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# A Study Literature of Critical Success Factors of Cloud Computing in Organizations

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### Abstract

The aim of this study is to identify the critical success factors that impact the organization to use cloud computing in their business processes. The author conduct a literature review study to identify the factors by collecting thirty papers from reputable database journal such as emerald, science direct, IEEE and Google Scholar. The author was using "cloud computing" as a keyword. After the author reviewed and analyzed the abstract of each paper, the author selected nineteen papers that related to this topic. The author found that **cost reducing, flexible, redundancy and reliability, scalability, collaboration, efficiency, virtually and availability** as critical success factors as the impact of the use of cloud computing for organizations. Further research can be conducted to validate this finding by developing an instrument and take a survey of organizations.

*Keywords: Critical Success Factors, Cloud Computing, Organizations*

## 1. Introduction

Cloud computing is a technology that has been adopted by organizations because of its dynamic, scalability and availability of its resources so that users can use it virtually[2]. Other author stated cloud computing is a new technology in an IT that make change, how, internet and information system to operate all over the world[4]. The early concept of cloud computing was to provide software and hardware resources which can be accessed by organizations and individu[7].

As the next generation of data center, cloud computing has virtual services like hardware, user-interface and logic application with a variety of QoS (Quality of Service) depend on the need of the user. These services can be spread through the internet[6]. Cloud computing can be the new alternative for companies to maintain their data. One

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of cloud computing services is data management application. This application will reduce the cost of the company to maintain the hardware in their office[8].

Although people in an organization already know about the benefit of cloud computing, the use cloud computing still has obstacles. This is because the organization does not understand how cloud computing can affect the way they are working.

In this study, the author would like to investigate the factors associated with triggers of the use of cloud computing by organizations. This article is divided into four sections. The next section will discuss the study and the theory that is relevant to our topic. Results and analysis will be provided in the third section. The last section will discuss our conclusion of this study.

## 2. Cloud Computing

Cloud computing is a pool of configurable computing network (e.g., networks, servers, storage, applications, and service) that is accessible as an on-demand network with minimal management effort or service provider interaction[13,11]. In another article the author mention that a cloud computing is a virtual and distributed computing over internet using web and software services[14]. Cloud computing also refers to the use of computing resources as a service, over a network[17]. For accessing of services, the tenants should pay for it.

From all of definitions of cloud computing above, the author can conclude cloud computing is on-demand computing with services that can be accessed through the internet. All of services are virtually, because the consumers only access those services every time they are needed for using it.

There three services that covered by cloud computing providers [18]:

a. SaaS: an application that can be used by hosts and managers in their own data center. Those users will access this application over the web. SaaS providers also combine its service with PaaS or IaaS as their expanding services.

b. PaaS: The occupants are using this application to develop and deploy their website. They do not need to worry about the infrastructure to develop a website. This service is able to support the complete life cycle of building and delivering web applications and services completely available from the internet.

c. IaaS: as its name, this service provide hardware (server, storage and network) and software (operating system, virtualization technology, file system) as a service. The tenants save their money and time. This service has been created to replace a traditional hosting system that does not require any long term commitment. Users only use this service on demand.
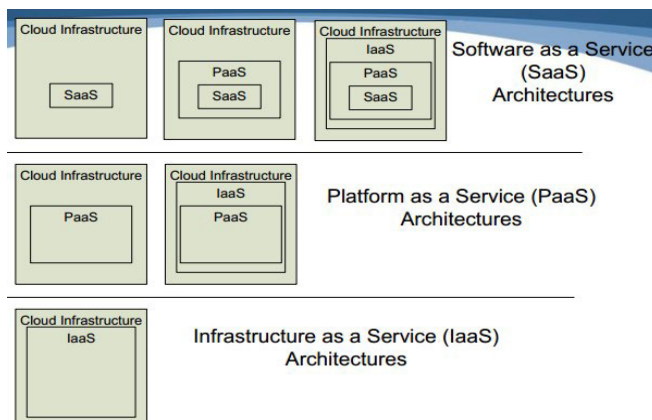


Fig 1. Service Model Architechture[19]

There three models of cloud computing. Applications that can be accessed through the web page called by the public cloud, for example social network, email services and sharing photos and document application. If cloud computing services only can be accessed in private networks, this service called private cloud. The hybrid cloud is also running on physical servers and ensures the proper function of other variants[5].

Another part of cloud computing is its architecture. There are two layers of its architecture, lower layer which is placed for physical resources such as storage servers and application servers. This layer management separately by virtual level to share services, storage capacity and security context[9].
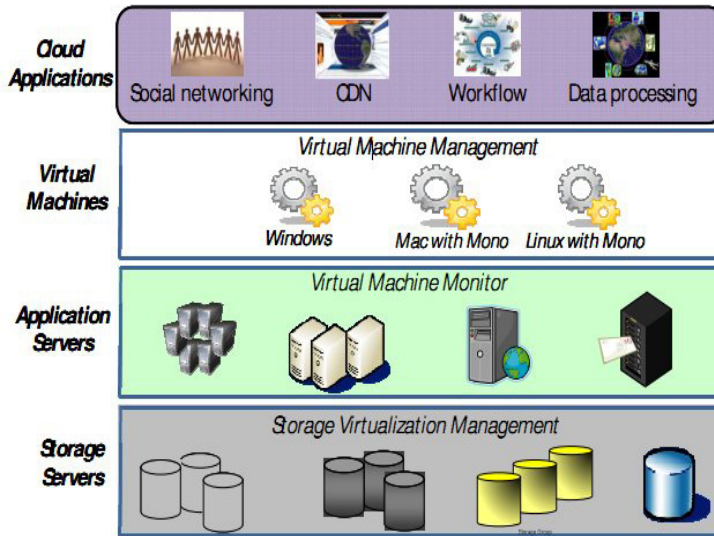


Fig 2.Typical Data Center[9]

## Why organizations use cloud computing?

The previous research has been conducted and successfully identifies factors on why organizations use cloud computing. Table 1 describes researches that have been investigating the using of cloud computing by the organizations.

Table 1. Studies on cloud computing services used by the organizations

| No | Authors | Topic of study |
|----|---------|----------------|
| 1 | Buyya, Rajkummar et al (2009) | To provide a definition of cloud computing from a market perspective by allocating resources with leveraging technologies such as Virtual Machines (VMs)[1] |
| 2 | Armbrust, Michael et al (2009) | Clearing term of cloud and conventional computing for comparison purpose. So that, the developers can identify the hindrances to develop cloud computing infrastructure. [2] |
| 3 | Ercan, Turcay (2009) | Analyzing the cloud computing architecture for education purposes[3]. |
| 4 | Ryan, Mark D (2011) | Conference management systems based on cloud computing[4]. |

| 5 | Buse, Razvan Florin (2011) | The type of services of cloud computing[5] |
| 6 | Calheiros, Rodrigo N et al | Creating Cloud simulation to provide an application to test cloud computing model and framework and combine it with its services[6]. |
| 7 | Sharif, Amir M (2009) | Identifies where and how cloud computing has developed in terms of the collision between internet and enterprise amounting paradigms[7]. |
| 8 | Abadi, Daniel J (2009) | Study about limitation and opportunities of cloud computing implementation[8]. |
| 9 | Kim, Won (2009) | Discuss of cloud computing status and the problem that will face by the providers in the future[10]. |
| 10 | Jamil, Danish et al (2011) | The security method that can be adopted by cloud computing providers[11]. |
| 11 | Kumar, Karthik et al (2010) | The effect of cloud computing accessed through mobile devices for its battery[12]. |

After investigating those papers above, the author found that there are eight factors that can be a reason why organizations use cloud computing in their business processes. Those eight factors are followed:

**A.  Cost Reducing**

The profits that cloud computing providers get is from the cost which is paid by the consumers for accessing these services. In other hand, consumers, such as enterprise, are enamored by the chance to reduce costs because of the cloud computing providers reserve "in-house" provision of these services[1, 5,6,7]. Another benefit of cloud computing pays only for what you use. This motto means, the consumers charged by single service that they use, when they access computing services. In addition, consumers no longer need to put a lot of money to build and maintain IT infrastructure. At any time they can use computer utilities that are sold by the providers. Moreover, servers from cloud computing are capable to do multi tasking of the computation so that the consumers can get results as quickly as they expect[3, 11]. Pay separately per resource is another aspect of reducing cost of cloud computing because most applications do not make equal of computation, storage, and network bandwidth, some are CPU-bound, others network-bound, and so on, and may saturate one resource while under utilizing others[2,8].

**B.  Flexible**

Flexibility of cloud computing services can be achieved by proving ability to access its services of any kind of device. It does not matter what kind of hardware and software that providers use. It is because the providers isolate the user's devices from its infrastructure[1]. As the business grows enough for the first time, providers can add their infrastructure such as hardware resources without notification to their consumers and the consumers do not realize it[2, 7]. To increase the speed of their services, the providers use different interfaces to their compute resources utilizing varied architectures and implementation technologies for consumers[3,8]. Base on their need, users can increase or decrease the level of use of the computing resources and services flexibly and easily[10].

### C. Redundancy and reliability

By placing their infrastructures around the world, the cloud computing providers are avoiding site failures and provide redundancy also ensure reliability[1]. Dividing the workload to multiple clouds in many places can save time and more reliable from consumer prespective[3].

### D. Scalability

Most of interface of cloud computing is user-friendly. Therefore, scalability can be achieved by expanding computing infrastructure. As a center of platform, the application-content makes user can adapt between content items and their needs[3,5,7].

### E. Collaboration

Because of the similarity and flexibility of architecture, facilities, collaboration can be done among cloud computing providers. Another aspect of collaboration is a homogenous manner of management of computer resources from different cloud computing providers[3, 7,8]. From the consumer side, with proper application, members of group that using cloud computing services can share their documents without afraid of outsiders who can access their documents and discuss any topic in that group[4].

### F. Efficiency

Using email services that provided by email providers such as yahoo.com, MSN Hotmail, Windows Live Hotmail and Gmail are an example of efficiency of cloud computing. For receiving professional mail, the company can count on mail providers, with the result that the company does not to buy equipments to provide mail server for their employees. Moreover, the company does not need to buy a software to create mail server. Those are done by cloud mail system providers[5,10]. Efficiency can be achieved because of users can access all services everywhere without considering the computer type and its storage, etc[6].

### G. Virtually

Using VMs (Virtual Machines), consumers are able to install their own application in their devices[8]. Any application run by the consumer have to be virtual towards computation, storage and communication model to cover up the implementation of cloud computing infrastructure[2]. Another fact of virtual of cloud computing is user do not need any background of the services because all of the resources are virtual that can be shared by the users[3,12].

### H. Availability

Providers of cloud computing, manage the infrastructure of it. The providers have control to the contents of cloud computing services in any aspect of study and available to the consumers whenever they request. To access these contents, a new application is created by the application developers[3,7]. Many kinds of services are cloud-based applications and can be accessed by the consumers like social network, file sharing, website and online video viewers. Each of these application types has a different composition, configuration, and deployment requirements[6]. A large cloud computing providers with data centers scattered around the world have the ability to provide a high level of fault tolerance by replicating data across vast geographic distances [8,11].

Based on table 1 and explanation above, the author rank the critical success factors (CSFs) of cloud computing in this table below. The correlation between the table and the explanation is based on the numbers of papers discussed of each factor.

Table 2. CSFs of the reason of organization use cloud computing
in their business processes

| Factors /Authors | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | V | V | V | | | | V | |
| 2 | V | V | | | | | V | |
| 3 | V | V | V | V | V | | V | V |
| 4 | | | | | V | | | |
| 5 | V | | | V | | V | | |
| 6 | V | | | | | V | | V |
| 7 | V | V | | V | V | | | V |
| 8 | V | V | | | V | | V | V |
| 9 | | V | | | | V | | |
| 10 | V | | | | | | | V |
| 11 | | | | | | | V | |
| Number of Factors | 8 | 6 | 2 | 3 | 4 | 3 | 5 | 5 |

The Critical Success Factors (CSFs) of cloud computing:
A. Cost Reducing
B. Flexible
C. Redundancy and Reliability
D. Scalability
E. Collaboration
F. Efficiency
G. Virtually
H. Availability

## 3. Conclusion

The author found that cost reducing, flexible, virtually, availability, collaboration, scalability, efficiency, and redundancy and reliability as critical success factors the impact of the use of cloud computing for organizations in their business processes. The most critical success factor is cost reducing and the less critical success factor is redundancy and reliability. Further research can be conducted to validate this finding by developing an instrument and take a survey of organizations.

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