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Article

The antecedents of cloud computing adoption and its consequences for MSMEs' performance: A model based on the Technology-Organization-Environment (TOE) framework

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INFORMATION & TECHNOLOGY MANAGEMENT | RESEARCH ARTICLE

The antecedents of cloud computing adoption and its consequences for MSMEs' performance: A model based on the Technology-Organization-Environment (TOE) framework

Frank Aligarh^{1*}, Bambang Sutopo² and Wahyu Widarjo²

Abstract: The utilization of cloud computing technology by Micro, Small and Medium Enterprises (MSMEs) businesses has become increasingly widespread. The reason for this trend is the relatively low cost in comparison to the benefits derived, which has led to a continued adoption of cloud computing. Consistent with this, the objective of this study is to investigate the factors that influence the adoption of cloud computing and its impact on MSMEs performance. An integrated model was developed based on the Technology-Organization-Environment (TOE) framework, which combines the elements of cloud computing adoption and micro and small business enterprise performance into a single model. The data for this study was obtained through a structured survey questionnaire administered to 197 owners/managers of MSMEs in Indonesia. The results obtained through SEM-PLS analysis indicate that factors such as relative advantage, organizational readiness, bandwagon effect, competitor pressure, computer self-efficacy, and computer anxiety significantly influence the adoption of cloud computing. However, the factors of

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PUBLIC INTEREST STATEMENT

MSMEs provide a foundation for Indonesia's economy. The way MSMEs conduct business has evolved as a result of technological advancements. MSMEs in Indonesia, as opposed to large businesses, can employ cloud computing to manage business operations. However, Indonesia still has a small number of MSMEs using cloud computing. In order to determine the drivers of cloud computing adoption and how it affects MSME performance, this study tested the TOE framework combined with individual factors. The findings indicate that, with the exception of the support for complexity and top management, all hypotheses are validated. MSMEs believe cloud computing is very user-friendly and doesn't add complexity. Meanwhile, the reason why MSMEs in Indonesia are not encouraged is due to the ambiguity of their role and organizational hierarchy. The addition of individual characteristics in this study helps the TOE framework become more comprehensive.

complexity and top management support were found to have no significant effect on cloud computing adoption. This research provides a theoretical contribution to the expansion of the TOE Framework.

Subjects: Information & Communication Technology (ICT); Small Business Management

Keywords: TOE; cloud computing adoption; MSMEs performance; Indonesia

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are essentially the driving force of the Indonesian national economy, given their greater number compared to large companies (Ridwan Maksum et al., 2020). These enterprises are dispersed throughout rural areas and have significant growth potential. According to data from the Ministry of Cooperatives and Small and Medium Enterprises in 2016, MSMEs contributed 62.57% of the national GDP, which amounted to 521,360,523,965,465 USD. MSMEs play a vital role in the national economic system by generating employment opportunities, increasing labor demand, and contributing to the gross domestic product (GDP).

Massive technological advancements are undoubtedly impacting the business processes of MSMEs in Indonesia. Technologies such as Social Networks, Semantic Web, embedded systems, Internet of Things (IoT), virtualization technologies, and cloud computing have been widely adopted by MSMEs worldwide (Alshirah et al., 2021; Ben-Daya et al., 2019; Khayer et al., 2020). The diverse range of technologies available necessitates adaptability from users, particularly MSMEs, when adopting new technologies. There has been extensive research on technology adoption in the context of MSMEs, including big data (Maroufkhani et al., 2020), social media (Eze et al., 2021; Oyewobi et al., 2022; Tajudeen et al., 2017), intelligent agent technology (Alsetoohy et al., 2019), accounting information systems (Lutfi et al., 2020; Ruivo et al., 2014b), and cloud computing (Ayoobkhan & Asirvatham, ; Khayer et al., 2020; Ray, 2016).

The process of technology adoption in MSMEs differs from that of large companies, as MSMEs have limited capital capabilities and lower technology acceptance compared to larger companies. Enterprise Resource Planning (ERP) is often used by larger companies due to their size and complex business processes, while the adoption of ERP by MSMEs would result in significant costs (Alsharari et al., 2020; Kharuddin et al., 2015). Additionally, MSMEs typically have simpler business processes compared to larger companies. Cloud computing is one technology that can be adopted by MSMEs, with its application in Indonesia being able to provide similar benefits to ERP, but with simpler business processes. Cloud computing has gained more attention in recent years in both the private and public sectors, as it can increase company capacity by providing services on a pay-per-use basis, allowing companies to adjust their use of IT resources (Ooi et al., 2018). Digitalization and automation in production, coupled with cloud computing, provide agility, flexibility, and productivity. Many application developers in Indonesia offer cloud computing services for MSMEs, although not all MSMEs are willing to adopt this technology. This study aims to identify the factors that influence cloud computing adoption and close this gap.

In the process of adopting cloud computing, an appropriate framework is needed to contribute both theoretically and practically. Several studies regarding technology adoption have used theories such as Unified Theory of Acceptance and Use of Technology (UTAUT) (Ammar & Ahmed, 2016; Rahi et al., 2020), Technology Acceptance Model (TAM) & Theory of Planned Behavior (TPB) (Awa et al., 2015; Salimon et al., 2021), Stimulus-Organism- Response (SOR) (Tak & Gupta, 2021; Yuan et al., 2020), and Technology-Organization-Environment (TOE) (Dadhich & Hiran, 2022; Khayer et al., 2020).

The study focuses on MSMEs in Indonesia and uses the organizational analysis unit. Theoretical frameworks such as TAM and TOE are applicable in organizational contexts. Although research on

the TOE framework has primarily focused on exploring technology adoption (Lutfi, 2022; Maroufkhani et al., 2020; Salimon et al., 2021), the current study proposes integrating individual factors like computer self-efficacy and anxiety into the TOE framework. The study investigates the impact of cloud computing adoption on MSMEs' performance.

The purpose of this study is to examine the antecedents and consequences of adopting cloud computing in Indonesian MSMEs by integrating individual factors into the research model. This research contributes theoretically to the development of TOE integrated with individual factors and testing the consequences of adopting cloud computing. Practical contributions are also obtained by providing information to MSME actors about the factors that cause people to want to use cloud computing technology.

2. Literature Review

2.1. Technology-Organization-Environment (TOE)

Tornatzky and Fleischer first introduced the concept of Technology-Organization-Environment (TOE) in 1990 to describe the phenomenon of technology adoption in organizational analytical units. Several instances of continuously innovating TOE are (Khayer et al., 2020; Putratama & Ali, 2020; Qalati, Yuan, et al., 2021; Tajudeen et al., 2017) The TOE framework explains that the conditions of technical progress, organizational structure, and industrial environment influence how acceptable an information system is. In addition, TOE is the sole theoretical framework that takes into account all the driving forces that can have an impact on information system adoption initiatives, according to (Owusu, 2020) the TOE framework essentially integrates a framework of organizational considerations, environmental factors, and technological factors (Qalati, Yuan, et al., 2021). The organization's relevant internal and external technologies are alluded to as technological factors. An organization's size, scope, managerial structure, and internal resources are examples of organizational factors. Industry, rivals, and governmental regulations are examples of environmental factors.

The dependence of adoption on technology, both from outside and inside the business, is explained by technological variables. he constructs that are often used to explain construct technology factors are relative advantage, compatibility (both technical and organizational), complexity, triability (trial/experiment), and observation (visibility/imagination). Some research also uses other constructs to explain this technological factor, including adoption costs affordability, availability of source code, feature completeness, collaborative development, and so on (Bhardwaj et al., ; Haneem et al., 2019; Shree et al., 2021).

Organizational factors, explaining the scope of the company's business such as top management support, organizational culture, the complexity of the managerial structure, formalization, differentiation, quality of human resources, and problem size (Ibrahim & Shahzad, ; Wu & Chen, 2014). Tornatzky and Fleischer (1990) revealed that from the results of previous studies the constructs that were often used were the role of informal relations and communication among employees, the quality of human resources, top management leadership behavior, internal slack resources, and organizational size.

Environmental factors are factors related to facilities and factors inhibiting company operations such as competitor pressures, customers, socio-cultural issues, government encouragement, and technological infrastructure such as consulting services through ICT. Tornatzky and Fleischer (1990) identified constructs in environmental factors, namely industry characteristics, government regulations, and technology supporting infrastructure. Industry characteristics consist of competitive pressure and pressure from competitors. Competitive pressure is pressure that arises from the threat of losing or maintaining a competitive advantage, which forces organizations to adopt new technologies as an alternative to current organizational strategies. Government regulatory

support in several previous studies was considered as the main environmental factor influencing technology adoption within the TOE framework (Naser et al., 2022; Spinelli, 2016).

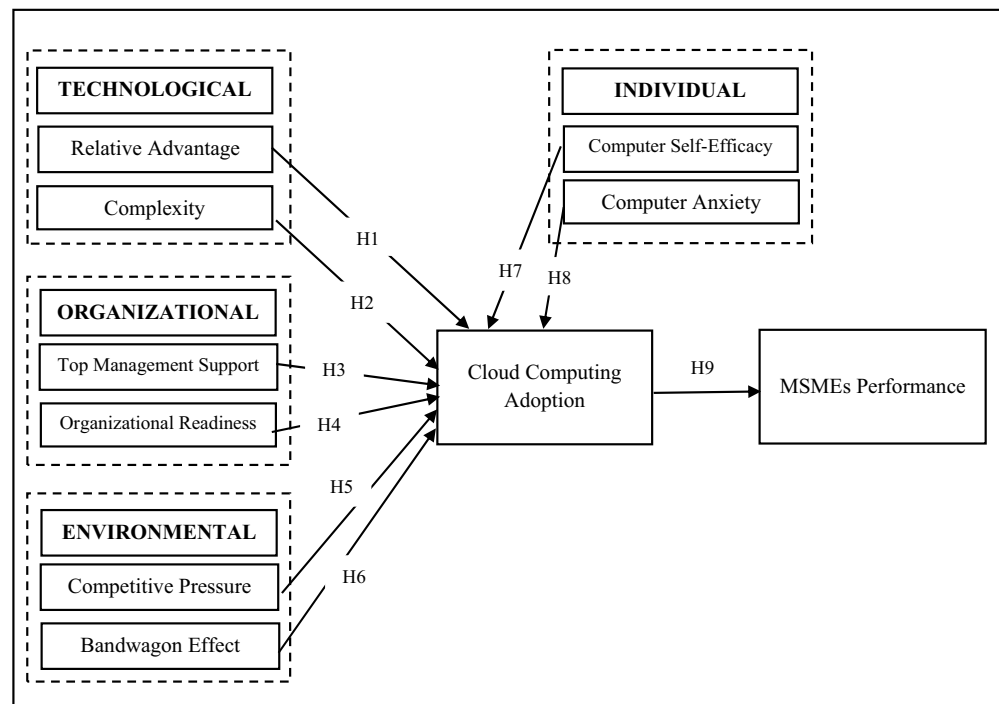
2.2. Extension TOE framework

The TOE framework can be expanded by incorporating individual components (Awa et al., 2017; Khayer et al., 2020; Venkatesh et al., 2012). According to Venkatesh et al. (2012), specific models can be modified and extended to explain the reasons for adopting particular technologies. This study proposes two personal factors: computer anxiety and computer self-efficacy. Both models are variations of the individual aspect, with computer self-efficacy defining a person's behavior pattern, available energy, and time required to overcome a particular obstacle, while computer anxiety refers to "the level of anxiety, or even terror, a person experiences when considering using a computer." Organizational analysis units primarily use the TOE framework (Gangwar et al., 2014), but this study takes individual aspects into consideration as a reflection of the owner/manager's technology acceptance (Malik et al., 2020; Nandankar & Sachan, 2020; Nguyen et al., 2022). Figure 1 illustrates the addition of individual factors to the TOE framework with the aim of producing a robust model, particularly in the context of technology adoption in MSMEs. The existence of these two variables will enhance our ability to explain the factors influencing technology adoption. Small and micro enterprises rely heavily on their proprietors, and the management and owner play a crucial role in the decision to adopt technology, making these two structures essential.

2.3. Hypothesis development

The degree to which the desired properties of the technology are recognized is referred to as a technological factor. Relative advantage is one of the aspects that might be felt from technological adoption, according to the innovation diffusion theory. Relative advantage describes how much an innovation is seen as being superior than the concept it replaces (Tajudeen et al., 2018). According to this study's authors (Harun & Tajudeen, 2021; Khayer et al., 2020; Qalati, Yuan, et al., 2021), using cloud computing technology will save expenses, free up business time, boost sales and productivity, and provide chances to utilise shared resources. MSMEs' adoption of cloud computing will increase the effectiveness of operational duties. MSMEs want to utilize cloud computing more, the bigger the relative advantage. Therefore the proposed hypothesis is:

Figure 1. Proposed Model.



H1: Relative advantage has positive effect on cloud computing adoption

The next technological characteristic is complexity. Complexity is defined as the perceived level of innovation, something that is relatively difficult to understand and use. The more complex the innovation is, the lower the level of acceptance. If the use of information technology systems can be shown in the context of acceptance of innovation, then these results support a negative relationship between complexity and the use of information technology systems. Complexity has a negative relationship when it comes to adopting a new innovation, the lower the level of complexity, the faster the innovation will be adopted. Conversely, the more complicated the innovation, the more difficult it will be to adopt (Bauer et al., 2005). Several previous studies have stated that complexity is a driving factor for technology adoption (AlBar & Hoque, 2019; Trawnih et al., 2021). Thus, the following hypothesis is developed:

H2: Complexity has negative effect on cloud computing adoption

The level of managers' technological awareness and acceptance of the new technologies being deployed is referred to as top management support (Maroufkhani et al., 2022). MSMEs have a variety of structures throughout nations, and their structures differ. In Indonesia, MSMEs frequently have a straightforward and centralized organization. Chief Executive Officers (CEOs) are frequently the owners of MSMEs themselves. Top management (CEO/Owner/Manager) will therefore be actively involved in the technology adoption process with relation to strategic, tactical, and operational decisions (Khayer et al., 2020). This is considered important to ensure that organizational members are committed to accurately implementing available resources and successfully leveraging cloud computing in solving the complexities that arise from natural resistance to the use of technology (Lutfi, 2022; Qalati, Yuan, et al., 2021). Several previous studies have stated that top management support can positively influence technology adoption such as SaaS (Oliveira et al., 2019), master data management (Haneem et al., 2019), enterprise resource planning (Awa et al., 2016). Therefore the proposed hypothesis is:

H3: Top management support has positive effect on cloud computing adoption

Organizational Readiness shows how an organization prepares everything related to the goals to be achieved. This is related to facilitating conditions which are the level of individual confidence that technical and organizational infrastructure exists to support everything in the use of a system or technology (Venkatesh et al 2003). Organizational and technical infrastructure is an important key to the success of information technology systems that are being developed or adopted by companies (Khayer et al., 2020). In the context of MSMEs, facilitating conditions may include IT infrastructure, internet connection, IT skills, and being compatible with current business processes. The better the facilitating conditions will increase the ability to adopt cloud computing in an MSME. The implementation of technology adoption can be said to be successful when the wealth or resources of an organization are fully supported in the motivation from the start and also the effort in implementing the technology (Aboelmaged, 2014). The term resource readiness places more emphasis on the flexibility that an organization has to configure and reconfigure its resources to facilitate digital innovation needs. This can be interpreted as the flexibility of a set of finance, technology, and human resources that provide the basis on which digital information can be provided. Another study found that organizational readiness and management support factors were significant facilitators of technology adoption (Oliveira et al., 2019; Ruivo et al., 2014b).

H4: Organizational readiness has positive effect on cloud computing

Competitive pressure refers to feelings of pressure that force companies to adopt new technologies that enable them to survive (Seo et al., 2020). In the context of MSMEs, it is stated that the higher the level of organizational pressure to compete, the more responses will be generated. Meanwhile, the bandwagon effect refers to a psychological term, namely the contagion effect. Qalati, Yuan, et al. (2021) explain that this effect arises when a product increases in demand because of other people, when a certain technology is used, certain companies will follow the usage trend. The higher the competitive pressure effect and the bandwagon effect will increase the tendency to adopt computing. So the proposed hypothesis is:

H5: Competitive pressure has a positive effect on cloud computing adoption.

H6: Bandwagon effect has positive effect on cloud computing adoption.

Computer self-efficacy refers to a person's level or belief in his own ability to complete a task (Salimon et al., 2021). Self-Efficacy determines the pattern of behavior shown by the individual, the amount of energy that is deployed, and the time that will be devoted to overcoming the challenges given. This is in line with research (Ozturk et al., 2016) which explains that individuals who have a high level of self-efficacy are likely to perceive challenging tasks as what they should do. In the context of this research, it will focus on the level of self-efficacy at the decision-making level in MSMEs. Increasing levels of self-efficacy will provide confidence for the adoption of new technologies such as cloud computing (Khayer et al., 2020) and m-commerce (Salimon et al., 2021). Then the proposed hypothesis is

H7: Computer Self-Efficacy has positive effect on cloud computing adoption

Anxiety is considered as the main factor that determines the intention to adopt information technology (Salimon et al., 2021). Excessive anxiety in the use of new technology is the cause of failure to use new technology. Anxiety is a construct derived from the Technological Acceptance Model (TAM) 3 (Venkatesh & Bala, 2008). In the context of TAM 3 anxiety is a condition of fear when faced with new technology. In the context of this research, anxiety is measured at the level of decision makers in MSMEs. The higher the level of anxiety will increase the resistance to the adoption of new technology, in this case cloud computing. So the hypothesis proposed is:

H8: Computer Anxiety has negative effect on cloud computing adoption

Cloud computing adoption certainly does not only stop at the usage level but also has logical consequences for the performance of micro and small business. Cloud computing is a resource that enables MSMEs to gain a competitive advantage (Qalati, Yuan, et al., 2021). Micro and small business performance is the main output from the adoption of new technology. Effective adoption and alignment of IT can improve company performance. The better adoption of cloud computing not only improves the performance (Khayer et al., 2020) but also business continuity (Lutfi et al., 2022). The proposed hypothesis is:

H9: Cloud computing has positive effect on MSMEs performance.

3. Research method

3.1. Design and participant

This research employs owners or managers of MSMEs as respondents, as the unit of analysis used is the organizational. The research was conducted in Surakarta and Yogyakarta, Indonesia, which have a diverse and significant population of micro and small businesses. These cities are also hubs

for creative industries, serving as examples for micro and small enterprises in Indonesia. The study collected data through both direct and online questionnaires. The study aims to investigate the adoption of cloud computing by micro and small firms in the Yogyakarta and Surakarta areas, with respondents selected based on their expertise and willingness to participate. The investigation used the accidental sampling method, a non-probability sampling technique, as several studies on technology adoption employ random sampling (Khayer et al., 2020).

3.2. Data analysis

Statistical descriptive analysis was used in this study to explain the demographic characteristics of the respondents. In this study, the demographic characteristics used are the type of industry, gender, business size and age of business. The variance-based Structural Equation Modeling (SEM) or Partial Least Squares (PLS) approach is considered the most appropriate approach because it has the ability to test multidimensional construct relationships simultaneously, whereas other statistical methods (eg, multiple regression, or multivariate analysis of variance) are limited to analyze the relationship between each construct individually (Hair Jr et al., 2021; Khayer et al., 2020). Furthermore, because this research aims at developing theory rather than testing theory, variance-based PLS-SEM is more appropriate to use. This research focuses on improving explained variance, which is more data-driven than estimation of model fit. The use of PLS-SEM is more recommended than Covariant Based Structural Equation Modeling (CB-SEM) (Sholihin & Ratmono, 2021).

4. Result and discussion

Because this study uses structural equation modeling to test the hypothesis, the number of respondents that must be met is five times the number of all constructs used. The number of respondents who were collected was 197. The questionnaires were distributed to respondents who were in the Surakarta and Yogyakarta regions, Indonesia. These areas are big cities in the country of Indonesia which have a large number of micro and small businesses so that they are very appropriate for the respondents in this study. Table 1 provides information about demographic data including industry type, gender, age, and so on. Respondents consist of 53% Males and 47% Females. Based on age classification, 57% are aged 20–30, 27% are aged 31–40, and 16% are aged 41–50. Based on industry classification, 66% are in the food and beverage category, 24% are in the retail and trade category, and 10% are in the other business category. Based on the firm size category, 51% have 1–4 employees, 33% have 5–10 employees.

4.1. Measurement model

Table 2 depicts convergent validity, reliability, and Average Variance Extracted (AVE). Convergent validity relates to the principle that measures of a construct should be highly correlated, typically measured by a factor loading value above 0.7. Reliability refers to the extent to which a measuring instrument can be trusted or relied upon, typically measured by a value of greater than 0.8. AVE is a coefficient that explains the variance within the indicators that can be explained by the common factor, typically measured by a value above 0.5. Table 2 shows that the factor loading, Cronbach's alpha, and AVE values meet the recommended criteria. However, there is one item, namely RA2, which has a value below 0.7, specifically 0.666. Since this study is an exploratory research, this value is still acceptable.

This study also tested discriminant validity by comparing the square root of the AVE and the correlation coefficient between constructs. Discriminant validity refers to the extent to which a construct is truly distinct from other constructs based on empirical standards. In other words, it is the ability of a measure to distinguish between different constructs that are theoretically expected to be distinct. As shown in Table 3, the AVE root for each construct is greater than the correlation between the coefficient constructs; this indicates that discriminant validity is acceptable.

Table 1. Descriptive statistics of respondents

Description	Category	Number	Percentage
Industry Classification	Food and Beverage	130	66%
	Retail and Trade	47	24%
	Other Business	20	10%
Position	Owner	69	35%
	Manager	128	65%
Gender	Male	105	53%
	Female	92	47%
Age	20–30	112	57%
	31–40	54	27%
	41–50	31	16%
Firm Size	1–4 People	100	51%
	5–10 People	66	33%
	11–50 People	31	16%
Education	Senior High School	87	44%
	Bachelor Degree	99	50%
	Master	11	6%

4.2. Structural model

The objective of this study is to expand the TOE framework by incorporating individual characteristics, particularly computer self-efficacy and computer anxiety. The proposed model consisted of eight exogenous variable (i.e. relative advantage, complexity, top management system, organizational readiness, computer self-efficacy, computer anxiety) and two endogenous variables (i.e cloud computing adoption and MSMEs performance) connected through nine path relationships. Because the objective of this study is to develop a research model, the use of variant-based SEM is recommended. Table 4 depicts the hypothesis testing in this study. Structural equation modelling revealed ten proposed hypotheses as significant but there are two hypothesis that is not supported. As hypothesized, our data supports the significant effects of relative advantage (H1, $\beta = 0.117p < 0.05$), organization readiness (H4, $\beta = 0.196p < 0.05$), competitive pressure (H5, $\beta = 0.231p < 0.05$), Bandwagon effect (H6, $\beta = 0.188, p < 0.05$) on cloud computing adoption. Computer self-efficacy (H7, $\beta = 0.190, p < 0.05$) and computer anxiety (H8, $\beta = -0.102, p < 0.05$) are an important predictor of Cloud computing adoption. However, complexity and top management support were not affect cloud computing adoption so that H2 and H3 were not supported (H2, $\beta = 0.014, p < 0.05$) (H3, $\beta = 0.031, p < 0.05$). cloud computing adoption significantly influences MSMEs performance (H9, $\beta = 0.497, p < 0.05$).

This study examines the antecedents of cloud computing adoption and their consequences for MSMEs performance. Relative advantage has a positive effect on cloud computing adoption. MSMEs who feel that using cloud computing has additional advantages will tend to adopt the technology (Dadhich & Hiran, 2022; Qalati et al., 2020). Complexity has no effect on cloud computing adoption, MSMEs feel that cloud computing technology is very easy to use so that MSMEs may not feel difficult in using this technology. In an organizational context, top management support has no effect on cloud computing adoption. Researchers suspect that MSMEs in Indonesia do not have a clear organizational hierarchy, so that the owner, manager, and IT expert may be the same person in determining whether or not to adopt technology. Because of the ambiguity of this role, the form of support for technology becomes less visible in the process of technology adoption. Organization readiness has a positive effect on cloud computing adoption. The low cost of adopting cloud computing and the company's ability to provide this technology have made MSMEs in Indonesia have a good level of acceptance of cloud computing (Alkhater et al., 2018; Haddara et al., 2022; Yoo & Kim, 2019). In the environmental context, competitor pressure and the bandwagon effect can affect cloud computing adoption (Alsheibani et al., ;

Table 2. Convergent validity and reliability

Construct	Item	Factor Loading	Cronbach's Alpha	rho_A	CR	AVE
Relative Advantage	RA1	0,715	0,778	0,777	0,849	0,530
	RA2	0,666				
	RA3	0,751				
	RA4	0,753				
	RA5	0,750				
Complexity	CMX1	0,898	0,867	0,994	0,903	0,757
	CMX2	0,768				
	CMX3	0,936				
Top Management Support	TMS1	0,827	0,821	0,824	0,882	0,651
	TMS2	0,782				
	TMS3	0,842				
	TMS4	0,775				
Organization Readiness	OR1	0,863	0,839	0,868	0,884	0,606
	OR2	0,862				
	OR3	0,715				
	OR4	0,735				
	OR5	0,700				
Competitor Pressure	CP1	0,839	0,721	0,731	0,844	0,645
	CP2	0,856				
	CP3	0,705				
Bandwagon Effect	BE1	0,808	0,706	0,709	0,836	0,629
	BE2	0,783				
	BE3	0,788				
Computer Self Efficacy	CSE2	0,732	0,707	0,720	0,835	0,629
	CSE3	0,831				
	CSE4	0,812				
Computer Anxiety	CAX1	0,776	0,746	0,764	0,855	0,663
	CAX2	0,887				
	CAX3	0,775				
Cloud Computing Adoption	CCA1	0,822	0,778	0,779	0,871	0,692
	CCA2	0,861				
	CCA3	0,812				
MSMEs Performance	SP1	0,819	0,879	0,886	0,911	0,672
	SP2	0,804				
	SP3	0,810				
	SP5	0,857				
	SP6	0,808				

Table 3. Fornell-Larcker Criterion

	C	BE	CP	CMX	CAX	CSE	OR	RA	SP	TMS
CCA	0,832									
BE	0,660	0,793								
CP	0,637	0,595	0,803							
CMX	-0,121	-0,088	-0,205	0,870						
CCA	-0,401	-0,348	-0,290	0,007	0,814					
CSE	0,631	0,618	0,465	-0,184	-0,407	0,793				
OR	0,632	0,545	0,533	-0,098	-0,254	0,550	0,778			
RA	0,552	0,503	0,499	-0,101	-0,262	0,449	0,496	0,728		
SP	0,497	0,473	0,403	-0,205	-0,284	0,417	0,419	0,563	0,820	
TMS	0,618	0,578	0,539	-0,167	-0,283	0,579	0,754	0,598	0,519	0,807

Table 4. Summary of hypothesis tests

H	Path IV>DV	β	T Statistics	P Values	Result
H1	RA -> CCA	0,117	1,974	0,049	Supported
H2	CMX -> CCA	0,014	0,310	0,757	Not Supported
H3	TMS -> CCA	0,031	0,290	0,772	Not Supported
H4	OR -> CCA	0,196	2,003	0,046	Supported
H5	CP -> CCA	0,231	3,556	0,000	Supported
H6	BBE -> CCA	0,188	2,116	0,035	Supported
H7	CSE -> CCA	0,190	2,594	0,010	Supported
H8	CAX -> CCA	-0,102	1,982	0,048	Supported
H9	CCA -> SP	0,497	8,808	0,000	Supported

Ayobkhan & Asirvatham, ; Qalati et al., 2022). Due to the relatively similar conditions of MSMEs in Indonesia in terms of both size and income, usually they are close to one another. In fact, many MSME communities have been found who have the same business character to help each other, especially in the process of technology adoption. If an MSMEs use new technology, the tendency for other MSMEs to also follow either voluntarily or mandatory. This closeness between MSME is also a hallmark of collectivist culture in Indonesia (Mohammed et al., 2022). Finally, the use of cloud computing certainly has a direct impact on MSMEs performance. Cloud computing adoption has a positive effect on MSMEs performance. Technology adoption is basically a must for MSMEs. Services that are more effective and efficient will improve company performance (Chi et al., ; Martín-Peña et al., 2020). Furthermore, cloud computing-based technology also provides a good security and privacy system for MSME data. As a result, performance is further enhanced because basic issues can be addressed by using cloud computing (Khayer et al., 2020).

Technology adoption can be done not only in the context of cloud computing but also other technologies that can improve performance (Abbad et al., 2022; Hsu et al., 2014; Khayer et al., 2020a; Prasanna & Jayasundara, 2019). The utilization of technology can be an effective solution for resolving issues related to financial management, human resource management, and inventory management in the MSMEs context (Jiang et al., 2022). Cloud computing is among the technological advancements that have been beneficial for numerous MSMEs in Indonesia (Anshari & Almunawar, 2022; Suryani et al., 2022). It offers owners the convenience of establishing financial policies on a weekly or monthly basis, as well as real-time monitoring of daily cash flow and employee performance, and precise inventory management through an integrated system. The food and beverage industry, in particular, benefits greatly from technology in managing inventory quantities, which can be quite complex.

5. Conclusion and Implication

This study adds to the existing theory on the Technological-Organizational-Environmental (TOE) framework by considering individual factors within the context of cloud computing. In other words, the research expands on the current understanding of how technological, organizational, and environmental factors interact with individual factors in the adoption and use of cloud computing. The adoption of cloud computing has been demonstrated to be significantly predicted by both computer self-efficacy and computer anxiety. Each MSMEs' confidence and concern about adopting technology are reflected in both constructs. In addition to expanding the TOE model, this simultaneously promotes research (Khayer et al., 2020). This is also visible from the determinant coefficient value of 0.637, which indicates that individual factors have been shown to have the ability to influence the adoption of cloud computing. Additionally, the coefficients of determinant values for endogenous variables are 0.75, 0.50, or 0.25 to indicate significant, moderate, or weak coefficients of determination (Hair Jr et al., 2021). This research not only broadens the research model but also studies at MSMEs performance in addition to the antecedents of cloud computing adoption. The results suggest that MSMEs' performance will rise with the adoption of cloud computing. This study is terribly beneficial for MSMEs in identifying the factors that influence the adoption of cloud computing. Cloud computing service providers must overcome high computer anxiety in order to offer services that inspire confidence and comfort. This research also has managerial contributions for MSMEs. MSMEs can benefit from using cloud computing to provide accurate financial information. By doing so, they can create positive incentives for both creditors and investors. Additionally, using cloud computing can reduce the cost of employee monitoring and result in more streamlined and effective business processes, ultimately adding value to the organization. The findings of this study may encourage other MSMEs to begin implementing digital transformation efforts in their own operations.

6. Limitation and future research

The results of this study reveal a number of beneficial and helpful research findings, but they should nevertheless be interpreted with certain caution because, like every research, they have some limitations. Firstly, this study only covers cloud computing. Even if there are other free technologies—including mobile payments, mobile commerce, and social commerce—that could also affect the business activities of the organization. Future study can test various technology types so that information about the degree of technology acceptance for micro and small firms can be gathered in a holistic way. Secondly, this study employs a quantitative methodology to examine whether micro- and small-business adoption of cloud computing is feasible. However, there are some topics that cannot be investigated using a quantitative method, particularly business processes during using cloud computing. The adoption of cloud computing technology in micro and small firms can be explored in the future using a qualitative method because it can properly depict the actual conditions. Thirdly, solely the effects of adopting cloud computing on the performance of MSMEs are analyzed in this research. The adoption of technology should boost the company's ability to remain viable in a time of high uncertainty. Future studies can assess how the use of technology improves corporate sustainability.

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Appendix

Construct	Questions	References
Computer anxiety	CA 1: I am apprehensive of using the cloud computing system to record transaction CA2: I am scared that could lose my information using the system for shopping CA3: I am hesitant to use the cloud computing system due to fear of committing errors that I cannot rectify CA 4: The system is rather scary to me	(Salimon et al., 2021)
Computer self-efficacy (CSE)	CSE 1: I could transact using cloud computing systems without anyone telling me what I should do CSE 2: I could transact using cloud computing system if there is a helping hand where I get stuck CSE 3: If had enough time I could finish the job I started using a cloud computing system CSE 4: I could finish a transaction using cloud computing if a built-in assistance facility is available CSE 5: I could complete a transaction using Cloud computing even if I have not used a similar system like that before	(Salimon et al., 2021)
Relative Advantage	RA1: Cloud computing provides new opportunities RA2: Cloud Computing allows us to accomplish specific tasks more quickly RA3: Cloud Computing allows us to enhance our productivity RA4: Cloud Computing allows us to learn more about our competitors RA5: Cloud Computing enhances the company's image"	(AlSharji et al., 2018) (Qalati et al., 2020)
Complexity (reverse code)	CX1 ... how easy it is to them to learn the system.* CX2 ... the intuitiveness of system. CX3 ... how comfortable they feel using it.	(Ruivo et al., 2014a)
Top Management Support	TMS1 Top management in my organization is interested in cloud computing TMS2 TM in my organization considers cloud computing adoption important TMS3 TM in my organization has shown support for cloud computing TMS4 TM emphasis on R&D, technological leadership, and innovations"	(Qalati, Yuan, et al., 2021)

(Continued)

(Continued)		
Construct	Questions	References
Organizationa Readiness	OR1: Our organisation has the financial resources to adopt social commerce. OR2: Our organisation has the technological resources to adopt social commerce. OR3: We have high connectivity to the Internet. OR4: Most of our employees have unrestricted access to computers. OR5: Most of our employees are computer literate.	(Abed, 2020)
Competitive Pressure	CP1 Cloud Computing would allow the firm stronger competitive advantage CP2 Cloud computing would increase firm ability to outperform competition CP3 Cloud computing would allow the firm to generate higher profits	(Qalati, Yuan, et al., 2021)
Bandwagon Effect	BE: Cloud computing is a popular application; therefore our firm would like to use it as well BE2: We follow others in cloud computing sytems BE3 We choose to adopt cloud computing because many other firms are already using it”	(Qalati, Yuan, et al., 2021)
MSMEs Performance	P1 “Improved the customer relationship P2 “Improved service quality” P3 “Increased customer engagement P4 “Improved data transaction recorded P5 “Inproved inventory recorded	(Qalati, Yuan, et al., 2021)
Cloud Computing Adoption	CCA1 My organization will adopt cloud Computing to improve service delivery CCA2 My organization will adopt cloud computing to improve operational efficiencies and reduce operational costs CCA3 My organization will adopt cloud computing to improve inter-organizational data exchange CCA4 My organization will adopt cloud computing to reduce data duplication CCA5 My organization will adopt cloud computing to improve operation	(Awa & Ojiabo, 2016)