digital applications	FRA2	0.651
Organization AVE = 0.708, CR = 0.951		
Digital applications reduce operational costs and/or marketing communications	CE1	0.709
Digital applications save time in operational and marketing activities	CE2	0.818
Our employees can learn new technologies quickly	EC1	0.761
Employees are willing to use digital applications to complete work	EC2	0.876
Employees are willing to accept innovation and generate new ideas	EC3	0.904
Employees are able to use digital applications to communicate/transact with customers	EC4	0.872
Digital applications help us complete tasks quickly	RA1	0.891
Implementing digital applications increases business effectiveness and efficiency	RA2	0.882
Environment AVE = 0.779, CR = 0.946		
Digital applications enable companies to have a stronger competitive advantage	CP1	0.844
Digital Applications help to get new customers	CP2	0.894
Customers demand the use of digital applications for transactions	CP3	0.871
Digital applications help us monitor competitors' marketing activities	IP1	0.889
Digital applications help customers to get products easily	IP2	0.915
Digital Application Adoption AVE = 0.848, CR = 0.971		
Adoption of digital applications helps in improving the quality and quantity of production/services	DAA1	0.913
The adoption of digital applications	DAA2	0.936

improves a company's reputation		
Adoption of digital applications can increase operational efficiency	DAA3	0.917
Adoption of digital applications increases customer satisfaction	DAA4	0.943
Adoption of digital applications increases company profits	DAA5	0.935
Digital application adoption can adapt to changes in market behavior	DAA6	0.880
SME Firm Sustainability AVE = 0.816, CR = 0.957		
Digital applications increase market share	SFS1	0.869
Digital applications increase company productivity	SFS2	0.929
Digital applications help improve service to customers	SFS3	0.922
Digital applications increase sales turnover	SFS4	0.905
Digital applications help gain competitive advantage	SFS5	0.889

For indicator reliability, a value of 0.70 or above is generally recommended, though a threshold of 0.40 or higher is considered acceptable for exploratory studies as shown in [26]. Based on the results above, it shows that all indicators meet the minimum value for indicator measurement, so no indicators were removed.

The composite reliability (CR) should meet a threshold of 0.70 or above. Based on the results shown in Table 3, all variables showing a CR above this level, a strong internal consistency reliability is established across the five reflective latent variables. To ensure validity for all indicators, each item's convergent validity requires an AVE of at least 0.50, and the result in Table 3 confirms this criterion is met.

D. Hypothesis Result

According to the research model that has been generated by SEM-PLS, it can be resulted in Table III.

Table III Hypothesis Result

Hypotheses	Original Sample	T Statistic	P-Value	Result
H1: Technology positively influences SME Firm Sustainability	0.150	2.025	0.043	Moderate
H2 : Technology positively influences Digital Application Adoption	0.130	1.629	0.103	Insignificant
H3 : Organization positively influences Digital Application Adoption	0.231	1.986	0.047	Moderate
H4 : Environment positively influences Digital Application Adoption	0.619	7.293	0.000	Moderate
H5 : Digital Application Adoption positively influences SMEs Firm Sustainability	0.786	10.683	0.000	Moderate

Building on the hypothesis testing results, this study provides a comprehensive understanding of the factors influencing digital application adoption and SME sustainability in West Java. The analysis shows that technology has a moderate and significant positive effect on SME sustainability (H1, p = 0.043). This indicates that technological resources and advancements play an important role in supporting long-term business viability. However, when it comes to driving digital application adoption (H2, p = 0.103), technology does not show a significant effect. This suggests that while technology is essential for business sustainability, its mere availability is insufficient to encourage SMEs to adopt digital tools, pointing to the need for complementary factors such as organizational readiness and environmental pressures.

The study further reveals that organizational factors have a moderate positive influence on digital application adoption (H3, p = 0.047). This demonstrates that internal capabilities—such as managerial support, employee skills, and resource allocation—are critical for SMEs in implementing digital solutions. Nevertheless, the effect size remains moderate, highlighting that organizational structures alone cannot fully drive adoption without reinforcement from external conditions.

Among all the tested variables, environmental factors emerge as the strongest driver of digital application adoption (H4, p = 0.000). This underscores the importance of external influences, including market demands, competitive pressure, and regulatory frameworks, in shaping SMEs' decision to embrace digital transformation. The strong significance of this factor implies that supportive ecosystems and government policies are vital in accelerating digital adoption across SMEs.

Most notably, digital application adoption shows a strong and significant positive impact on SME sustainability (H5, p = 0.000). This finding confirms that digital adoption is not only beneficial but essential for enhancing SMEs' competitiveness, efficiency, and resilience in the long run. By integrating digital tools into their operations, SMEs can strengthen their market position and ensure sustainable growth.

V. CONCLUSION

The survey results provide a comprehensive overview of the demographic and sectoral distribution of MSMEs in West Java, particularly highlighting the concentration of enterprises in Bandung Regency and Bandung City. This geographic concentration suggests that these areas are key hubs for MSME activity, possibly due to favorable economic conditions and a supportive business environment.

The study concludes that technology supports SME sustainability but does not directly drive digital adoption. Instead, organizational readiness moderately influences adoption, while environmental factors are the strongest driver. Most importantly, digital application adoption significantly enhances SME sustainability, confirming that digitalization is a key determinant of long-term growth.

These findings collectively emphasize the need for targeted strategies that enhance technological capabilities and leverage environmental factors to support the continued growth and sustainability of MSMEs in West Java. The convergence of demographic concentration, sectoral dominance, and the driving forces of digital adoption provides a nuanced understanding of the current state and future prospects of MSMEs in the region.

VI. LIMITATION AND FUTURE RESEARCH

This study employed a purposive sampling method due to the difficulty in accurately identifying the number of MSMEs familiar with or already using digital applications. Time constraints limited data collection to a specific region, focusing only on West Java, Indonesia. It is therefore suggested that future research be conducted in more diverse and densely populated areas of Indonesia, such as Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek), to achieve more representative and comprehensive findings on the B2B business market across the country.

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APPENDIX A

Table 1. List of Survey Indicator

Variabel	Construct	Indicator
Technology	Perceived Complexity	PC1: Adapting to implementing digital applications requires a short time
		PC2: Easy implementation of digital applications in company activities
	Perceived Compatibility	PCC1: Information technology infrastructure is in line with the use of digital applications
		PCC2: The use of digital applications is very suitable for business operations
	Financial Resource Availability	FRA1: Our company has a budget to adopt digital applications
		FRA2: Our company, is financially ready and invested in the adoption of digital applications
Organization	Cost Effectiveness	CE1: Digital applications reduce operational costs and/or marketing communications
		CE2: Digital applications save time in operational and marketing activities
	Employee Competence	EC1: Our employees can learn new technologies quickly
		EC2: Employees are willing to use digital applications to complete work
		EC3: Employees are willing to accept innovation and generate new ideas
		EC4: Employees are able to use digital applications to communicate/transact with customers
	Relative Advantage	RA1: Digital applications help us complete tasks quickly
		RA2: Implementing digital applications increases business effectiveness and efficiency
Environment	Customer Pressure	CP1: Digital applications enable companies to have a stronger competitive advantage
		CP2: Digital Applications help to get new customers
		CP3: Customers demand the use of digital applications for transactions
	Industry Pressure	IP1: Digital applications help us monitor competitors' marketing activities

		IP2: Digital applications help customers to get products easily
Digital Application Adoption	Digital Application Adoption	DAA1: Adoption of digital applications helps in improving the quality and quantity of production/services
		DAA2: The adoption of digital applications improves a company's reputation
		DAA3: Adoption of digital applications can increase operational efficiency
		DAA4: Adoption of digital applications increases customer satisfaction
		DAA5: Adoption of digital applications increases company profits
		DAA6: Digital application adoption can adapt to changes in market behavior
SME Firm Sustainability	SME Firm Sustainability	SFS1: Digital applications increase market share
		SFS2: Digital applications increase company productivity
		SFS3: Digital applications help improve service to customers
		SFS4: Digital applications increase sales turnover
		SFS5: Digital applications help gain competitive advantage