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# Benefits And Challenges Of Cloud Computing Technology Adoption In Small And Medium Enterprises (SMEs)

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**Abstract** In today's digital era and globalization, many small and medium business (SME) businesses are adopting cloud computing for the company's operations. Cloud computing is a growing data center technology in line with increas-ing traffic on the internet in the era of the Internet of Things (IoT). This technology overcomes the weaknesses of conven-tional servers for speed, scalability, and efficiency. However, there are still SMEs who are not sure of the benefits of cloud services. Therefore, this research is conducted to explore the opinions of SMEs about the benefits of cloud computing ser-vices in their business operations that encourage them to adopt this service. The qualitative research method is conducted by interviewing the top management of a number of SMEs engaged in the information and communication technology (ICT) industry. SMEs are domiciled in Jakarta and Bandung, Indonesia and have been using cloud computing platform services. The results found that the most perceived benefits of cloud computing are cost savings because it can reduce cap-ital expenditures, such as procurement of computers with high performance and purchase their own server by SMEs. On the other hand, the service enhances the company's internal organizational processes to accelerate decision making, expand markets, and speed up communication with customers. However, the security aspect and the limited provision of infra-structure remain a challenge for the adoption of cloud computing in SMEs in Indonesia. The company's effective strategy is considered to be able to minimize the negative impact of this challenge.

**Keywords** SMEs; Adoption of technology; Cloud computing

## 1. Introduction

Cloud computing is a platform that brings flexible and cost-effective benefits to SMEs [1]. This technology is also able to support the availability of data and services and demonstrate compliance. Another advantage, cloud computing overcomes the weaknesses of conventional servers to gain speed, scalability, and efficiency, enabling corporate profits through improved internal processes of corporate organization, speeding up decision making, expanding markets, and accelerating communication with customers [2]. Indeed, the main reason behind the adoption of cloud computing is that SMEs are not satisfied with the existing infrastructure because they do not meet their business expectations. However, there are still SMEs who are not sure of the benefits of cloud services. For example, cloud computing poses additional risk-level challenges as services are often handed over to third parties, making it more difficult to maintain data and privacy [3][4][5]. Therefore, the implementation of cloud computing can be easier for SMEs if they have done a brief analysis of the advantages well [6].

In this study, interviews with a number of management leaders (top management) SMEs engaged in the field of ICT is done to know manfaaat that encourage them to apply cloud computing on their company. Management leaders are individuals who provide support and commitment to make companies more likely to adopt new technologies. In some cases, ICT department staff suggested the adoption of cloud computing services, which was later endorsed by the top management team [7].

Businesses that are the focus of this research are SMEs. In developing countries, the role of SMEs becomes more meaningful especially in terms of reducing poverty and unemployment. As a result, the proper and effective devel-opment of SMEs will have a significant impact on the eco-nomic development of a country [8][9]. SMEs need to be encouraged to adopt technology because now the need for ICT becomes important, as a tool to survive and develop, especially in the era of globalization, digital, and even in-dustry 4.0 [10].

## 2. Literature Review

### 2.1 Cloud computing services

Cloud computing, is a growing data center technology in line with increasing traffic on the Internet in the era of the Internet of Things (IoT). This technology allows a person to store documents on this network, then the document can be accessed on other computers outside the network. Even through cloud computing, software programs do not run from one's personal computer, but rather stored on servers

accessed via the internet. Cloud computing provides the resources and capabilities of information technology (such as applications, storage, communications, collaboration, infra-structure) through services offered by CSP (cloud service providers) [11]. Cloud computing consists of 4 content, namely 1) Software as a service (SaaS); 2) Platform as a service (PaaS) and 3) Infrastructure as a service (IaaS); and 4) Communication as a service [12][13].

### 2.2 Previous research on cloud computing and SMEs

Previous research has raised a theme of cloud computing adoption in SMEs. Research from Malysia [14] points out that an important success factor for adopting cloud computing consists of three organizational factors such as top management support, firm size and technological readiness. Organizational factors are assessed by several variables that impact on cloud compusting in SMEs. These factors can be used for decision makers in organizations that want to evaluate the implementation of cloud-based services in their companies. While [15] describes research results in Australia, the successful adoption of cloud computing requires ade-quate government support in the form of revisions to laws related to data protection and policy review and incentives in promoting adoption. The findings also highlight that awareness is a key factor in the diffusion of cloud computing. Another study [1] states the implementation of cloud com-puting can be successful if the company is able to maximize the benefits promised by this service. The benefits of cloud computing for the company, because the organization is faced with the need for high processing capabilities, large storage capabilities, ICT resource scalability and high availability, with the lowest cost possible, then cloud com-puting becomes an attractive alternative. However, the na-ture of cloud computing poses challenges for SMEs because they are still many who consider to apply it. This is because there are still issues such as security, legal compliance and regulations.

## 3. Research Method

The design of this study was based on methods in previous studies [6]. This study uses qualitative methods through interviews of SMEs in Jakarta and Bandung, Indonesia. The study was conducted in May-June and September 2017. Seven SMEs using cloud computing were selected to discuss the benefits of using this service, which then encouraged them to adopt it. Source criteria based on the duration of the use of cloud at least in the past year. Position of SMEs are in the ranks of management leaders such as CEO and CTO.

## 4. Result and Discussion

### 4.1 Interview Summary

Cloud computing provides a variety of services that are suitable to run a business especially in the ICT industry. Based on interviews, SMEs engaged in the industry, using more cloud services to run the company's operations, ranging from email correspondence, communicating with employees without having to be in the office, utilizing data analysis applications to measure company performance, to make product innovation new. Generally the type of cloud used is a type of Saas, which helps them manage their business operations effectively. While on data storage and server utilization using Iaas, some use more than one cloud computing service provider, to support one server activity when it is under repair or down. Most SMEs use public clouds, but some SMEs use private clouds because companies want security and privacy. However, this type of service must be paid at a relatively high cost.

The results of this study indicate the benefits of cloud computing is the most perceived cost savings because it can reduce capital expenditures, such as procurement of computers with high performance and purchase their own servers. In some services it can even be used for free and its capacity can be increased when the demand of the company has a lot. Cost efficiency can ultimately improve the competitiveness of enterprises because companies can allocate funds and other technical focus on areas that have more impact for the company. But on the other hand, the challenge of using the cloud faced is the lack of control of SME companies against the server because this facility is entirely under the control of cloud service providers. The effective strategy and planning of the company has so far been expressed to suppress the impact of this challenge.

### 4.2 Use of cloud computing in SMEs

The decision to use certain cloud types for business operations is derived from studies conducted by management. This review is derived from the opinions of previous users on similar clouds, whether from reviews on the internet, price considerations, or they ultimately did use a reputable cloud service provider. The use of a particular type of cloud directly will prove to SMEs, whichever provides benefits as expected. Therefore, management monitors the services used. The results of this monitoring may cause the company to make a decision to change services from a particular service provider if they feel the lack of benefits required by the company. However, SMEs can maintain the use of services from certain cloud service providers, if the weaknesses found in services, are considered to be minimized with specific strategies and plans.

### 4.3 Benefits Adopting Cloud Computing

The following are some of the benefits that are the reason for the adoption of cloud computing in SMEs, which is observed in research:

#### 4.3.1 Cost saving

***Using "rental services"***

The use of cloud computing reduces the cost of capital expenditures, especially in the early formation of business so that this has a major impact for the company. It's an on-demand service that can be accessed whenever the user needs. The use of cloud computing drives businesses running without having to pour high funds by using applications that offer services like those used in large companies. Ordinary computing also allows SMEs to use "rental services for services provided by cloud computing providers. This service is able to shift tasks that SMEs should be working on to be handled by cloud computing providers. For example, in cloud storage services, cloud computing service providers are able

to replace the tasks of SMEs in the procurement of data storage devices, data management and maintenance, to the needs of large physical space for data storage.

***Minimize the purchase of new software licenses***

License purchases for new software can be minimized because SME users do not have their own cloud infrastructure. The use of software can be done because SMEs have been hiring cloud services at a much more affordable cost. Cloud computing strategies such as tailor services can tailor solutions for companies. Companies need cloud computing services with integrated, dynamic and sophisticated web-based computer systems. In this way, applications, files, and email can be easily accessed with internet connection, and software and hardware requirements also decrease in this way. Thus, the needs of companies using licensed software are reduced [16].

***Trial services***

In other cases, SMEs also benefit from trial or trial facilities, one of which is done through initial promotion. This facility allows SMEs to use the service without having to pay in advance. It is also disclosed in the previous peneltiian, that cloud computing services provide SMEs the choice of test capabilities. This allows SMBs to use this service at the trial stage before it is implemented. This has a major impact on their decision to adopt a particular service, but it is also very useful as it gives them the opportunity to choose the most suitable service provider [6]. In addition, a test of cloud computing solutions encourages intimacy, which helps improve acceptance [17]. But indeed for the use of a number of cloud computing services, SMEs have to spend relatively more expensive. However, this is considered comparable to the benefits gained, such as the use of private clouds for greater security and privacy.

**4.3.2 Deepening the niche of the existing market**

SMEs assess cloud attendance makes it easier for them to reach consumers via the Internet, because consumers also use the cloud (especially public cloud) for daily activities. Both producers and consumers are now in an all-cloud or cloud-based era. Almost all business activities are considered to be done online such as buying and selling transactions to perform hobby activities. Community needs to use the internet are expected to increase in the future, thus increasing the opportunity of SMEs to use cloud for their business activities. Based on the results of this study, most SMEs have plans in the coming months to add cloud services to be used. This is in line with the company's plan to create new products and attract more consumers from existing markets.

**4.3.3 Increasing competitiveness**

Many SMEs who reveal the quality of the product increased due to the use of cloud computing that has the maximum quality. This impact on increasing the competitiveness of the company. On the other hand, the competitiveness of the company also increases as cloud offers the speed and cost efficiency of the company so that management can focus on other things that have a big impact for the company. [17][18] the SME environment is very competitive because of the pressure to follow the competition, provide the means to increase growth, manage change, promote services to customers, and at the same time must remain competitive. Such conditions lead SMEs to improve their innovation capabilities in adopting technology. This makes cloud computing an attractive choice for SMEs in making it part of the company's infrastructure. On the other hand, competitive pressures encourage companies to adopt cloud computing, which implies the company is aware of responding more quickly in a competitive environment [7].

**4.3.4 Flexibility/ Scalability**

A cloud service is a business that helps SMEs because it provides flexibility, ie accessibility to anywhere or global access capabilities. Even SME players can access corporate data from various devices, including their personal devices. SMEs acknowledge this is interesting because cloud services can improve employee mobility. For example: a company meeting does not have to wait for employees to gather in the office because the discussion can be done via a cloud service, such as SaaS. While clouds also quickly handle the additional burden afforded by the company through the superiority of scalability. This can be done without dealing with the reliability of the system being developed by the company.

**4.3.5 Guarantees for cloud services**

The presence of cloud can replace the role of hardware used by SMEs business, such as the procurement server itself. This of course causes the risk of damage to technological infrastructure to be low because the management is done by a provider of cloud services that have reliability. The reliability of cloud services is usually reviewed in advance by SME management, before finally entrusting their data storage on a particular server. Similar results are presented by [6] which call cloud providers offer guarantees for cloud services and the risk of data unavailability is also minimized due to cloud computing. In this way, SMEs are more confident in cloud providers, allowing them to use their storage.

**4.3.6 High level of data security**

SMEs assess the data placement on cloud computing to be attractive because the cloud provides a high level of security, although a number of services offered, free as in Saas service. Management acknowledges, initially read carefully the cooperative agreement for the use of Iaas service servers, to ensure the security of corporate data (and including consumers) well. For example, knowing for sure in the country where their data is stored. One of the strategy to increasing security for server data by SMEs is done by storing data on more than one server located in different locations.

**4.3.7 Reliability**

Cloud computing technology delivers good service reliability such as ensuring service operates 24 hours in 7 days a week, even when they are doing maintenance services. The strategy of storing data in more than one type of server service provider is also done to anticipate the unexpected, if the service provider is down.

SME management recognizes continuously monitoring the reliability of cloud services to keep them in line with what the company expects. At least this reliability should be observable through a series of measurable parameters. This is in line with previous studies that reveal monitoring and measurement of the impact of cloud computing implementation by key performance indicators set to help confirm the effect of cloud computing adoption [18]. The impact of this monitored implementation is a key requirement for cloud migration. Users monitor Cloud apps in terms of performance, availability and security [20]. On monitoring, organizational management also assesses the effectiveness of the cloud based on the following criteria: 1) quality improvement; 2) improvement of environmental performance; 3) avoid cost over the premise solution; And 4) increased productivity. Quality is measured by the level of customer satisfaction and informal surveys [21].

**4.3.8 Easily on maintain (easy to manage cloud)**

The ease of using and managing cloud services is the reason for choosing and maintaining cloud users. The use of cloud causes SMEs not to spend more effort ahal that can be resolved by this service and technically can focus on other things more important like the quality of product custody. This aspect, as reported in the research [22] which is one of the most important determinants of cloud computing acceptance is the ease of use of this technology for others in organization and top management.

**4.3.9 Effective solution for competence support *ICT facility support***

Based on interviews with resource persons, the support of cloud as a supporter of ICT facilities on SMEs varies. Starting from as an application to communicate with each other in the internal company more effectively, because it is able to connect messages from various staff that work but not all are in the office. There is also a cloud service that plays a role in providing the ability to track the status of work that must be done at the request of consumers, to the use of servers managed by cloud service providers.

Cloud computing supports the business needs of SME companies engaged in the ICT industry. This technology is indeed considered capable of implementing simple and effective solutions with the help of computing [6]. Even many SMEs who mention, the use of cloud as if it is mandatory in the digital era for the industry business. This usage will certainly continue to be out in other industries, especially for companies that have web platforms as one of their product sales channels. In this study, SMEs in the ICT industry claimed not too difficult in adopting the cloud for operations at the beginning of their business runs. This is in line with previous research [7] that reveal companies with sophisticated technological resources (hardware, software, and expertise), such as ICT companies, may not have problems adopting cloud computing at first, but will affect how far The application of this technology depends on the needs within the organization. Organizational competence can help facilitate the utilization of ICT applications and resources along the enterprise value chain to implement cloud computing.

***Technical skills support***

SMEs said infrastructure development by themselves could add to the budgetary need to bring additional experts in the field of development and maintenance. But this is not necessary for SMEs who already use the cloud. Previous research also describes the same thing. [6] SMEs can get effective support anytime because cloud computing allows their service providers to work from the device. SMEs can spend more money on training their human resources than presenting experts who need special fees. The budget for employees training comes from the efficiency of infrastructure procurement due to the use of cloiud. In this way, organizational performance can be improved by following some effective strategies. The incidence of cloud is considered to help the condition of SMEs that have resource gaps. Other research mentions, this is because cloud services can save company money for the cost of hiring a number of employees and this is ultimately beneficial for new businesses (small) who are trying to start [23].

**4.3.10 Facilitate communication to create innovation**

The use of cloud computing is able to overcome barriers in communicating, whether between fellow company employees, between companies and consumers, even between companies and suppliers. For example: the presence of cloud computing enables the interaction of multiple users at once, thus making team collaboration capabilities within the company easier. This encourages the creation of innovation through the interaction of ideas submitted.

One source revealed that the use of clouds helped speed up corporate decision making. Most corporate actions come from consumer response. Suggestions and criticism from consumers logged in through cloud devices, such as Official Line Account of the company or authorized corporate email. The advice given helps SMEs to know the error in the operation of the company's applications and also as a reference for their future product development. It also shows cloud computing can cut the chain between companies and consumers because communication among them does not require a third party. Similar ease occurs in communication between companies and suppliers. Similar findings are also presented in a study [24] which states that cloud computing allows companies to interact with customers, employees, and partners in various ways. Companies can get tremendous business opportunities, which can help them build real-time interaction and innovation to flourish.

**4.3.11 Green (environmentally friendly)**

The use of cloud computing is considered an environmentally friendly step because it suppresses the use of hardware and energy usage such as more electricity.

**4.3.12 Produce products at relatively affordable prices**

SMEs acknowledge the benefits they have gained over the adoption of cloud computing in their business operations that enable them to deliver more affordable product prices to consumers. This is important because in the current internet-of-things era, consumers can easily compare the prices of products on the market. The drive to attract markets with affordable pricing strategies is high for SMEs. Efficient and effective enterprise operations through

the use of clouds are recognized to help SMEs to produce products at relatively affordable prices.

### 4.4 Challenges Adopting Cloud Computing for SMEs

But on the other hand, there are challenges facing SMEs on the use of cloud computing, among others:

#### 4.4.1 Lack of control capability

The cloud computing facility is entirely under the management, management, and control of these technology service providers. This results in a lack of SME enterprise control over the cloud server. Based on the results of the study, the management admitted to having experienced server service problems due to maintenance period that hampered business operations. The company also can not do anything if at any time the server service down for some reason. So the strategy is to use multiple servers at once that are coordinated for SMEs business needs to keep running 24 hours in 7 days. On the other hand, SMEs also sometimes complain of a "lock-in" system. [17] explain, moving from one provider to another provider is at least problematic, interoperability between different providers is not even possible in many cases. This so-called "lock-in effect" looks very critical by a number of SMEs. However, from the wcloudcara of SMEs, this system is increasingly considered the trend is declining as more and more service offerings that free users.

#### 4.4.2 The need for ICT specialists

SMEs mention when the main society using cloud computing is the presence of human resources who have sufficient ICT knowledge. This is especially true for the use of PaaS and IaaS services that are considered to be quite complex. Errors in using cloud can cause potential losses for the company, and on the other hand also the consumer, so it could have a negative impact on business continuity.

#### 4.4.3 The importance of internet connection needs

The use of cloud encourages dependence on the Internet because it must have a network to access it. SMEs assess, relying on internet for cloud computing access in developing countries like Indonesia is still a constraint, especially in little region which far from big city. Internet connections are considered to be of low quality and uneven supply in different regions.

#### 4.4.4 Risk

Implementation of the wrong server infrastructure may endanger security such as web or applications that the company has become easily hacked by cyber attacks. The use of cloud also opens up a potential hazard to the consumer or corporate web user because of hacking of data by cyber action. However, security strategies can be enhanced with data encryption and backing up data on other server services located in different countries. This risk aspect has been widely described in other studies. [25] one of the main risks in using cloud services is dependence on the internet. Internet-connected services are not secure, and sometimes ICT teams have to get into trouble with fingerprints and loud security attacks. While [18] explains, if there is interference in internet connection or intermittent connection, users will not be able to access data in the cloud. Service interruptions may occur during transactions, file transfers, or other tasks, and consequently, tasks may be delayed [26].

#### 4.4.5 Government regulation

Government regulations, especially in Indonesia, are currently considered to be unregulated about the legal framework for data placement by third parties. The government is also expected to provide services and infrastructure that support quality internet connections for cloud services activities by SME companies. In other research, disclosed the government policy that pay attention to the regulation of cloud computing into consideration of SMEs adopt this technology. As in India, there are data protection and other regulatory policy rules that drive the expansion of cloud services, and strengthen domestic broadband access to Cloud services [27]. Another step to encourage cloud computing adoption is that governments need to allow the private sector, including service providers, industry associations, consumer advocacy bodies and brokers, to engage SMEs with cloud computing technology. On the other hand, industry and government associations should provide education and awareness for ICT service provider organizations. ICT providers need to explore the benefits and opportunities of cloud computing for SMEs and how to make the transition to provide cloud computing-based solutions [15].

#### 4.4.6 Challenge of migration issue

The issue of migration for SMEs encompasses a number of issues, such as the difference in workings from the use of prior technology to new services. There are also labor issues that will be pruned because the cloud allows operational automation, so it is efficient from a technical point of view. Another challenge to move data is very large because the company has a large number of consumers, it is feared the migration process can disrupt the company's operations. Other studies also address issues on migration issues such as proper cloud vendor identification, effective cloud resource management, and the transition of ICT hardware and investment into new services [28].

#### 4.4.7 Continuing change

In the ICT industry everything becomes rapidly changing over time, including the condition of service upgrades to the glory of service providers. Management states, it is not impossible if a cloud service provider someday meet bankruptcy or tripped over legal issues. SME management states continue to monitor the current state of the ICT industry to anticipate changes that occur. It is important to make the best planning for the company and minimize the negative impact on the SME business.

## 5. Conclusion

The research finds that the most perceived benefits of cloud computing are cost savings because it reduces capital expenditures. On the other hand, the service enhances the company's internal organizational processes that accelerate decision-making, expand markets, accelerate communication with customers. However, the security aspect and the provision of limited internet connection infrastructure are still a challenge for the adoption of cloud computing in

SMEs. So far, the effective strategies and plans of the SMEs are still considered to be able to minimize the negative impacts of these challenges.

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