

Information and communication technology among MSMEs: Drivers and Barriers

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ABSTRACT

There is an increasing trend of Information and Communication Technology (ICT) among micro, small, and medium enterprises (MSMEs) today. However, implementing ICT in MSMEs is still challenging due to financial and resource limitations. This study identifies and analyzes the driving and inhibiting factors affecting ICT implementation in MSMEs. Data from 175 MSMEs were analyzed using quantitative descriptive techniques in percentages and smart PLS for confirmatory factor analysis (CFA). Based on the analysis results, nine driving factors and eleven inhibiting factors for ICT adoption in MSMEs were found. Although much research has been conducted in the field of ICT, there is still a need to adjust strategies and policies that can support ICT adoption for MSMEs, especially in developing countries.

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1. INTRODUCTION

The integration of Information and Communication Technology (ICT) in Micro, Small, and Medium Enterprises (MSMEs) is an essential factor for their growth and competitiveness in the global market [1]. However, ICT adoption among MSMEs, especially in developing countries such as Indonesia, still needs to catch up [2]. Its slow adoption rate is due to barriers such as poor telecommunication infrastructure, limited ICT literacy, high ICT equipment costs, and incomplete government regulations for e-commerce [3]. Therefore, understanding the factors that drive and hinder ICT adoption among MSMEs in Indonesia [4].

In Indonesia, MSMEs play an essential role in the economy, contributing to

job creation and economic growth. In Cilacap Regency, the MSMEs sector has experienced a positive trend over the past five years, with an increase of 5% annually. Despite this growth, many regional MSMEs still need to improve in adopting ICT, which hinders their ability to compete effectively in the market [5]. Based on Open Knowledge Maps [6], research on ICT adoption among SMEs in Indonesia is still rare, and it has yet to be conducted on SMEs in Central Java. Most of the existing research focuses on general barriers to ICT adoption among MSMEs without providing a detailed analysis of the specific challenges faced by MSMEs in different regions of Indonesia. This gap in the literature underscores the need for more focused research on ICT adoption among MSMEs in specific regions of Indonesia [7].

This research is timely and relevant, given the increasing importance of ICT in improving the competitiveness of SMEs in today's digital era [8]. The proposed Information and Communication Technology research among MSMEs in Indonesia aims to fill this gap. The research identifies what ICTs MSMEs are already using, the specific drivers and barriers to ICT adoption among MSMEs, and provides valuable insights that can be used for stakeholders and government to consider in making policies and strategies to promote ICT adoption among MSMEs in Central Java, Indonesia.

2. LITERATURE REVIEW

2.1 *Definition and importance of MSMEs*

MSMEs in Indonesia are categorized based on their business capital or annual sales [9]. Based on capital, micro-enterprises are businesses with a business capital of up to a maximum of Rp1,000,000,000 (one billion rupiahs), excluding land and buildings of the business premises. Small enterprises are those with a business capital of more than Rp1,000,000,000 (one billion rupiahs) up to a maximum of Rp5,000,000,000 (five billion rupiahs), excluding land and buildings of the business premises. Medium-sized enterprises have a business capital of more than Rp5,000,000,000 (five billion rupiahs) up to a maximum of Rp10,000,000,000 (ten billion rupiahs), excluding land and buildings of the business premises.

MSMEs are critical to the health and dynamism of the Indonesian economy. Their contribution to job creation is significant for a large portion of the labor force, helping to reduce unemployment rates and improve living standards [10]. MSMEs contribute significantly to Indonesia's Gross Domestic Product [11]. MSMEs often operate in local communities, contributing to the local economy and supporting community development.

Many MSMEs engage in social responsibility practices, support local causes, and contribute to the social fabric of their communities. MSMEs contribute to the diversification of the economic base, reducing communities' dependence on large firms and specific industries. A diversified economic base makes the economy more resilient to shocks and downturns. Many MSMEs carry out export activities, thus contributing to the country's trade balance and international economic relations [12].

2.2 *ICT Transformation in MSMEs*

Information and Communication Technology (ICT) transformation in Micro, Small, and Medium Enterprises (MSMEs) has been a significant focus recently. MSMEs are encouraged to introduce new technologies due to various requirements and changes in the business environment. Introducing new technologies is challenging for MSMEs due to limited resources and the complexity of technological transformation [8]. However, adopting ICT is critical for MSMEs to remain competitive over time. The challenge is for these companies to strategically adopt and incorporate ICT into their organizations [13].

Various ICTs can be utilized by MSMEs to improve their marketing performance and competitiveness, including cloud computing [14] digital payment [15], marketplace [16], blockchain and AI tools [17], e-commerce [18], websites, email marketing, affiliate marketing, and online advertising [19], social media [20], mobile phone [21]. Applying these technologies can help MSMEs produce new products, reach new markets, and improve their business performance. However, for adequate ICT implementation in MSMEs, it is essential to determine the right technology, economically and culturally, about the resources available in the firm.

Table 1. Drivers of ICT Adoption

Drivers		Type of ICT	Source
1	Cost-effectiveness	Cloud computing	Neicu et al. (2020)
2	Flexibility, and operational efficiency		
1	Efficient and relatively safe	Digital payment	Setyanto & Sunarjo (2021)
2	Increase consumer confidence		
1	Accessible and efficient transactions	Marketplace	Sulasih et al. (2022)
1	Optimize the supply chain	Blockchain	Mishrif & Khan (2023)
2	Encourage the innovation process	AI tools	
1	Grow market share and customers	E-commerce	Gao et al. (2023)
1	Attract new customers	Websites	Bruce et al. (2023)
1	Promote products	Email marketing	
1	Go outside the market	Affiliate marketing	
1	Attract new customers	Online advertising	
1	Maintaining communication with consumers	Social media	Sulasih et al. (2024)
2	Marketing tool		
1	Promotes better communication	Mobile phone	Mushi (2024)
2	Simple and easy to use		

2.3 Drivers and inhibitors of ICT adoption in MSMEs

Various factors influence the adoption of Information and Communication Technology in MSMEs. Understanding these driving and inhibiting forces is critical for MSMEs to effectively navigate the digital landscape and utilize ICT for their growth and competitiveness. Businesses use ICT for different purposes, some described in Table 1. In addition to its benefits, ICT also has challenges or barriers for businesses, as shown in Table 2.

3. METHODS

This study used a descriptive quantitative method. Data was collected using an online questionnaire instrument, which consists of 16 driving factors and 19 inhibiting factors for ICT use. The number of samples for this study was 175 MSMEs of the Fashion, Culinary and Craft Creative Industries in Central Java, Indonesia. The sampling techniques used were accidental sampling and purposive sampling. The questionnaire measurement used a Likert scale consisting of (1) strongly disagree, (2) disagree, (3) moderately agree, (4) agree, and (5) strongly agree. The data were analyzed using descriptive statistics and presented in percentage form and using Confirmatory Factor Analysis / CFA [22].

Table 2. Barriers to ICT Adoption

Barriers		Type of ICT	Source
1	Data security and privacy concerns	Cloud computing	Neicu et al. (2020)
2	Provider support		
1	Weak formal institutions and legal structures.	Digital payment	Setyanto & Sunarjo (2021)
1	Risk of online transactions	Marketplace	Sulasih et al. (2022)
2	Limited skills and knowledge		
1	Financial limitations	Blockchain	Mishrif & Khan (2023)
2	Limited knowledge	AI tools	
1	Financial limitations	E-commerce	Gao et al. (2023)
2	Limited skills and knowledge		
1	Financial limitations	Websites	Bruce et al. (2023)
2	Technical skills limitation		
1	Skill limitation	Email marketing	

1	Difficulty managing partnerships	Affiliate marketing	
1	Financial limitations	Online advertising	
2	Limited technical skills		
1	Difficulty determining exciting topics and content	Social media	Sulasih et al. (2024)
2	Difficulty determining customer segments		
1	Financial limitations	Mobile phone	Mushi (2024)
2	Limited skills and knowledge		

Table 3. Respondent Characteristics

Category	Characteristics	(%)
Gender	Male	29
	Female	71
Education	Elementary school	6
	Junior high school	10
	Senior high school	32
	Associate expert	11
	Bachelor's degree	37
	Master's degree	4
	Type of business	Culinary
Fashion		9
Craft		3
Length of business	1-3	38
	4-6	22
	7-9	22
	>9	18

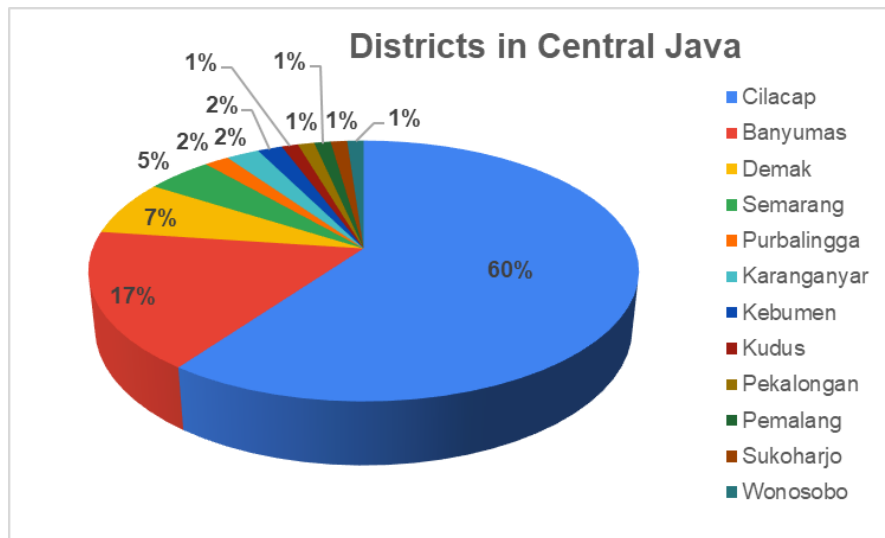


Figure 1. Respondent areas of MSMEs in Central Java

4. RESULTS AND DISCUSSION

Respondent Characteristics. Seventy-one percent (71%) of MSME actors in Central Java are dominated by women, with 37% having a Bachelor's degree and culinary

businesses. As mentioned in Table 3, most MSME businesses are only 1 - 3 years old. Most respondents came from Cilacap Regency (60%) and Banyumas Regency (17%); the rest were from other districts in Central Java, as shown in Figure 1.

Table 4. Factors driving the use of ICT by Central Java MSMEs

Factor	(%)
Smartphones are simple and easy to use for marketing	87
Smartphones promote better communication with consumers	89
My MSME uses social media as a marketing tool	86
My MSME uses social media to maintain communication with consumers	90
My MSME uses online advertising to attract new customers	79
My MSME uses affiliate marketing to expand the market	38
My MSME uses email marketing to conduct marketing	14
My MSME uses a website to attract new customers	22
My MSME uses e-commerce to increase the number of customers and market share	19
My MSME uses Artificial Intelligence to drive the innovation process	19
My MSME uses a marketplace because transactions are more efficient	83
My MSME uses digital payments to increase consumer confidence	87
My MSME uses digital payments because it is more efficient and relatively safe	87
My MSME uses cloud computing for cost-effectiveness	31
My MSME uses cloud computing for operational flexibility and efficiency	13
My MSME uses Blockchain to optimize the supply chain	14

Identification of Driving Factors.

The driving factors for MSMEs in Central Java to use ICT can be seen in Table 4. Most MSMEs in Central Java use smartphones to improve consumer communication (89%).

Social media is still the leading tool for MSMEs in Central Java in marketing compared to other ICTs (86%) and is used to maintain communication with consumers (90%).

Table 5. Factors inhibiting the use of ICT by MSMEs in Central Java

Factor	(%)
My MSME is concerned with data security and privacy when using cloud computing	42
My MSMEs need to learn more about cloud computing providers and the facilities they provide	85
The legal structure and formal institutions governing digital payments must still be more vital	85
There is still a high risk in online transactions in the marketplace	83
My MSME needs to gain more skills and knowledge in using the marketplace	79
My MSME has financial limitations when it comes to using Blockchain	45
My MSME needs to gain more knowledge of artificial intelligence	38
My MSME has financial limitations when it comes to using e-commerce	85
My MSME needs more skills and knowledge to use e-commerce	42
My MSME has financial limitations when it comes to using websites	85
My MSME needs more technical skills to use the website	85
My MSME needs to gain more skills in using email marketing	43
My MSME needs help managing affiliate marketing partnerships	45
My MSME needs more financial resources to use online advertising	85
My MSME needs more technical skills to use online advertising	85
My MSME needs help determining exciting topics and content when using social media	83
My MSME needs help determining customer segments by using social media	79
My MSME has financial limitations when purchasing a smartphone	25
My MSME needs to gain more skills and knowledge in using smartphones	17

Identification of Barriers. MSMEs still face many barriers in Central Java in using ICT, as shown in Table 5. The main barrier is financial limitations in online advertising, websites, and e-commerce (85%). Moreover, they need more technical skills to use online advertising and websites (85%).

MSME performance. ICT use affects MSMEs' performance in Central Java, as shown in Table 6. MSMEs' sales, profits, assets, and equity increased after using ICT.

Table 6. Performance of MSMEs in Central Java

Performance	(%)
The use of ICT increases MSMEs' sales	86
The use of ICT increases MSME profits	86
The use of ICT increases the equity of MSMEs	87
The use of ICT increases MSME assets	86

Table 7. Validity and Reliability of ICT Adoption Drivers

Driver Factors		
Question	Outer Loading	Validity
D1	0,739	Valid
D2	0,790	Valid
D3	0,821	Valid
D4	0,798	Valid
D5	0,849	Valid
D6	0,531	Invalid
D7	0,572	Invalid
D8	0,717	Valid
D9	0,678	Invalid
D10	0,658	Invalid
D11	0,755	Valid
D12	0,735	Valid
D13	0,802	Valid
D14	0,698	Invalid
D15	0,697	Invalid
D16	0,561	Invalid
Barrier Factors		
Question	Outer Loading	Validity
B1	0,536	Invalid
B2	0,871	Valid
B3	0,829	Valid
B4	0,742	Valid
B5	0,765	Valid
B6	0,688	Invalid
B7	0,539	Invalid
B8	0,786	Valid
B9	0,531	Invalid
B10	0,782	Valid
B11	0,783	Valid
B12	0,478	Invalid
B13	0,605	Invalid
B14	0,865	Valid
B15	0,826	Valid
B16	0,742	Valid
B17	0,762	Valid
B18	0,332	Invalid
B19	0,355	Invalid

Validity of Drivers and Barriers to ICT Adoption. CFA estimation results as in Table 7, for the driving factors of ICT adoption in MSMEs in Central Java, there are seven invalid factors, outer loading <0.7. Factors

inhibiting ICT adoption in MSMEs in Central Java also have eight invalid factors, outer loading <0.7.

Reliability of ICT Adoption Drivers and Barriers. Based on the analysis results

contained in Table 7, all invalid data were removed. Only valid data is used and analyzed again, as shown in Table 8. It can be concluded that the AVE value of all constructs

is > 0.5, and the CR value of all constructs is also > 0.7. This indicates that all constructs have met the required composite reliability requirements.

Table 8. Construct Realibility and Validity

No	Factor	Cronbach's Alpha	rho_As	Composite Reliability (CR)	Avergae Variance Extracted (AVE)
1	Driver	0,954	0,998	0,957	0,671
2	Barrier	0,934	0,943	0,946	0,665

Table 9. Valid and Reliable ICT Adoption Drivers

Driver Factor	Author
My MSME uses social media as a marketing tool	Sulasih et al. (2024)
My MSME uses social media to maintain communication with consumers	
Smartphones promote better communication with consumers	Mushi (2024)
Smartphones are simple and easy to use for marketing	
My MSME uses digital payments to increase consumer confidence	Setyanto & Sunarjo (2021)
My MSME uses digital payments because it is more efficient and relatively safe	
My MSME uses a marketplace because transactions are more efficient	Sulasih et al. (2022)
My MSME uses online advertising to attract new customers	Bruce et al. (2023)
My MSME uses a website to attract new customers	

Based on the data processing results in Table 7, out of 16 factors driving ICT adoption in MSMEs in Central Java, only nine are valid and reliable, as shown in Table 9. In line with the research results of Sulasih et al. [20], MSMEs in Central Java use social media to maintain communication with consumers and as a marketing tool. Smartphones are still a mainstay for MSMEs for marketing and improving communication with consumers, according to the results of Mushi research [21]. MSMEs in Central Java use digital payments because transactions are more accessible, efficient, and relatively safe, which aligns with the results of research on digital payments conducted by Setyanto and Sunarjo [15]. In addition, in marketplaces, such as the results of research by Sulasih et al. [16], MSMEs in Central Java also tend to use the marketplace because transactions are more accessible for MSMEs. Few MSMEs in Central Java still use websites and online advertisements. However, MSMEs strongly agree that websites and online advertisements can attract new customers, as stated in the research of Bruce et al. [19].

As for the inhibiting factors for ICT adoption in MSMEs in Central Java, based on the results of data processing Table 7 of the 19 inhibiting factors, only 11 are valid and reliable, as shown in Table 10. In line with Sulasih et al. [16], MSMEs still have skills and knowledge constraints in using the marketplace, and the risk of online transactions on the marketplace is still high. Digital payments are also similar to Setyanto and Sunarjo [15], which shows that the legal structure and formal institutions governing digital payments still need to be stronger. The barriers to using social media are also in line with the research of Sulasih et al. [20]; namely, MSMEs need help determining attractive segments and topics. Cloud computing is still new to MSMEs in Central Java, and many MSMEs have yet to receive information regarding cloud computing providers and the facilities they provide [14]. Financial limitations and technical skills are fundamental barriers for MSMEs in Central Java to use e-commerce [18], websites, and online advertising [19].

Table 10 . Valid and Reliable ICT Adoption Barriers

Barrier Factor	Author
My MSMEs need to learn more about cloud computing providers and the facilities they provide	Neicu et al. (2020)
The legal structure and formal institutions governing digital payments must still be more vital	Setyanto & Sunarjo (2021)
There is still a high risk in online transactions in the marketplace	Sulasih et al. (2022)
My MSME needs to gain more skills and knowledge in using the marketplace	
My MSME has financial limitations when it comes to using e-commerce	Gao et al. (2023)
My MSME has financial limitations when it comes to using websites	Bruce et al. (2023)
My MSME needs more technical skills to use the website	
My MSME needs more financial resources to use online advertising	
My MSME needs more technical skills to use online advertising	
My MSME needs help determining exciting topics and content when using social media	Sulasih et al. (2024)
My MSME needs help determining customer segments by using social media	

5. CONCLUSION

Descriptive statistical analysis and CFA revealed the driving factors behind ICT adoption by MSMEs in Central Java. However, in addition to these driving factors, they face constraints in using ICT. Despite these constraints, ICT has been shown to play an essential role in improving the performance of MSMEs. Therefore, MSMEs must continue learning and adapting to using ICT to overcome the challenges.

The limitation of this study is the uneven number of samples in each district and city in Central Java, making it impossible to generalize the results. Suggestions for future research are to use a more evenly distributed sample, not piling up in one

region. Add more sample areas, not only from Cilacap, Banyumas, Demak, Semarang, Purbalingga, Karanganyar, Kebumen, Kudus, Pekalongan, Pemalang, Sukoharjo, and Wonosobo regencies.

Cloud computing, blockchain, e-commerce, and websites are still unfamiliar to MSMEs in Central Java. Suggestions for further research focus on ICTs commonly used by MSMEs in Central Java, such as digital payments, social media, smartphones, marketplaces, and online advertising. They are analyzing ICT, which is widely used so that it can provide more detailed and in-depth insight into its use. The study results can help business people who use social media to improve their business performance.

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