The Cloud Computing Adoption Factors in Various Organizations: A Systematic Literature Review

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Abstract - Cloud computing offers so many advantages to the organizations such as availability, and cheaper cost. Many organizations are adopting cloud computing. However, the decision to adopt cloud computing is affected by several factors. Therefore, it is important to investigate the most common factors that affect the decision of organizations to adopt cloud computing. This systematic literature review helps to identify the main factors that affect the decision on adopting cloud computing by organizations. From our search in different databases such as ACM Digital Library, IEEE, SpringerLink, Scopus, etc., we select around 150 articles from the field of cloud computing and around 30 articles were qualified to be reviewed to help achieve the goal of this paper. For the purpose of this systematic literature review article, the criteria were set to select only the studies which followed the Technology Organization Environment (TOE) framework and were published from year 2014 to 2020. This review paper has identified the main factors and concerns that influence the decision to adopt cloud computing. Considering the importance of cloud computing, we encourage that future research to be on the awareness of organizations about cloud computing.

Keywords - Cloud Computing, Factors, Technology Adoption, Organizations, TOE

I. INTRODUCTION

Cloud computing is one of the most discussed technologies in the recent years due to the benefits it brings, mostly to the organisations worldwide. In the past decade, cloud computing is considered as one of the most adopted technology and it is in the top five emerging technologies [1]. According to reference [2] cloud computing is an innovative technology that enables organizations to deploy and develop their own innovative applications. Cloud computing has the potential to make the softwares even more attractive as service to the organizations [3]. References [4] and [13] argued that “cloud computing has emerged as a high-potential IT innovation that replaces the need for organisationally owned IT assets with on-demand and rapidly scalable alternatives delivered as services over the Internet”. Many organizations are aiming to adopt cloud computing services. Cloud computing is seen to bring many benefits to organizations. To mention few, better performance, accessibility worldwide, cost reduction and bigger storage capacity are some of the benefits that cloud computing brings to organizations [5]. Moreover, cloud computing services are already used by some organizations in their daily operations even without them being aware of using them. For instance, according to reference [6], many organizations use Gmail, Google Docs, and Dropbox services etc, which fall in the category of cloud computing services, although these organisations do not have the awareness that these services fall under cloud computing services. Organizations which have already adopted cloud computing services see it as one of the most powerful tools in IT, meanwhile those who have not embraced cloud computing see it as complex and immature tool to adopt [7].

Considering the benefits of cloud computing, many large organizations are trying to adopt to cloud computing services [1]. Based on the study conducted by reference [8], organizations and governments are adopting increasingly cloud computing.

On the other hand, despite all of the benefits that cloud computing is bringing to the organizations, many organizations, especially small ones, are still hesitant to adopt it. For instance, in the many reviews conducted in cloud computing adoption, scholars stated that Small and Medium Enterprises (SMEs) face more challenges as well as have more concerns when it comes to cloud computing adoption [5], [6], [9], [1]. In their research, reference [6] stated that cloud computing adoption rate is even slower than predicted.

Even thought there are different views by organizations whether to adopt cloud computing or not, research shows an increasing trend of adoption rate of cloud computing applications [10]. There is little doubt that it is crucial to know the main factors that affect the decision to adopt cloud computing. This systematic literature review enables us to identify the main factors influencing organizations to adopt cloud computing and the main concerns that refrain organizations from adopting cloud computing.

Furthermore, this paper uses the Technology Organization Environment (TOE) framework as it is considered as most appropriate framework to examine the factors that affect the decision of adopting cloud computing. Furthermore, the TOE framework is used by many researchers to examine the factors of cloud computing adoption [11], [12], [9], [6].
II. RELATED WORK

A. Cloud computing adoption in various organizations

Various sectors and organizations worldwide are trying to adopt cloud computing. For instance, cloud computing is rapidly spreading in educational institutions [15]. Cloud computing is becoming “new dawn” for education because cloud computing allows virtualization of resources, in particular software applications which allows these resources to be delivered online through internet instead of being installed on institution workstations [12]. Therefore, cloud computing plays an important role in online education programs such as e-learning. Scholars have identified several factors influencing educational institutions to adopt cloud computing, although they might vary depending on the country. For instance, reference [16] has identified that the main factors to adopt cloud computing in education in developing countries are compatibility, trialability, observability, results demonstrable and relative advantage, meanwhile they claimed that the main concerns to adopt cloud computing are socio-cultural, poor ICT infrastructure, risk, data security and complexity. In addition, reference [16] stated that the main factors to adopt cloud computing in education in Africa are awareness, cost effectiveness, good ICT infrastructure, relative advantage, compatibility, trialability, observability and results demonstrable, while they argued that the main concerns to adopt cloud computing in education are risk, data security, socio-cultural factors and complexity. Furthermore, the main factors that influence education institutions in Saudi Arabia to adopt cloud computing are relative advantage, compatibility, top management support, in contrary, the main concerns that are complexity, vendor lock-in, data concern, and government regulations [17]. Also, in their study, reference [18] suggested that the main factors to adopt cloud computing by education institutions in India are relative advantage, compatibility, complexity top management support, competitive pressure and external expertise. Additionally, reference [12] argued that the main factors that have impact in cloud computing adoption in education institutions in Canada are relative advantage, compatibility, institutional size, technology readiness and service provider support, while the author argued that factors that have negative impact on adoption of cloud computing by education institutions are complexity, perceived barriers and regulatory policy. Moreover, in their study, reference [19] found that factors that push education institutions in Pakistan to adopt cloud computing are affordability, government, support, reduce cost, easy and implementation, on the other hand, these authors states that the main concerns when it comes to adoption of cloud computing in education institutions are complexity, privacy, availability, integrity, confidentiality, trust, compatibility and cost. Furthermore, the factors that have a great impact in cloud computing adoption in education institutions in the United States and Canada are relative advantage, regulatory policy, and service provider support, at the same time factors that have negative impact on cloud computing adoption in education institutions are complexity, institutional size and technology readiness. According to reference [15], the factors that influence cloud computing adoption in education institutions in Malaysia are relative advantage, compatibility, top management support, institution size, service provider support and government support, meanwhile the main concern to adopt cloud computing by educational institutions is complexity. In a research conducted by reference [20], it was found that factors that have a great impact in adoption of cloud computing by educational organizations in Yemen are compatibility, relative advantage, regulatory policy, security and top management system. Furthermore, reference [10] argued that some of the factors that affect the cloud computing adoption in developing countries are cost, ease of use, and painless IT operations, on the other hand, the author argued that privacy, security, trust, lock-in with service providers, and data transfer capacity are concerns that impact the decision of cloud computing adoption. These findings show that the main common factors impacting the adoption of cloud computing in education institutions in different countries such as the United States, Canada, Brazil, Saudi Arabia, Yemen, Malaysia, Pakistan, India are relative advantage, compatibility, top management support, and institution size, meanwhile the main concerns when it comes to adoption of cloud computing in education institutions are complexity, privacy, integrity security and government regulations.

Also, cloud computing has gained great attention in healthcare institutions. Healthcare institutions are adopting cloud computing to reduce infrastructure cost, however, security is still a great concern [21]. Cloud computing enables healthcare institutions to share IT resources such as expert skill sets, software and hardware to enhance the processing capacity [22]. Reference [23] argued that cloud computing can be used to manage the personal health records in US. In addition, reference [23] stated that there are 300 personal health records system, even though this is a large number, they still have a low adoption rate of these systems. Cloud computing can benefit the traditional electronic health record in healthcare industries by changing the design in terms of efficiency utility and economy [21]. There is a lot of research conducted to investigate the factors that influence the decision whether to adopt cloud computing in the healthcare sector. For example, in their study, reference [21] found that the main factors to adopt cloud computing in private and public hospitals in Brazil are cost, flexibility, and top management support, meanwhile they found that the main concerns when it comes to adoption of cloud computing are security, risk, availability and regulations. Furthermore, reference [22] argued that the main factors influencing healthcare industries in Saudi Arabia to adopt cloud computing are relative advantage, compatibility and technology readiness. Based on the above findings, there is no same factor that influence the decision of healthcare organizations in adoption of cloud computing in Brazil and Saudi.

In addition, government and private sectors are benefiting from cloud computing services. However, even though in many countries the respective governments are supporting the development of ICT, still the adoption rate of innovative technologies is still low across the countries, especially in government sectors [24], [25]. Security,
finance, ICT skilled staff, resistance to change, performance, reputation and lack of cooperation amongst departments are the main challenges faced by government sector when it comes to adoption of new innovative technologies such as cloud computing [25]. Public sectors are even less open minded when it comes to adoption of innovative technologies [25]. However, many developed and developing countries are tending to adopt cloud computing to improve user satisfaction and efficiency [25] and reduce capital expenditure cost and increase flexibility [24]. In addition, research found that quality of services, trust, relative advantage, compatibility, trialability, top management support and technology readiness are the main factors to adopt cloud computing in private sector organizations [26]. Meanwhile, they claimed that security and privacy are the main concerns to adopt cloud computing in private sector organizations. Moreover, the main factors to adopt cloud computing in government sector organizations in Australia are cost, top management support, and employee’s knowledge [25]. Meanwhile, the same reference [25] argued that organizations size, complexity, compatibility and organization’s technologies readiness have negative impact on the adoption of cloud computing.

In recent years, there has been an increasing amount of literature on the determinants of cloud computing adoption among SMEs. SMEs are tending to adopt cloud computing to overcome the competitive advantage. Some of the advantages that cloud computing brings to SMEs are scalability, flexibility, and reduced cost [27], [28]. However, most of the SMEs worldwide are still hesitant when it comes to cloud computing adoption [9]. One reason for not adopting the cloud computing by SMEs is due to the size and structure of SMEs, many SMEs face various challenges starting from lack of having access to enough resources [27], [5]. We have reviewed literature on the factors that push adoption of cloud computing by SMEs in various countries. For example, in their research, reference [29] argued that the main factors impacting the cloud computing adoption by SMEs in Taiwan are relative advantage, compatibility, trialability, observability, ease of use, security and lower financial costs, however, firm size is the main concern. Also, reference [6] stated that cost saving, top management support and technology readiness positively influence cloud computing adoption, on the contrary, the factors that have negative impact on the adoption of cloud computing are advantage, competitive pressure and external support. Additionally, in a study conducted in China among various SMEs by reference [30], it was found that the main factors to adopt cloud computing is compatibility, while, they argued that the main concerns when it comes to cloud adoption are costs, complexity and security. According to reference [1], the factors that influence the cloud computing adoption by SMEs in Pakistan are relative advantage, compatibility and cost reduction, at the same time authors argued that the main negative impact on adoption of cloud computing is complexity. The factors such as relative advantage, compatibility, cost, technology readiness, top management support, competitive pressure and regulatory support have a great impact on cloud computing adoption by SMEs in Malaysia, meanwhile complexity is the only concern that SMEs consider when adopting cloud computing [27].

Furthermore, reference [28] confirmed that cost savings, compatibility, top management support, firm size, competition and regulatory support are the main factors to adopt cloud computing in SMEs in Nigeria, however, they claimed that complexity, security and privacy are the main concerns to adopt cloud computing. Moreover, reference [31] suggested the factors that push different SMEs to adopt could computing are organization readiness, trialability and top management support, on the other hand, they argued that the main concerns to adopt cloud computing in different SMEs are complexity, risks, compatibility, size of firms and regulation policies. The study conducted in SMEs in India by reference [5] showed that the main factors that negatively influence the decision of cloud computing adoption are security, privacy, organizational risk, sharing, collaboration confidentiality and integrity. Based on the review conducted, it is understandable that the main common factors that push cloud computing adopting by SMEs in countries such as Malaysia, India, Nigeria, Pakistan, China, and Taiwan are relative advantage, compatibility, trialability, cost saving, firm size, and top management support. Meanwhile, the most common factors that negatively affect the decision to adopt cloud computing by SMEs in these countries are complexity and security.

B. Technology Organization Environment (TOE) framework

The Technology Organization Environment (TOE) framework represents the process by which organizations use when implementing and adopting innovative technologies [32]. According to reference [33], TOE framework is “an organization-level theory that explains that three different elements of a firm’s context influence adoption and these contexts are technological context, organizational contexts and environmental contexts”.

Technological context is defined as organizational internal and external related technologies [6], [27], [33]. The main technological factors cited by authors are relative advantage, compatibility, complexity, trialability, observability, security, risk, trust [22], [34], [35], [36].

Organizational context consists of the resources and structure of the organizations such as strategical behaviour of higher management, organizations size, communications processes within the organizations [6], [18], [33]. Many authors have cited top management support and firm size as organizational factors that may influence cloud computing adoption [7], [27], [28], [31].

Environmental context includes the organizations regulatory environment, organizations technology available which it affects directly or indirectly the adoption of innovative technologies [6], [27], [33]. ICT infrastructure and regulations are the most common factors cited by authors that may affect the decision of organizations whether to adopt cloud computing [7], [17], [28], [29], [31].

III. PROCEDURE REVIEW

In this article we included only empirical studies that used the terms “cloud computing”, “factors” “technology adoption”, “organizations” and “TOE”. The research was
conducted using several databases such as ACM Digital Library, SpringerLink, Scopus, Google Scholar. In addition, 70% of the reviewed articles was downloaded only from good journals such as ACM, Springer, IEEE. We have set the criteria to review articles which are published from year 2014 to current date. Our search was restricted to only articles that use Technology Organization Environment (TOE) framework. Moreover, the methods of collating, appraising, and analyzing data was specified to be quantitative and mixed mode only and analyzing and appraising data were not limited to any specific software (e.g., some studies reviewed in this article use SPSS, AMOS, SmartPLS and so on). The search was not restricted to specific industry or country. We omitted studies which did not include TOE framework and systematic literature review. With this yielding to around 150 articles, we continued the search by reviewing the abstract of each article first then continuing with full text review which yielded to around 30 articles and eliminating around 120 articles due to the irrelevance of their topics with this study.

The main questions that guided this review are “what are the main factors that influence organizations to adopt cloud computing?” and “what are the main concerns of organizations when it comes to adopting cloud computing?”

IV. FINDINGS

This review focuses on the factors that influence the organizations decision when it comes to adoption of cloud computing by considering around 30 articles. Based on the review conducted, it was found that the main factors that influence the decision of organizations to adopt cloud computing are relative advantage (RA), compatibility (C), trialability (T), technology readiness (TR), top management support (TMS) and firm size (F). Meanwhile, the main concerns to adopt cloud computing by organizations are complexity (CO), privacy (P), and security (S). TABLE I presents the summary of reviewed articles and key findings. The positive (+) sign represents the positive relationship between the factor and adoption of cloud computing as opposed to the negative (-) sign which represents the negative relationship between the concern and adoption of cloud computing.

TABLE I SUMMARY OF THE RELATIONSHIPS OF FACTORS/CONCERNS AND ADOPTION OF CLOUD COMPUTING

<table>
<thead>
<tr>
<th>Authors</th>
<th>Factors/Concerns</th>
<th>Technological</th>
<th>Organizational</th>
<th>Environmental</th>
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<td>[10]</td>
<td>S(-), T(-)</td>
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<tr>
<td>[34]</td>
<td>RA(+), C(+), CO(-), Tr(+), O(+), Sr(-), R(-)</td>
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<td>S(-), R(-)</td>
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<td>ICI(+), R(-)</td>
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<td>RA(+), C(+), CO(-), Tr(+), O(+), Sr(-)</td>
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*Technology readiness (TR), Trust (Tr), Risk (R)

V. DISCUSSION

According to TABLE I, 19 out of 20 articles reviewed which explored relative advantage variable claimed that relative advantage positively affects the decision to adopt cloud computing. Meanwhile, 23 out of 25 articles which investigated the compatibility variable stated that compatibility positively affects the decision to adopt cloud computing. Moreover, 6 out of 7 articles which examined the variable of trialability showed that trialability positively influences the decision to adopt cloud computing. In addition, all 3 articles which explored the variable of observability found that observability positively impacts the decision to adopt cloud computing. Additionally, 8 articles which explored the variable technology readiness argued that technology readiness positively affects the decision to adopt cloud computing. As well as top management support was found to positively affect the decision to adopt cloud computing in 12 out of 13 reviewed articles which studied the variable of team management support in their studies. Moreover, firm size positively affects the decision to adopt cloud computing was argued by 8 out of 11 articles which examined the firm size variable in their studies. Therefore, it can be argued that relative advantage, compatibility, trialability, observability, technology readiness, top management support and firm size is a main factor to adopt.
cloud computing.

To add up, TABLE 1 shows that there are four common main factors that concern different organizations to adopt cloud computing. For example, complexity was found to negatively affect the decision to adopt cloud computing based on 23 out of 24 articles which investigated the complexity variable in their studies. Additionally, security, risk and trust were found to negatively affect the decision to adopt cloud computing according to 12 articles, 5 articles and 3 articles, respectively, which examined the mentioned variables in their studies. Also, 3 articles which investigated the regulations variable show that regulations negatively affect the decision to adopt cloud computing. As such, complexity, security, risk, trust and regulations are to be considered before adopting cloud computing by different organizations.

![Diagram of Technology Factors and Organization Factors](Image)

Figure 1 represents the framework of the current study which is consistent with the TOE framework. In addition, Figure 1 identifies the factors that influence the adoption of cloud computing in this systematic literature review. The main factors that influence cloud computing are relative advantage, compatibility, trialability, observability, top management support, firm size and good ICT infrastructure. Meanwhile, the main concerns to adopt cloud computing by organizations are complexity, privacy, security, risk, trust and regulations.

![Figure 1. The model of the current study](Image)

VI. CONCLUSION

In conclusion, this review paper has identified the main factors that influence the decision of organizations as well as the main concerns by them to adopt cloud computing. This research paper will help organizations which are considering cloud computing adoption to know the factors and concerns before its implementation. In addition, another significance of this systematic literature review is the new framework which is consistent with TOE framework and helps to identify the main factors that positively and negatively affect cloud computing adoption.

Similar to most of the articles, this review paper has some limitations. The use of only TOE framework is seen to be as one of the limitations. To address this concern, it is recommended for future studies to incorporate other frameworks as well, for instance, Technology Acceptance Model (TAM) in addition to TOE framework. However, TOE framework is considered to be as the most appropriate framework when it comes to identifying the factors that push organizations to accept any technology, as such only sources following TOE framework principles were selected. Moreover, it is recommended for future research to apply more scientific approaches such as quantitative approach by collecting data from organizations for better investigation of the factors investigated in this review paper instead of only reviewing the literature and studies conducted by other researchers.

Furthermore, this review paper provides a better understanding of factors influencing cloud computing adoption and it helps organizations in their decision making whether to adopt cloud computing. Given the importance and benefits of cloud computing, we encourage further research on cloud computing adoption in other organizations and industries. We provide suggestions for future research to enhance the field of cloud computing research such as awareness of organizations about cloud computing and cloud computing security. Many organizations are becoming keen to adopt new innovative technologies such as cloud computing. However, all these innovative technologies have their own advantages and disadvantages. As such, awareness about new innovative technologies, in particular cloud computing is something that organization should consider before adopting it. Therefore, we propose future research to investigate the awareness of not only employees but also organizations about cloud computing. In addition, risk and security associated with adoption and usage of cloud computing is another important factor to be considered by organizations. We encourage future research to examine risks and security of cloud computing and how it might impact the organizations if there is any breach as security is considered as one of the main challenges that organizations pointed out.

REFERENCES


