

Factors influencing SaaS adoption by MSMEs

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Abstract— Cloud computing has been around for quite long, yet some organizations have never used it, especially MSMEs in Indonesia. Several factors hinder its implementation by MSMEs, including unequal infrastructure for using the internet in Indonesia. This paper assesses the literature on cloud computing, SaaS, e-Commerce, and e-wallet to determine the initial factors that affect technology implementation. The results showed that the frameworks widely used to obtain and assess variables include the DOI, TAM, and TOE. Furthermore, compatibility and the pressure from competitors to adopt technology are the highly considered variables. Among the factors, perceived usefulness and ease of use is also deemed by MSMEs in implementing e-commerce and e-wallet.

Keywords: Cloud computing, SaaS, e-wallet, e-commerce, adoption frameworks, MSMEs

I. INTRODUCTION

Cloud computing continues to grow since its inception in 2008 [1]. National Institute of Standard and Technology (NIST) define cloud computing as a computational network that facilitates consumers anytime, anywhere, and when needed. Its main features includes rapid elasticity, on-demand self-service, broad network access, and resource pooling [2]. Even though security is still being doubted[3]–[5], the desire to implement it is still high.

Previous research showed that cloud computing is used by MSMEs to improve the competitiveness of their business, especially marketing products [6], [7]. Due to some factors that the government needs to improve, cloud computing is not fully applied in Indonesia. China has been developing strategies to use cloud computing to manage e-commerce run by MSMEs. [8]. Additionally, research by [9] showed that 38.5% of entrepreneurs stations in West Java know the internet but are still unfamiliar with cloud computing. The same study established that about 49% of workers do not use the internet at all.

Currently, the use of SaaS in SMEs is still at a relatively low rank. This is in accordance with the research by the Sub-directorate of Information and Communication Technology Statistics, which stated that 65.14% of MSMEs do their business from social media, including Facebook, Twitter, and Instagram. Only 25.72% joined marketplaces, such as Bukalapak, and Tokopedia, Lazada [10].

As an archipelago, Indonesia has vast areas and many islands. In Asia, it is ranked 11th by Asia Cloud Computing Association in 2018. This is because the score for infrastructure is still relatively low compared to other Southeast Asian countries, such as Malaysia and the Philippines [11]. More time is needed to develop the infrastructure that supports the implementation of the internet. In general, telecommunication companies help the Indonesian government improve internet connection, including Telkom Indonesia, Indosat Ooredoo, Smartfren, and others [12], [13].

Micro Small Medium Enterprises (MSMEs) remain the most significant contributor of state revenues in Indonesia. The contribution of MSMEs reaches 60% of the total state income [14]–[16], with the government introduced many friendly policies to MSMEs to help improve product quality and access markets using e-commerce facilities [17].

With the vast technological development, the payment system of e-commerce has changed from Cash On Delivery (COD) and Fund Transfer to an electronic wallet system. Research by [18] established that MSMEs use the non-cash payment system growth and receive attention from the user, especially millennials. This recognition is attributed to various advantages, including comfortable to use, saving time, and being traceable [18]–[20].

Adopting new technology requires individual experience by people or organizations, though several factors discourage its usage. For instance, there are frameworks to comprehend the elements of IT implementation, including the Use of Technology (UTAUT) [6], [21], Technology Acceptance Model (TAM) [22], [23], the Unified Theory of Acceptance and the Diffusion of Innovation (DOI) and the Technology, Organization, and Environment (TOE) framework [[24]–[27]. These frameworks help define the factors that affect the implementation of SaaS and e-wallet on MSMEs in Indonesia, both from the individual and the organization side. Therefore, the underlying questions in this paper focus on the factors that must be assessed before MSMEs decide to use SaaS and E-Wallet in E-Commerce.

II. REVIEW OF RELATED WORKS

A. Cloud Computing and SaaS

Cloud computing enables people to access resources they need anytime, anywhere, including storage, processing powers, system applications, servers and other mobile services. This cloud model has three service models, and four deployment models also composed of five essential characteristics. There are various advantages of using cloud computing, including being driven by its characteristics. The significant characteristics of Cloud Computing include On-demand self-service, wide-ranging network access, resource sharing, rapid flexibility, and measured service [2]. Apart from its characteristics, cloud computing also has three models that can be selected according to customer needs. These include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) [2], [28], [29].

Although Cloud Computing has many advantages, some issues arise, such as security and infrastructures, including speed, connectivity, and bandwidth. Another drawback is considering the Cost. In case the clients use the free model, they will get limited features. Consequently, it will be quite hard to do data relocation suppose the Downtime occurs [1].

SaaS which is one of the most applied model of Cloud Computing, delivers the service through the client interface, such as Web browser or application on Smartphone [1]. This service is also considered to represent Cloud Computing itself [30]. Many researchers and developers recognize it as a leading factor in Cloud service because it is widely used [9], [27], [30], [31]. Though it may not be easy to tell if SaaS is already being utilized, this service was first used on web-based mail, which almost all computer and smartphone users currently have [27].

B. MSMEs in Indonesia

Table 1 shows the explanation of the enterprises based on the classification by the Indonesia government.

TABLE I. THE MSMEs CRITERIA BASED ON THE INDONESIA GOVERNMENT

Types	Description	Size (Million Rupiah)
The Micro Enterprises	a productive business owned by an individual and individual business entity	≤ 50 , no land and building; or annual sales results ≤ 300
The Small Enterprises	an individual or a business entity, not part of a Medium Enterprise or a Large Enterprise	$50 \geq$ net worth ≤ 500 , no land and building; or $300 \geq$ annual sales $\leq 2,500$
The Middle Enterprises	an individual or business entity, not part of Small Business or a Large Business	$500 \geq$ net worth $\leq 10,000$ no land and building, or $2,500 \geq$ annual sales $\leq 50,000$

The number of MSMEs reaches 64 million, approximately 99% of all business actors in the country [32]. However, only about 10 million have participated in the government program of Go-Online [33]. Some reasons hinder MSMEs from using Cloud Computing, especially SaaS. For instance, some MSMEs are considering security and privacy as an issue [34]. However, this reason is not in line with the research conducted by [34]. Yet, this reason is not aligning with the research conducted by [23], [35]–[37], which established that privacy

and security factors do not significantly influence the decisions related to the acceptance of Cloud Computing. Even though they have doubts in their first trial, they believe that the Cloud Computing provider guarantees their data security and privacy. Security for CC services is improving over time.

Other issues faced by the MSMEs include infrastructure, cost-effectiveness, firm size, education background of the middle to top management, the industry, individual, organization, technology, market, external support, and government support [6], [9], [22], [38], [39]. If the leaders or owners of MSMEs feel that they do not need to switch to using SaaS even though the technological knowledge of workers is quite good, the organization's level of readiness is relatively low [40].

C. E-Commerce and E-Wallet

E-Commerce as part of E-Business is widely applied in today's economic process because it accelerates processes. The organization must deliver the services and products as fast as possible. Furthermore, it helps provide excellent service before competitors [41]. E-commerce in Indonesia begun with Business to Customer (B2C) in the early 1990s, pioneered by Bhinneka.com with a fund transfer payment system [42]. Many websites for e-commerce developed afterward, including Kaskus.com, Tokobagus.com, Tokopedia.com, BukaLapak.com, and Lazada.com [42], [43]. However, the merchants in the e-commerce portals are dominated by MSMEs, rising by 40% every year.

Since the use of smartphones and the internet has become common, e-commerce is increasingly recognized by customers. Mobile e-commerce applications are growing with Gojek, Tokopedia, Bukalapak, OLX, and Grab, featuring e-commerce players extending their services to mobile applications[44]. The payment system for e-commerce is now moving to a non-cash system. For instance, E-wallet was first used in Indonesia around 2007 by Doku [43]. Later, many local brands of e-wallet dominated the transaction, such as Go-Pay, Sakuku, Dana, and OVO [45]. The trend to use e-wallet increase among e-commerce customers, especially the millennials [18], [20], [45]. This rise happens with the government encouraging MSMEs to go online [45]–[47].

Although the use of e-wallet has become a trend, some customers choose to pay in cash [10]. This is because 51% of Indonesian citizens still do not have bank accounts [48]. The nature of Indonesia as an archipelago country explains this condition. Furthermore, the internet's infrastructure out of the main islands is yet to be established [11]. Furthermore, several MSME uses e-commerce for marketing their products and services. However, not all use applications that are intended for this purpose. SaaS is the basis on which e-commerce and e-wallet applications are developed. An e-wallet as a means of payment is part of the implementation of e-commerce. For this reason, there is a need for further research to determine the nature of the development of e-commerce and e-wallet as part of SaaS in Indonesia.

D. Adoption Models

The DOI is the first framework to measure technology adoption and offered the basis for the development. The DOI

has five major attributes which are compatibility, observability, complexity, relative advantage, and trialability [49]. This framework focus on user intention to use the technology from the perspective of an individual and external characteristics [4], [19], [50]. Moreover, TOE is a framework that assesses technology adoption from three aspects, including technology itself, organization, and environment. Many researchers collaborate TOE with DOI because the attributes of these two frameworks complement each other [24]–[27], [51]. They are used to determine the factors that affect SaaS implementation on MSMEs, both from the individual and the organization side.

III. METHODOLOGY

A systematic process is used to determine the initial factors describing software implementation as a Service (SaaS) in e-commerce by MSMEs. This paper anticipates to review the current research related to adopting a cloud-based application to deepen the literature with relevant statistics. The documents found were selected based on Year (2012-2020) and Relevance.

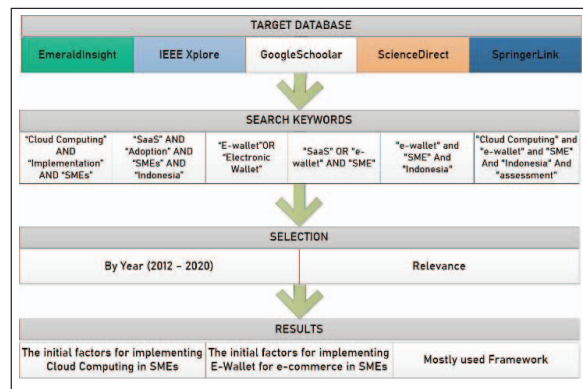


Fig. 1. Research Literature Selection structure

Fig. 1 shows the methodology of this research and the expected results. The resources found are shown in Table II include journals, dissertations, thesis, and books. Some of these resources are eliminated because the topics are too technical, leaving 220 articles. An additional selection process was also carried out. The selection is based on theories of frameworks, research objects, places/areas, and data processing systems, while duplicated articles were eliminated. The remaining papers related to the method used for implementing cloud computing, especially in SaaS and e-wallet, specifically 30 articles. The first step is information extraction, followed by frequency analysis to present the most frequent factors, theories used, and methodology. Figure 2 shows how the review process of the articles was conducted.

TABLE II. RESULT OF LITERATURE SELECTION

Sources	Emerald Insight	IEEE Xplore	Google Scholar	Science Direct	Springer Link	Total
Keywords						
"Cloud Computing" AND "Implementation" AND "SMEs"	10	15	15	10	10	60
"SaaS" AND "Adoption" AND "SMEs" AND "Indonesia"	5	1	19	12	13	50
"E-wallet" OR "Electronic Wallet"	13	14	10	8	3	48
"SaaS" OR "e-wallet" AND "SME"	0	13	14	8	18	53
"e-wallet" AND "SME" AND "Indonesia"	0	0	8	1	0	9
Total	28	43	66	39	44	220

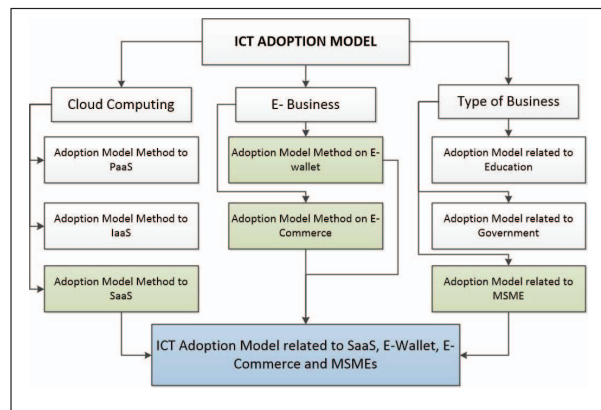


Fig. 2. Research Literature Model

IV. RESULT AND DISCUSSION

The previous research integrated the frameworks to determine the variables assessed. Table III shows the distribution of the frameworks frequently used, including DOI, TOE, and TAM. Other frameworks are used as a compliment in joining variables. Most studies combine the TOE and DOI frameworks because they have related variables.

TABLE III. DISTRIBUTION OF FRAMEWORK

References	TAM	TOE	DOI	UTAUT	UTAUT 2	TRI	HOT	TPB	TCO	ANT	RBT/ RBV	IDT
[52]	x	x	x									
[24]–[27], [53], [54]		x	x									
[55], [56]	x	x						x				
[22], [23], [57]–[59]	x											
[60]		x							x			
[6]				x								
[36], [61]–[65]		x										
[34]		x	x							x		
[35]											x	
[66]		x										x
[67]					x							
[68]				x								

The frequency analysis results of the articles shown in Fig.3 and Fig.4 are based on Fig.1. This includes the frequency of variables found in reviewed articles based on the TOE and DOI framework on Cloud Computing Service (SaaS), e-commerce, and E-wallet. Compatibility, complexity, and relative advantage are the primary factors for implementing SaaS in MSMEs from the Technological aspect. The competitive pressure from the Environmental point of TOE has the highest frequency of use in the research. The executive or top management and enterprise intention from the organizational aspects are the second top variables in the list.

Regarding factors for implementing e-commerce, competitive pressure from the environment and firm size from the organization aspect have the highest frequency. The perceived benefits and Compatibility from the Technological aspect, executive management from the organization, and government Support and Trading Partner Readiness from the environmental aspect are also critical factors that MSMEs consider while implementing e-commerce. In transactional operation of e-wallet, MSMEs tend to try and observe the performances first, and the enterprise intends of usage become the key factor.

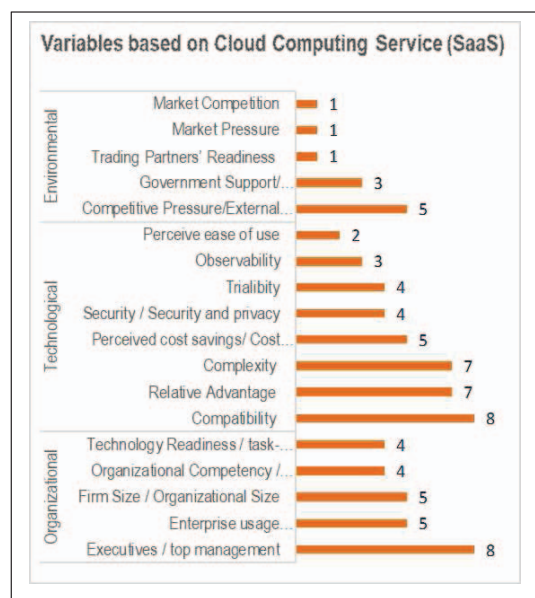


Fig.3. The variables used frequency for SaaS

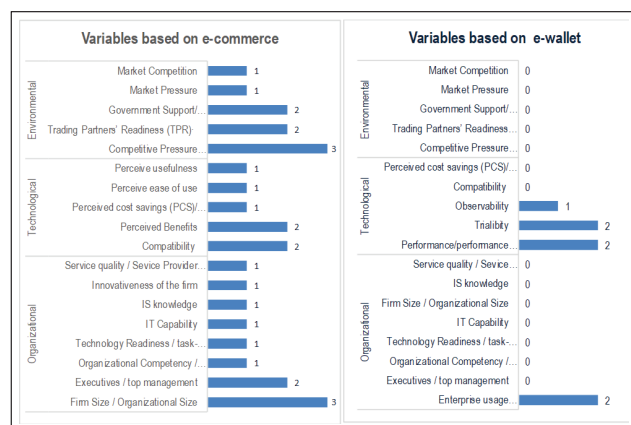


Fig.4. The variables used frequency for e-commerce and e-wallet

V. CONCLUSION AND FUTURE DIRECTION

The DOI, TAM, and TOE frameworks are preferred frameworks for evaluating the adoption of technology. However, their combination with other frameworks still needs development. This review shows that compatibility and executive are the most used factors in implanting SaaS. Additionally, competitive pressure and firm size are essential in implementing e-commerce. E-wallet implementation factors focus on trialability, performance expectancy and enterprise usage intention. These results provide a better view of the factors to consider before applying the SaaS and e-wallet in their e-commerce transaction.

Future research needs to develop a questionnaire to gather data from MSMEs. The factors extracted from the three frameworks are expected to provide input to the government regarding what to consider when using technology.

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