

# A Taxonomy of Potential Factors Determining the Performance of IT-Organizations Using Cloud Computing

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**Abstract:** *Cloud computing is an internet based computing environment that provides services and other computing resources for users to subscribe who only pay for the resources and services used. Cloud computing is ideal technology now a days for small and medium business organizations. The technology gives opportunity to small and medium business organizations to have access to infrastructures that they cannot afford to buy as well as compete in large business markets. . It provides attractive benefits to many public and private organizations like Pay As You Use (PAYU), fast deployment, Flexibility etc. This paper identify twenty (20) potential factors determining the performance of IT-Organization using cloud computing services and categorized these factors according to organizational or functional unit.*

**Keywords:** Cloud Computing, Cloud Performance, Organizational performance, Cloud Performance factors.

## 1. Introduction

Cloud computing can be viewed as internet based computing environment that provide services and other computing resources for users to subscribe who only pay for those computing resources and services they used. In such away, a small organization does not have to procure its own IT gadgets to support its activities. Organizations only make subscription to the services and computing resources from the cloud service providers and get started(Chao, 2014). Since 2007, cloud computing continue to become a popular innovation in the IT industry(Choi-Hong Lai, 2014; Lori, 2009). The cloud computing technology or service providers offer the services based on the following primary service models so that customers can choose based on their organizational needs or requirements.(Shahzad, 2014).

**Infrastructure as a Service(IaaS):**IaaS gives subscriber opportunity to access infrastructures and services such as processing power, storage area, networks, and other resources provided by the service providers (Shahzad, 2014; Vepuri and Rahman, 2012).

**Platform as a Service(PaaS):** This service model gives end user an opportunity to develop and deploy onto the cloud infrastructure, user-created or acquired applications using programming languages and tools supported by the service provider(Hongxia, 2014; Nedbal *et al.*, 2014; Rajendran, 2013; Vepuri and Rahman, 2012).

**Software as a Service(SaaS):** Referred to as software distribution model(Avram, 2014). This service deployment model gives user an opportunity to use the service provider's applications(software) available in the cloud technology.(Nedbal, *et al.*, 2014) These applications once the user subscribed to the service, it can be accessed using various client devices through the provided user

interface(Ibrahim, 2014). This also gives users an opportunity to have access to the available software online instead of buying and using it locally at their host computers, people pay only the service fees instead of the application license(McGeogh and Donnellan, 2013). The software are centrally hosted and used on demand(Arpaci *et al.*, 2015).

### 1.1 Key Characteristics of Cloud Computing

The five key cloud computing characteristics defined by National Institute of Standards and Terminology (NIST) are outlined below(Hailu, 2012):

- 1) On demand Self service: A user can subscribe a service that require no human interaction and the service is utilized only when needed(Jula *et al.*, 2014). Depending on the current demand, the user may request for the service and quickly release the resource when the task is completed(Rajendran, 2013). All subscribed resources will always be readily available but the user utilizes those resources only when their need arise(Dinadayalan *et al.*, 2014; McGeogh and Donnellan, 2013). This gives user some degree of flexibility and the resources that are being shared will not be tight down by single user.
- 2) Broad Network Access: Broad network access in Cloud Computing means user can broadly access resources via network from almost everywhere using different devices like laptop, palm top etc(Hutchison, 2014; Pallis, 2010; Rajendran, 2013; Zissis and Lekkas, 2012). In this characteristic, one can figure out that cloud computing provides wide range of access to the clients and verity of devices in which different platforms can be use to access the services as well as resources provided by the cloud service providers from different location or platforms.
- 3) Resource pooling: This characteristic refers to cloud computing ability to provide services and resources, physical or virtual to user irrespective of whether the user

knows where the services are coming from or not (Qian *et al.*, 2015). Cloud computing user does not need to have knowledge and does not need to know about the location of the provided resources (Ussenaiah M. and MCA, 2014). This means a collection of services and resources are pooled by the service provider to serve multiple clients irrespective of their physical location or service need (Stieninger *et al.*, 2014).

- 4) **Rapid Elasticity:** This characteristic of cloud computing refers to its ability to rapidly be scalable (Alam *et al.*, 2015). Provision of service and resources are based on the user needs, services are dynamically subscribed (Hu *et al.*, 2015). This can be viewed as another term for scalability which means depending on the demand, Cloud computing provide user with ability at any time to scale up or scale down the service or resources subscribed. In other words, Rapid elasticity in cloud computing means user has full service subscription flexibility and control over the subscribed services and infrastructures.
- 5) **Measured Service:** Resources and service usage can be monitored and reported (Shahzad, 2014). Cloud Computing provides user with monitoring capabilities to measure the amount of service and resources that has been utilized at any time (Prasanth *et al.*, 2015). This characteristic made cloud computing to become service driven innovation in that consumer subscribe the service and resources based on the need and the usage can be measured, monitored and reported accordingly. Consumer may decide to buy just the time they need to use the infrastructure or just the storage space they need.

## 2. Background and related work

This section begin by introducing how cloud computing started and its development up to the current stage. The idea of Cloud computing was first envisioned by J.C.R. Licklider, who referred to as the initiator of the development of Advanced Research Projects Agency Network in 1969 (ARPANET). The vision of Licklider's was to have global interconnectivity and the capability to access data from any site, from anywhere in the world, the Internet and eventually cloud computing technologies (Wu *et al.*, 2013).

Technology limitations at that time served as major constrain for Licklider to execute his idea of having vast global computer network. The first data was exchanged via two computer nodes in October 1969 when ARPANET came to reality. This was considered beginning and first time when computing technology had been used to exchange data in an Internet nature. Later more computers were added to ARPANET, and research provided a functioning Host-to-

Host protocol called the Network Control Protocol or NCP, in addition to new networking software (Garrison *et al.*, 2012; Phaphoom *et al.*, 2015). From this idea, cloud computing could be considered to be born as the service that provide users with an online application with offsite data storage rather than running installed software and having resources on premise (Tan, 2015).

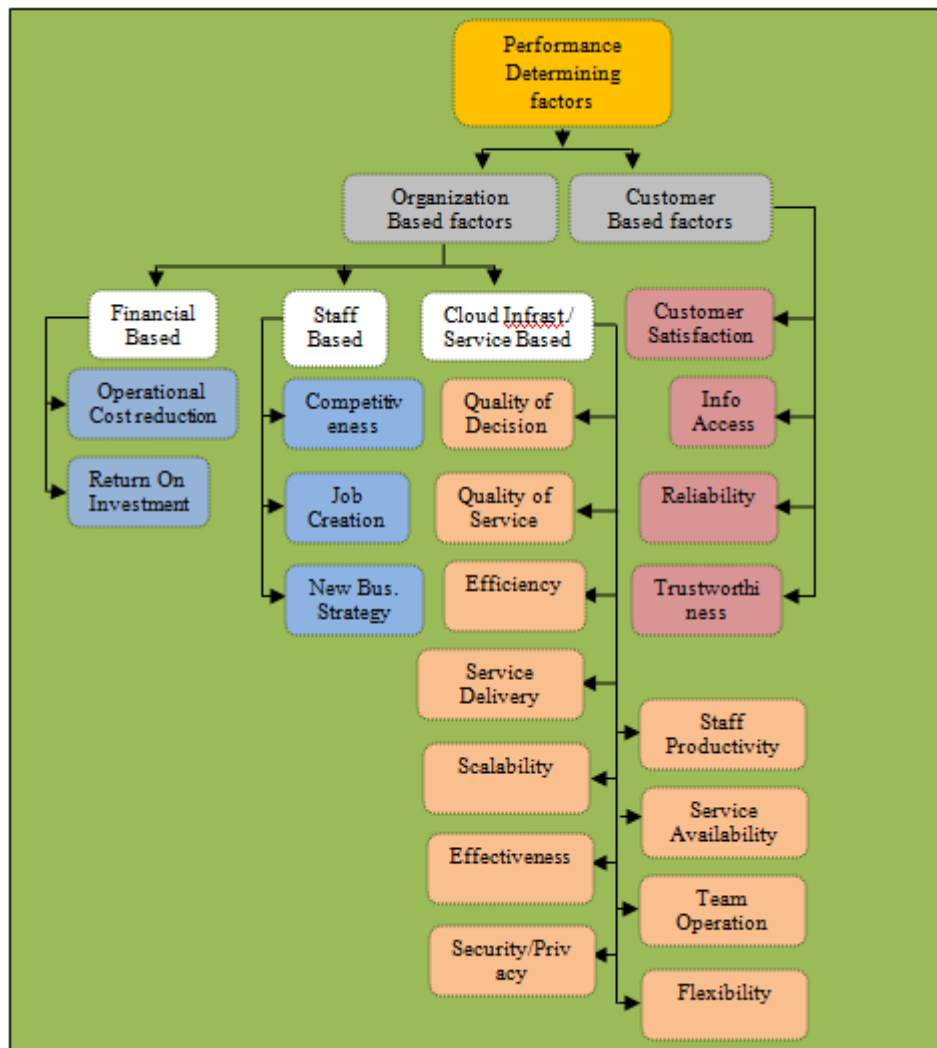
As with any decision about alternative ways to meet a business need, there should be a cost-benefit analysis applied when considering to migrate an application as well as factors associated with such migration (Bharadwaj and Lal, 2012). There are often differences in the version of various infrastructure, the programming models, the libraries available, even the semantics of data access are different; for example, cloud platforms typically provide eventual consistency rather than transactional guarantees (Tran *et al.*, 2011).

## 3. Potential factors determining the performance of IT-organization using cloud computing services

The research discovered some potential factors determining the performance of IT-organization using cloud computing services from various literatures. according to (Singh *et al.*, 2011), the factors are: Improved Security, Trustworthiness, Reliability, Effectiveness, Efficiency, and Improved Quality of Service. (Bharadwaj and Lal, 2012) Stated the factors as: Improved Information access (Nedbal, *et al.*, 2014), Improved Quality of decision making, Improved Competitiveness, Improved service delivery, Improved staff satisfaction, Improved service availability. (Jackson, 2014; Pallis, 2010) Better customer satisfaction, Scalability, Speed, Improved productivity and Reduction of staff cost. (Ibrahim, 2014; Sharma *et al.*, 2015) Operational cost reduction and New business or market strategy. Improved Return On Investment (ROI). Improved Job creation (Tran, *et al.*, 2011).

### 3.1 Classification of potential factors determining the performance of IT-organization using cloud computing services

The paper classified the factors determining the performance of IT-organization using cloud computing services into Organizational based, Customer based, Financial based, Staff based and cloud infrastructure/services based factors as shown in figure 1.



**Figure 1:** Classification of potential factors determining the performance of IT-organization using cloud computing services

Figure 1 shows the categories of the potential factors as classified by this paper. The major classifications were based on organizations and customers. However, organizational based classification has financial, staff and cloud infrastructures/services as sub classes. However, under each sub class there were relevant/related sub sub classes. On customer side also the paper presents relevant sub classes.

### 3.2 Factors Inclusion criteria

- Factors from Peer-reviewed papers concerning Cloud computing, including research survey, case study or experience report from cloud practitioners.
- Factors from Peer-reviewed papers concerning Cloud Adoption.
- Factors from Peer-reviewed papers concerning Cloud Adoption and organizational performance and Online surveys conducted by prominent cloud practitioners.
- Factors from Books about cloud computing adoption and organizational performance.
- Majority of literatures concerning Cloud adoption, cloud performance, organizational performance was published between the year 2010 and 2015(Wade, 2015).

### 3.3 Exclusion criteria

- Papers concerning Cloud computing, Cloud Adoption and organizational performance using cloud that are not peer-reviewed, even though it met the inclusion criteria.
- Literatures concerning Cloud adoption, cloud performance, organizational performance published before the year 2010 and there is available paper published between 2010 and 2015.
- Papers or research report that discusses information out of the academic scope(Wade, 2015).

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### 5. Conclusion and Future Research

Cloud computing offers many benefits to IT-organizations for achieving their targeted business or operational goals. This paper was aimed at providing an overview of cloud computing services, Key Characteristics of Cloud Computing, factors determining the performance of IT-Organization and finally these factors were categorized according to organizational or functional unit. Area of cloud

computing is very wide, we hope this opens an opportunity for further research to compare the level of cloud adoption and the performance of IT-organization using cloud computing in developed and developing countries based on the identified factors.

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