The Organizational Critical Success Factors for Adopting Cloud Computing in SMEs

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Abstract—Cloud computing has emerged as one of the most discussed topics among enterprise IT professionals. This paper is giving list of cloud computing advantages and disadvantages and some reasons will cause company adopt cloud based services or avoiding. The small and medium size enterprise does not possess sufficient financial and human recourse, in comparison to the large size factories, hence they are not capable of upgrading their IT requirements efficiently, It will not allow them to have a sufficient chance to compete with powerful competitors, in a business environment. Evaluating the impact of organizational factors on cloud computing adoption in SMEs was determined as the main purpose of this study and led to focus on the TOE framework as a famous theory on evaluating IT adoption. For this purpose, organizational context divided into three main factors in base of TOE framework include organizational, environmental and technical context. Three set of critical success factor criteria chosen by review of previous studies for each three level of organizational factors. It can be helpful for small and medium size enterprises which want to evaluate their organizational condition for adopting cloud based services.

Keywords – organizational critical success factor; cloud computing adoption in SMEs ; Cloud advantages and disadvantages

1. INTRODUCTION

Cloud computing are developing globally and presenting the following facilities: services and resource sharing, external information storing, full availability, auto-scalability and most importantly pay-as-you-go or the services renting concept. The cloud computing knowledge was introduced in 1969 but the biggest evolution in this field happened since 2000[1].

Cloud providers can deliver computing resources as a service and cloud services are included (software, hardware and platform). It offers a shift away from computing as a product that is owned, to computing as a service that is delivered to consumers over the internet from large-scale data centers or clouds. The cloud users will able to utilize of these resources everywhere and every time. Otherwise rapid service delivery will cause companies to encourage change in IT agility for reengineering their business process. The company makes a fundamental revolution in application and interacts with consumers. The result of economic and business research in Europe is shown cloud computing could generate €763 billion ($1.05 trillion) and 2.4 million new jobs by 2015[2].

Cloud computing is not simply about a technological improvement of data centers but a fundamental change in how IT is provisioned and used [3]. Small and mid size factories doesn’t have enough financial and human recourse in comparison of large size factories so they couldn’t upgrade their IT requirements efficiency. It will cause they don’t have a sufficient chance when compete in a business environment with powerful competitors. Researches in United kingdom show SMEs company are eagled to using the Internet and services for increasing their business opportunity. SMEs understand that use update technology in enterprise effect advance in business field.[4]

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Competition in business market growth rapidly, thereby it caused all companies need to have update skills and technology for producing new services appropriate to market required[5]. SMEs limited recourses led to usually they gain less advantages in compare with other competitors. Small and Medium size enterprises are not able to access all required new technology of IT services.

It is necessary for SMEs those finding and implementing new strategic ideas for achieving more advantages in the global market. This new strategy must help SMEs to adopt new required technology. Developing in enterprise IT
infrastructure can eliminate some of the barriers for participating in global marketing and help SMEs to have efficient business and compete in global markets[6].

The drawbacks in the adopted diffusion technological innovation have to be considered in a theoretical model for cloud computing diffusion, which are triggered by the explicit technological, organizational, and environmental aspects of the company. Huge quantity of empirical studies has targeted on various IS domains and the TOE structure clarifies the acceptance of innovation. These factors constitute eight predictors for adopting cloud computing as highlighted in Figure 1[7].

![Figure1: Cloud Adoption Framework][7]

The objective of this paper is to analyze and describe critical success factors of cloud computing adoption reference to the TOE framework. Tornatzky and Fleischer (1990) developed The TOE framework for adopting IT efficiency in organizations. TOE was designed for covering organizations request in adopting and implementing technical innovations. The organizational condition can be one of the effective factors in SMEs which can encourage them to adopt cloud computing and using of cloud benefits. TOE organizational context and practices that are applicable to a large business may not fit a small business. There is a need to examine cloud computing adoption in SMEs separately rather than in the relational view commonly used[8]. These critical success factors were derived from a previous research which conducted about critical success factors on IT adoption.

2. LITRATURE REVIEW

A. Cloud computing in SMEs

National Institute of Standards and Technology (NIST) defined “cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services), that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics (on demand self service, broad network access, resource pooling, rapid elasticity and measured service), three service models (software as a service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS), and four deployment models (Public cloud, private cloud, hybrid cloud and community cloud)"[9].

The use of information and communication technologies (ICT) can improve business competitiveness, and has provided genuine advantages for small and medium sized enterprises, enabling them to compete with large firms [10]. In traditional IT environments, increasing the complex management issue of software, hardware and networking equipment require specialist staff for implementing and maintaining IT services. Some of the promised benefits of cloud computing can be very appealing for SMEs, which need to maximize the return on their investment and still remain competitive in an ever demanding business environment[11].
B. Cloud Computing Advantages and Disadvantages

Cloud computing is now growing rapidly and organizations of all shapes and sizes adapting to this new technology. IT experts believe that cloud based services will continue to grow and develop even further in the coming few years. While cloud computing is undoubtedly beneficial for mid-size to large companies, it is not without its downsides, especially for smaller businesses. Table 1 shows a list of advantages of disadvantages of cloud computing.

<table>
<thead>
<tr>
<th>Cloud Computing Advantages</th>
<th>Cloud Computing Disadvantage</th>
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<tbody>
<tr>
<td>Cost Savings</td>
<td>Lack of Control</td>
</tr>
<tr>
<td>Scalability/Flexibility</td>
<td>Dependency</td>
</tr>
<tr>
<td>Reliability</td>
<td>Risk</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Essentially need an Internet connection</td>
</tr>
<tr>
<td>Minimize licensing new software</td>
<td>Migration Issue</td>
</tr>
<tr>
<td>Innovation</td>
<td>Lack of Standards</td>
</tr>
<tr>
<td>Multiple Users at same time</td>
<td>Continuously Evolving</td>
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</table>

C. Reasons for Adopting and Avoiding Cloud Computing Adoption in SMEs

Cloud computing applications offer benefits to companies that implement them and will cause the development information technology in all organizations, universities and industries. Despite all the potential advantages offered by cloud computing enterprises are worry about cloud based services. Table 2 determine some reasons that influence on company decision about adopting or avoiding cloud computing[12].

<table>
<thead>
<tr>
<th>Reason for adopting cloud computing</th>
<th>Reason for avoiding cloud computing</th>
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<tbody>
<tr>
<td>Centralized Data</td>
<td>Security</td>
</tr>
<tr>
<td>Monitoring Data</td>
<td>Latency</td>
</tr>
<tr>
<td>Remote Access</td>
<td>Service Level Agreement (SLA)</td>
</tr>
<tr>
<td>Easy Implementation</td>
<td>Migrating Applications</td>
</tr>
<tr>
<td>Agility</td>
<td>Internet Dependency and Performance</td>
</tr>
<tr>
<td>Device and Location Independence</td>
<td>Employee skills</td>
</tr>
<tr>
<td>It’s Greener</td>
<td>Managing Business Risks</td>
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D. Organizational factors that have effect on cloud adoption in SMEs

Organizational factor The TOE structure was recommended by Tornatzky and Fleischer[13] to explain the process of innovation in the framework of a business. The three characteristics of a business that has an impact on the innovation adopted- technology, organization and environment, are considered. The internal and external technology appropriate for the organization are referred by the technology aspect, and the appropriate technologies that exist for probable acceptance.

The drawbacks in the adopted diffusion technological innovation have to be considered in a theoretical model for cloud computing diffusion, which are triggered by the explicit technological, organizational, and environmental aspects of the company. Suggesting the TOE structure has been accredited to several studies advanced by Tornatzky and Fleischer [13], to examine IT acceptance by firms. Technological, organizational, and environmental are the three aspect groups identified by the TOE structure. Overall studies on IS adoption tend to examine large businesses, and findings from these studies are unlikely to be generalizable to small businesses because of various fundamental differences between large and small businesses [14].

As a result, there is a lower level of awareness of the benefits of cloud computing and a lack of IS knowledge and technical skills in small businesses [15]. In addition, SMEs lack financial resources and are highly susceptible to short-range planning in response to their highly competitive environment. Hence, they do not have funds.
readily available for cloud adoption or tend to adopt the lowest-cost IS, which may be inadequate for their purposes [16]. Because of a tendency to adopt a short-term management perspective, they underestimate the amount of time and effort required for cloud computing implementation.

Further, SMEs typically have less slack resources with which to absorb the shocks of an unsuccessful investment in IS adoption. Because of the unique characteristics of an SME, there is a need to examine whether models of cloud computing adoption developed in the large-business context can be equally applied to small and medium size enterprises. While large enterprise suffers from many of the same constraints, the effect on small businesses is more significant. The skills, time, and staff necessary for planning are not major issues in large businesses, yet these same issues represent most of the difficulties in SMEs [6].

Larger businesses have more resources and infrastructure to facilitate innovation adoption. SMEs suffer from a special condition commonly referred to as resource poverty. Resource poverty results from various conditions unique to SME, such as operating in a highly competitive environment, financial constraints, lack of professional expertise, and susceptible to external forces. Because of these unique conditions, small businesses are characterized by severe constraints on financial resources, a lack of in-house IS expertise, and a short range management perspective [17]. Consequently, SME face substantially more barriers to adoption of cloud computing and are less likely to adopt cloud based services than large businesses. [8] argue that, even among SME, the larger the business, the more able it is to hire people with specialized skills, such as knowledge of IS. In addition, the organizational condition can be one of the effective factors in SMEs which can encourage them to adopt cloud computing and using of cloud benefits. TOE organizational context and practices that are applicable to a large business may not fit a small business. There is a need to examine cloud computing adoption in SMEs separately rather than in the relational view commonly used.

3. RESEARCH METHODOLOGY

The qualitative method selected for this research. Qualitative methods are used for gathering data, reviewing the literature and collect initial information cloud computing adoption. After classified the collected data, a list of cloud computing advantages and disadvantages and a list include of reasons for adopting and avoiding cloud based services prepared. In next step, Three set of critical success factor criteria chosen by review of previous studies for each three level of organizational factors include top management support, firm size and technology readiness.

In improving the aggressiveness of a country’s economy, information technology (IT) is regarded everywhere as a vital tool nowadays. The fact that IT has significant effects on the productivity of firms is generally adopted today. If, and when, IT is widely covered and utilized, these impacts will only be then fully achieved. Hence, it is critical to comprehend the determinants of IT adoption and the theoretical models that have arisen addressing IT adoption. Regarding the contrast of IT adoption models at the individual level, there are few reviews of literature, and to the best of our understanding, at the firm level, there are even fewer. This review will overcome this gap. In this research, The critical success factor assess for accepting information technology by investigating in researches that use the TOE theory for adoption models at the firm level applied in information systems (IS) literature.

4. ORGANIZATIONAL CRITICAL SUCCESS FACTOR

Even as cloud services change the way enterprises create, share, consume and dispose information & data, not every workload can be moved to the cloud. Determining which cloud delivery model fits is a decision driven by business needs and desired functionality depending on the size of the enterprise and the kinds of data, applications and processes in the enterprise. Enterprises need to evaluate and choose the right cloud deployment model taking into consideration the following critical factors for successful adoption of cloud and its operationalization within the organization:

A. Top management support

In cloud computing adoption, top management support plays a significant role as it involves the provision of resources, simulation of services and re-engineering of procedures [7]. The needed resources for its adoption will probably be allotted by top management after acknowledging the advantages of cloud computing and encourage the organizational members to execute the change. The management will be against its acceptance when they miss the mark in deriving the advantages of cloud computing to their business. Thus The degree of support provided by the higher management in adopting the technological innovations for business use is referred as top management support.

Top management backing is one of the three top forecasters for IT innovation adoption at the organizational level as suggested by the latest review of the IT adoption literature. Top management backing has a beneficial relationship
in the organizational’s choice to adopt an innovation; has also been suggested by earlier studies on IT innovation acceptance based on TOE structure.

Quinn contended that there exist two diverse grounds for mitigating the beneficial relationship between top management backing and technological acceptance of modernization. The abundant disbursement of organizational resources (e.g., financial, technical, and human) for the perfect acceptance and execution of an IT innovation can be initially assured by powerful top management backing. Secondly, top management can offer lasting vision, suggestions, backing, and the responsibility to produce a favorable environment for the IT innovation to reduce organizational conflicts on adopting an IT innovation [18]. Hence, it is very possible that organizations with a firmer top management support for KM systems would most probably accept such systems [19].

**TABLE 3:** Top management critical Success Factor for Adopting Cloud Computing in SMEs

<table>
<thead>
<tr>
<th>Critical Success Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td>Management of IS human resource [21]; [20]</td>
<td>Organizations are able to in the shortest time order and use required services also the company don’t need hire new IT experts for developing their IT infrastructure [20]</td>
</tr>
<tr>
<td>provide a vision and commitment to create a positive environment for innovation [7]</td>
<td>Top manager has significant impact for adopting new technology in organizations. Top manager must have sufficient information for cloud services which required it and investigate clear vision for the company if they use the specific cloud service [7].</td>
</tr>
<tr>
<td>understanding of the capabilities and limitations of IT [22]; [21]</td>
<td>Organizations which want access more benefit in the market must use the emerging technology. Top managers must completely investigate about the new IT based service which they want to use and determine all limitations and benefits. After appraising all aspects of service, decide about using the service [21].</td>
</tr>
<tr>
<td>Establishing reasonable goals for using cloud computing [22]; [21]</td>
<td>Top manager is responsible for developing the company. In the new century, information technology is used in all dimensions of sciences and works, so a successful manager must have a plan for developing their company and in base of the plan uses of required information technology [21].</td>
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### B. Firm Size

Another essential factor that can impact on the adoption of cloud computing is firm size. As they have more resources and can afford greater risks connected with innovative adoption, bigger firms have a plus point over smaller ones. Studies have shown that smaller firms do not willingly accept newer technologies, although they are more adaptable [23]. A crucial determinant that will ensure the adoption of cloud computing as a technological innovation is the size of the firm (Low, et al., 2011).

Organizational size is consistently discovered to be encouraging with regards to the organizational leaning towards accepting an innovation as per the IDT/DOI theory by Rogers (1995). Jeyaraj et al. (2006) also showed that organizational size is one of the three top forecasters of IT acceptances by organizations based on an assessment of 51 empirical studies. Organizational size certainly influenced the organizational adoption of IT innovations suggested by the assessment of the studies based on a TOE structure [24].

The bigger sized organizations typically have more flexibility in their resources and therefore assign more organizational resources (e.g., financial, technical, and human resources) for the adoption of any new IT innovation is one possible reason for the substantial positive relationship between organizational size and IT acceptance. (Montazemi, 1988). The fact that bigger organizations have a greater need, more resources, expertise, know-how, and more capability to endure malfunction as compared to smaller organizations was maintained by [25]. Compared to other kinds of organizations, public sector organizations are no different and their bigger size can also lead them to incur failures. [19]

**TABLE 4:** Firm Size critical Success Factor for Adopting Cloud Computing in SMEs
Critical Success Factor | Description
---|---
Increased ability of small firms to compete with other companies both locally and nationally [26];[27] | Larger organizations are found to have greater slack in resources and are therefore able to experiment with new innovations. They are also able to more easily mobilize adequate financial resources required for implementing innovations. Even within the small business category, the larger ones are able to take risks with new technologies but cloud-based services give the ability to SME’s use the emerging technology with the lowest price and compete with large size companies [26].

• SMEs is more flexible about quick change [11];[26] | Small and medium-size firms can be more innovative, they are flexible enough to adapt their actions to the quick changes in their environment, compared to larger firms, which have multiple levels of bureaucracy and this can slow down decision-making processes [28]. Finally, IT adoption often needs coordination, which may be relatively easier to achieve in small firms [11].

• Cloud computing has a positive impact on the creation of new firms, new products [11];[20] | Organizational size was found to be an important parameter for start-up small-size businesses; their small size enabled them to change direction quickly and to be more flexible if needed. For start-up companies, using cloud computing may be attractive, because it can help avoid capital expenditure. Otherwise, SME’s can cost their invest for producing new products instead of the cost of providing new IT technology [11].

Develop SMEs market [26, 29] | Cloud computing can help small and medium-size enterprises develop their markets, to increase sales turnover and to raise profitability, sever constraints on financial and human resources often cause SME business to lag behind large businesses in the use of information technology [29].

C. Technical Readiness

The adoption of modern technology is impacted by the technological readiness of organizations, which are technological infrastructure and IT human resources [30];[6]. Implemented network technologies and enterprise systems, which offer a platform on which the cloud computing applications can be built is referred to by technological infrastructure.

The execution of cloud-computing-associated IT applications are provided with the knowledge and experiences of IT human resources. Only if firms have the necessary infrastructure and technical efficiency, cloud computing services can become part of value chain activities. Hence, firms that have technological readiness are more ready for the acceptance of cloud computing [7].
### TABLE 5: Technology Readiness Critical Success Factor for Adopting Cloud Computing in SMEs

<table>
<thead>
<tr>
<th>Critical Success Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td>Reducing infrastructure management[31]</td>
<td>Cloud providers offer facilities for their customer from installing the services until maintenance so organizations which use IaaS services don’t need several experts for maintenance and update the infrastructures. when they face to a problem can contact to cloud provider company and ask them to deal with the problem[31].</td>
</tr>
<tr>
<td>Reducing IS cost [21, 32]</td>
<td>Using cloud based services will cause, reducing the cost related to IT experts, maintenance the service, update and system upgrade. [21]</td>
</tr>
<tr>
<td>Data availability[21]; [31]</td>
<td>Cloud services like IaaS and SaaS give opportunities to their customers to access their servers, software and data from online if access to high speed internet[31].</td>
</tr>
<tr>
<td>Reduction of software maintenance [31]; [32]; [21]</td>
<td>Cloud computing providers offer will do all steps of installing the software, maintenance and update it, so enterprise with paying a reasonable price can using the update software also the company don’t need use an available team of IT experts for maintenance and update the software. [21]</td>
</tr>
<tr>
<td>Technical skills of IS staff [6];[31]</td>
<td>Nowadays company try to eliminate paper base work so increase use of IT technology in all parts of their company so they need to have an employee with good computer knowledge for updating and advancing in their works. Otherwise a company with powerful decision maker with its background can update with emerging technology rapidly so organization is able to efficiently compete with their competitors[33].</td>
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### 5. CONCLUSION

Based on our analysis of relevant studies, critical success factors for adopting cloud computing in SMEs were developed. These factors were investigated in three organizational factors such as top management support, firm size and technology readiness. Organizational factor is assessed with several variables which have an impact on cloud adoption in SMEs. Therefore, it can be useful for the organizational decision maker which intent to evaluate adopting cloud based services in their enterprises also The organizational context based on TOE, was developed and assessed in SMEs, so it can be useful for others, in order to evaluate the impact of the complete TOE framework on SMEs. Prepared critical success factors can be helpful for small and medium size enterprises that want to use cloud based services so in base of these factors they will be able to evaluate their organizational conditions for adopting cloud computing.

### REFERENCES