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Review article

A Systematic Review of Organizational Factors Impacting Cloud-based Technology Adoption Using Technology-Organization-Environment Framework

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ABSTRACT

Cloud computing services such as file storage and big data analytics offer cost-effective, secure, flexible, and sustainable services to their users. Despite their benefits, the adoption of many cloud services is still limited, and many organizations are hesitant to adopt cloud technologies for several reasons. Researchers have used innovation adoption theories to explore the factors influencing users' decisions toward accepting and using a new information system. This study presents a systematic review of the factors influencing organizational decisions concerning the acceptance of cloud-based technologies using the technology-organization-environment (TOE) framework. We analyze, integrate, and classify these factors and show that much of the literature has emphasized the technical aspects of technology adoption, such as cloud security. We further show factors like top management support, relative advantage, cloud complexity, and competitive pressure are the most critical factors affecting organizational attitude toward cloud technology adoption.

1. Introduction

The National Institute of Standards and Technology (NIST) defines cloud computing as "a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g., network, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [24]. The NIST definition reveals the main advantages of cloud computing, shareability, scalability, and cost reduction. It also reveals some disadvantages associated with using cloud computing, like access control and resource ownership. For example, clients become unable to migrate their data from a cloud service provider to another due to a lack of standards (Ali et al., 2019). As a result, cloud computing usage is accelerating among individual and organizational users, and its market size is

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expected to exceed 623.3 billion dollars by 2023 (GCCM, [35]). Furthermore, cloud computing disadvantages have become an important research agenda among researchers in recent years who strive to search for new solutions to these problems (Chen et al., 2012).

Cloud computing services are offered through three service models: cloud infrastructure-as-a-service (IaaS), cloud platform-as-a-service (PaaS), and software-as-a-service (SaaS) ([24]; Gill et al., 2020; Beheshti-Atashgah et al., 2020). In the IaaS service model, the cloud provider enables the user to access and use managed hardware like hosting servers, storage, or firewalls and can install customized operating software like virtualized operating systems. In the PaaS model, where the cloud provider enables the user to access and use pre-prepared operating systems with development platforms or data management systems. In the SaaS model, the cloud provider allows the user to use online applications like accounting software, a file-sharing service, or a learning management system.

1.1. Cloud computing models

Cloud computing is divided into four known deployment models: private, community, public, and hybrid [24]. In the private deployment model, the cloud computing services are offered through either an internet connection or a private connection and only to private users instead of the general public. This model is also called the corporate cloud and may reside inside the using organization. The community deployment model is different, as its services are accessible by a limited number of people or organizations who share its governance and share specific goals or missions, like research groups. The public deployment model offers its services over the internet and makes them available to anyone who wants to use or purchase them. Finally, the hybrid deployment model is a cloud environment that can operate a mix of the public and private deployment models. For example, this deployment model is useful for some organizations like travel agencies, where an application in the public cloud can access other applications in the firm's private cloud to add or update records.

The cloud service or deployment models are designed to enable on-demand service delivery, which is a big step forward in using computational resources. Thus, the cloud makes computing resources, whether applications or hardware, essential assets for any computer user as mobile phones or electricity [7]. Much of the literature emphasizes the on-demand feature of the cloud, which leads to reduced cost in maintenance services compared to operating or maintaining similar computing services on the organizations' premises, for example, costs associated with electricity consumption and the need for hardware [11,26]. Other advantages associated with operating cloud computing include the minimal need for human interaction [5], which is useful for organizations experiencing low demands for their services [26,39].

1.2. Opportunities and challenges with cloud computing

The rapid development of information technology has increased market competitiveness. Consequently, consumers' habits also changed, to which organizations need to be efficient and deliver services at a reduced cost. This explains a significant portion of the continuous need to adopt an innovative technology (Trigueros-Preciado et al., 2013). The cloud, with its features, has attracted many organizations, even at a varying adoption rate from public to private organizations (Ali et al., 2015). For example, many companies are already using an advanced SaaS service like cloud-based big data analytics (CBDA) to generate revenues, driven by the cloud's flexibility and cost-effectiveness (Hadwer et al., [14]). However, the adoption rate of the same technology among public organizations is low. At the same time, research shows that public organizations are still hesitant to adopt them, struggling with factors related to technical challenges like security and fear of data control loss [17], or low usage compared to high investment [23]. Additionally, other common adoption challenges also face educational organizations, like the uncertainty of value gained from cloud computing use [34] or cultural influence on the workplace [1].

Therefore, understanding the factors that motivated the private sector to adopt cloud technologies, whether technical or organizational, is essential to improve how emerging cloud technologies like cloud analytics can be adopted in the public sector (i.e., healthcare, education). To this end, innovation diffusion studies are pivotal to understand how cloud-based technologies, such as innovation, can reach optimum usage in organizations.

1.3. Theorizing cloud computing adoption

Cloud adoption studies fall under innovation diffusion research, which focuses on how innovation is communicated among members of a social system through specific channels (Rogers, 2003). This is usually built on several rational models, known in the literature as adoption frameworks or models. These models describe the factors that make users, whether an organization or an individual, decide to accept and use innovation, i.e., a cloud-based technology. While they form the theoretical foundation in adoption studies, they are used as instruments to identify the factors that impact users' decision to accept new technologies and foresee the significant factors that affect the adoption decision (i.e., replacing a traditional technology with a new one).

Among many adoption frameworks, the technology-organization-environment (TOE) framework by Tornatzky and Fleischer (1990) is chosen for this research because it focuses on the organizational factors instead of individual ones. Other frameworks, such as the innovation diffusion model (Rogers, 2003), technology acceptance model (Davis et al., 1989; Venkatesh et al., 2000, 2003, 2008), human-organization-technology model (Yusof et al., 2008), decomposed theory of planned behavior (Taylor and Todd, 1995), technology task fit model (Goodhue and Thompson, 1995), and inter-organizational system model (Iacovou et al., 1995), are not considered in this research because their focus is on individual intention and behavior toward using innovation.

The TOE framework categorizes the factors influencing an organization to adopt an innovation into three categories, including (1) technology (i.e., systems security and complexity), (2) organization (i.e., organization size and top-management support of replacing functioning systems), and (3) environment (i.e., market uncertainty, governmental or competitors' pressure). The TOE is a suitable holistic instrument for organizational-level research. It overarches the technical aspects of cloud technology and the external and internal organizational factors that make successful use of cloud-based technology [26]. Yet, the TOE framework and the remaining technology adoption frameworks belong to the pre-cloud era. They have been used in the past with traditional computing systems to measure and facilitate their organizational acceptance. Limited research has employed adoption frameworks to understand decisions of using cloud technologies in organizations. No single research known so far has been conducted to predict public organization's intention to use cloud-based technology. We conduct a literature review to investigate the factors influencing cloud adoption within the TOE context with the following research question: *What factors are influential on the organization's decision to adopt a cloud computing technology?*

The following objectives are formulated to answer this question:

a) defining cloud computing, its models and services, and the associated opportunities and challenges surrounding its adoption,
b) understanding how stand-alone or integrated TOE is used in the literature to investigate the different contexts of generic cloud adoption by organizations in the public or private sectors, and
c) listing and classifying technical and non-technical factors influencing the cloud adoption process decisions and their significance.

The remainder of this paper is organized as follows. In Section 2, we present the methodology adopted for this study. In Section 3, we present our results. In Section 4, we further discuss our findings, and in Section 5, we conclude with our conclusions.

2. Methodology

Several methodologies are available for conducting a systematic literature review (SLR), including the methods proposed by Webster and Watson (2002), Levy and Ellis (2006), and Kitchenham (2004, 2007, 2009) in information system research, or the method proposed by Fink (2005) in health informatics, or the method proposed by Rouseau et al. (2008) in management and organizational sciences. We adopted the SLR method proposed by Kitchenham and Charters [19] for two reasons: (1) it is widely used in the computer and information system domain, and (2) it is a more recent method compared with the other SLR methods in the literature. The Kitchenham and Charters's (2007) guidelines can be divided into four phases: developing the review protocol, defining the selection criteria, performing the review process, and reporting the findings.

2.1. Phase 1

In this phase, a clear description of the research question is developed. In addition, the domain of the research is focused on browsing for articles in relevant databases. In this case, the domain would involve surveying the computer and information system. In this regard, the following four prominent databases are chosen for this study: ACM Digital Library, IEEE Xplore, ISI Web of Science, and Springer.

The research question is divided into several keywords to develop a search string using Boolean expressions and wildcard symbols. The search string is customized according to the search system in each database. The first inclusion criterion considers articles published in the last seven years (2014-2021). Unfortunately, several databases do not allow for the inclusion of other criteria (i.e., the type or language of articles) at this stage. Therefore, these additional criteria were used in later phases of the search process. All articles containing the keyword "cloud" or some combination that involve other words like adopt*, accept*, factors, paramet* (for parameter or parameters), and determin* (for determinant and determinants in their title) were included in the shortlist. The process aggregated a total of 176 articles. These articles were then processed using Jabref, a reference management software capable of removing duplicates. This resulted in the reduction of the total number of articles from 176 to 117.

2.2. Phase 2

In this phase, more criteria are used to shortlist the articles. Not all the databases' search results are accurate. In this phase, irrelevant articles are omitted based on their titles. In this regard, review articles, editorial prefaces, and non-English articles were all eliminated. As a result, the number of shortlisted articles was reduced to 85 peer-reviewed papers.

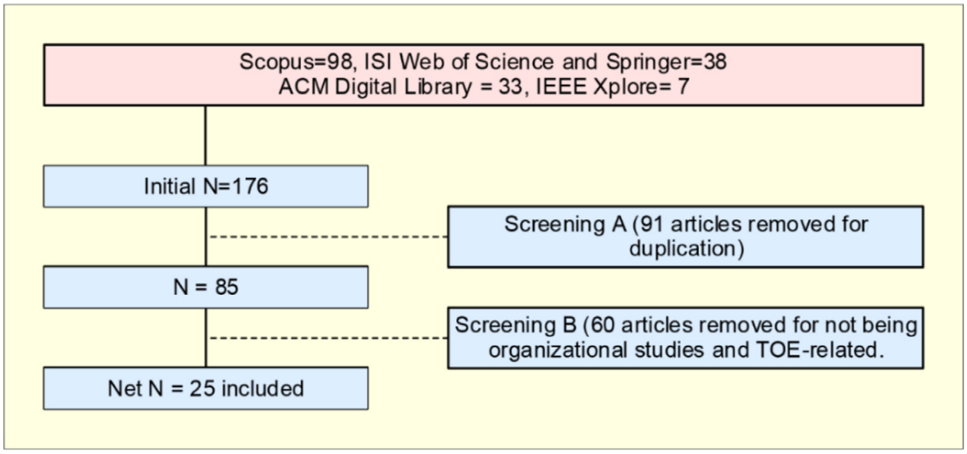

Figure 1. The selection process and its screening results

2.3. Phase 3

In this phase, all the shortlisted articles were read comprehensively for answers related to the research question and objectives.

Figure 1 summarizes all phases and the outcomes of each phase.

3. Results

The primary goal of this review is to identify the factors that may influence the adoption of cloud computing services in organizations. The other objectives include defining cloud service and models and determining the theoretical models or frameworks for investigating cloud service adoption by organizations. Achieving these objectives will eventually assist in investigating other emerging cloud computing technologies adoption, like cloud big data analytics.

3.1. Cloud computing service and models

More than half of the shortlisted studies referred to the definition of cloud computing given by The NIST [2,10,13,15,17,21,27,29,30,33,34,40]. The NIST definition reveals the main advantages of cloud computing as shareability, scalability, and cost reduction. It also points out some disadvantages of cloud computing technology, including access control and resource ownership issues. While cloud computing advantages accelerate its adoption among users, the challenges associated with its use made it a significant research agenda that attracted researchers to improve its operability. Three service models of cloud computing exist today: IaaS, PaaS, and SaaS. In The IaaS model, the cloud providers allow users to access and use their managed hardware as hosting servers, storage, or firewalls as well as to install customized operating software like virtualized operating systems [10,13,34]. In the PaaS model, cloud providers allow users to access and use pre-prepared operating systems with development platforms or data management systems [4,15,17]. Finally, in the SaaS model, cloud providers allow users to use online applications like accounting software, a file-sharing service, or a learning management system [12] [2,23,27].

Furthermore, cloud computing technology is deployed using any of the four known deployment models: private, community, public, and hybrid. In the private deployment model, cloud computing services are offered through either an internet connection or a secured connection only for private users [17,40]. This model is also known as the corporate cloud, as the cloud may be created and located within the user's data center. Meanwhile, the community deployment model allows its services to be accessed by a limited number of people or organizations who share the same governance and specific goals or missions, such as research groups [2] or e-government agencies [23]. On the other hand, the public deployment model offers its services over the internet and makes them available to anyone who wants to use or purchase them. Some of the top providers of this deployment model include Amazon, Google, and IBM [10]. Lastly, the hybrid deployment model combines the public and private deployment models [2]. This model is useful for organizations like travel agencies, where the public may have access to the organization's private cloud to add or update travel information or records [40].

3.2. Cloud adoption theories

The studies in the literature can be divided into two groups: articles that merely used Tornatzky and Fleischer's theory of TOE [36], and articles that used customized TOE's adoption framework and/or integrated this framework with other adoption theories like Roger's diffusion of innovation (DOI) [31]. Table 1 details the use of theories in the shortlisted articles.

Table 1
Model frequency distribution

Adoption Model	Frequency
TOE	12
TOE Customized/Derived	4
T.O.E + D.O.I	5
T.O.E + other	4

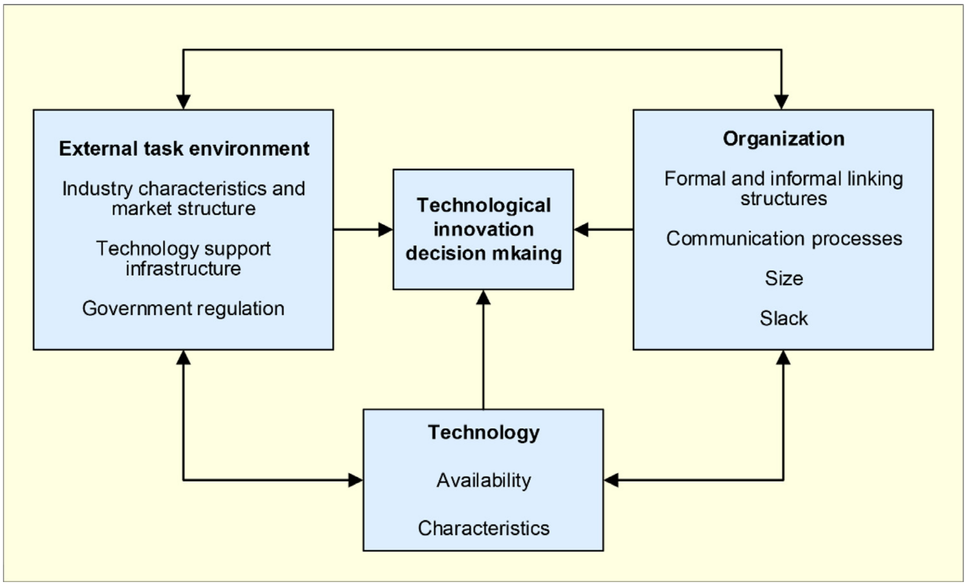

Figure 2. TOE adoption theoretical framework [36]

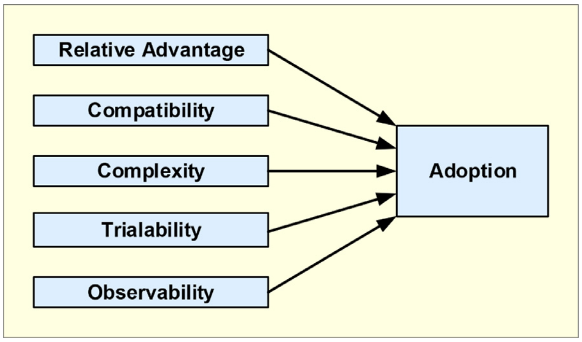

Figure 3. Diffusion of Innovation Theory (Rogers, 1983-2010).

The TOE theory is developed to describe the organizational components that affect a firm's adoption decision [36]. Its adoption model identifies three dimensions under which innovation adoption factors of technological, organizational, environmental fall. The technological dimension describes the relevance of new technologies to the firm. It examines the impact of factors like data security and protection, privacy, complexity, and compatibility. The organizational dimension refers to the availability of resources within the firm that enables the adoption. It examines the impact of factors like the organization's size, prior experience in technology utilization, and cost reduction. The environmental dimension explains the features of the industry in which an organization operates. It examines the impact of factors like governmental regulations and/or competition. Figure 2 shows the TOE adoption theoretical framework.

The DOI theory explains how specific attributes (factors) of innovation enable its adoption [26] (see Figure 3). The factors specified in this theory include (1) relative advantage, referring to the degree to which an adopter perceives that the innovation provides features or benefits that supersede the existing system; (2) compatibility, referring to the degree to which the innovation fits the adopter's existing values, previous practices, and current needs; (3) complexity, referring to the degree to which the complexity of an innovation is perceived; (4) observability, referring to the extent to which the innovation is

Table 2
Summary of factors collected from the literature that influence the adoption of cloud

Factor	RA	CM	CX	HC	SC	MS	OS	CS	SI	RS	CP	CL
Source	***Technological***					***Organizational***				***Environmental***		
1. [26]	√		√			√	√	√				
2. [21]			√		√	√		√				
3. [20]					√							
4. [10]	√	√	√	√		√						
5. [13]			√							√		
6. [38]	√	√	√		√	√						
7. [32]	√	√							√	√		
8. [17]	√				√					√		
9. [2]						√						
10. [23]	√	√			√							
11. [40]		√										
12. [27]	√	√				√	√		√	√		
13. [29]					√							
14. [22]		√	√			√						
15. [15]										√		
16. [33]	√											
17. [9]						√		√				
18. [30]					√							
19. [3]				√			√				√	√
20. [34]	√	√	√			√				√		
21. [1]	√	√			√	√			√	√		
22. [42]	√	√	√		√		√	√				
23. [43]		√	√		√	√						
24. [44]		√	√		√	√					√	
25. [45]			√		√	√						

(**RA**=Relative Advantage, **CM**=Compatibility, **CX**=Complexity, **HC**=Human Competency, **SC**=Security Concerns, **MA**=Management Attention, **MS**=Top Management Support, **OS**=Organization Size, **CS**=Cost Savings, **SI**= Satisfaction With Existing IS, **RS**=Regulatory Support, **CP**=Competitive Pressure, **CL**=Cloud Locality)

visible to others; and (5) trialability, referring to the degree to which an innovation may be experimented with on a limited basis [31].

Among the five attributes of the DOI, the impact of relative advantage on adoption is extensively explained and measured in the literature for many reasons. An innovation relative advantage can be tangible features or values perceived by the technology producers and users compared to the existing one. While the impact of trialability, another DOI attribute, has not received sufficient attention in adoption literature (Table 2), many cloud computing services providers offer limited services to their user organizations.

The DOI theory remains essential to the studies on information systems adoption. Therefore, it is widely used to investigate cloud adoption in two ways: (1) for comparing the degree of adoption at several organizations (i.e., comparing manufacturing companies and services companies in Portugal) [26], or small and medium enterprises [27,33], and (2) for understanding the organizational conception of cloud adoption [22,23,38]. Some researchers have argued that integrating the TOE with other adoption models, like the DOI, can strengthen its capability to explain or better predict successful adoption [9,10]. Meanwhile, some others claimed that the TOE is comprehensive enough and that the DOI is an integral part of TOE [10]. They believe that the DOI's main attributes, i.e., relative advantage, complexity, and compatibility, are already presented under the technological dimension of the TOE; thus, using the TOE alone for the entire study is sufficient.

3.3. Adoption factors

A combination of the TOE and DOI is used to encourage cloud adoption among the government agencies in China to provide policy recommendations to policymakers. Complexity, security, and performance issues all represented in one factor created technological concerns, besides the cloud's relative advantage, the DOI attribute. The study concluded that internal factors, like top management support, impact cloud adoption more than cloud relative advantage [31].

Another case of integrating TOE with cloud computing was conducted by [21]. Lian et al. [21] expanded TOE and renamed it into the human-organization-technology model to facilitate cloud computing adoption in Taiwanese hospitals. This extended model enabled the researchers to conduct a focused study by investigating staff competence in adopting cloud computing at hospitals. Lian et al. [21] found that the technical competence of the staff that were involved in the adoption decision (i.e., senior IT staff and the chief information officer), played a significant role in determining the adoption of cloud computing. Regardless of which adoption model was employed throughout the investigation, it turned out that the non-technical factors played a significant role in cloud computing adoption [22,26,33,38]. These factors include top management support, size of the organization, and users' innovativeness or awareness of cloud adoption's relative advantages. While this reflects the importance of non-technical factors in cloud adoption [14], it calls for more attention and a deeper investigation

Table 3
Top Factor frequency distribution and dimensions

Factor	Frequency	Dimension
Top management support	13	Organization
Security Concerns	12	Technology
Compatibility	12	Technology
Complexity	11	Technology
Relative advantage	11	Technology
Regulatory Support	7	Environment
Organization Size	4	Organization
Cost Savings	4	Organization
Human Competency	2	Technology
Competitive Pressure	2	Environment
Cloud Locality	1	Environment

The following sections describe the significant factors in each TOE dimension.

of how neglecting these factors impedes cloud adoption. Overall, 69 factors that influence organizations' decision to adopt cloud computing technology have been identified and investigated through several TOE-based adoption models.

Table 2 shows the three classifications of these factors into technological, organizational, and environmental groups. Some researchers have renamed/referred to the same factor differently, although they share the same description. For example, there are three different classifications for the impact of government regulations on cloud adoption: government policy [32], regulatory environment [27], and compliance with regulations [3]. Other scholars who used a customized version of TOE have added more dimensions like social [3] or human [21,32]. Unfortunately, there has not been any clear justification to separate these factors independently from the TOE environmental or organizational dimensions. Therefore, social or cultural factors were classified into the environmental dimension, while human factors were classified into the organizational dimension. Table 2 details influential factors in cloud adoption among organizations in each study, and Table 3 presents the most frequent factors in the selected literature:

3.4. Technological factors

In the technological dimension, the cloud's relative advantage, as a computing method with capabilities that exceed the existing method of on-premises computing, is reported as one of the most influential factors that convince organizations to adopt it. Relative advantage, along with complexity [10,27,32,34,38] and compatibility [10,13,26,27,38], are components of the DOI's attributes as explained previously and influential technological factors on cloud computing adoption. However, the effect of this factor is minimal in organizations of Asian cultures, like China [22] and Saudi Arabia [2], where the culture is described as collectivistic in nature. However, culture significantly moderates the relationship between relative advantage and cloud computing adoption in Yemen [1].

Although the security factor plays a significant role in influencing organizations to adopt cloud computing [3,17,21,29], it was deemed to be insignificant in different instances [2]. A possible explanation of this variance is the recent enhancements in cloud services provisioning, including improved data management tools and encryption for data transmission. With these technical enhancements, cloud computing can manage more intensive requests on computing applications by its users. In terms of cost reduction, both PaaS and SaaS may help businesses reduce the costs of purchasing various office equipment and tools by optimizing the use of virtual desktops, file-sharing platforms, and other digital solutions. Cost reduction has encouraged a wider penetration of cloud services among users, leading to an increased acceptance of cloud computing to some extent as a secure environment for storing organizational data, something quite difficult only a few years ago.

3.5. Organizational Factors

All studies have shown that non-technical factors, like staff competency and top management support, have a mid-to-high impact on cloud adoption. This effect increases when the competency of administrative or technical staff is high. Some scholars studied staff competency as an individual characteristic, like Chief Information Officers' creativity [21], users' awareness of cloud computing [33], the team's IT knowledge [38], or Chief Executive Officers' knowledge [32]. All of them played a major role in the decision-making process. Both the Chief Executive Officers and Chief Information Officers are top management level staff when they tend to accept the adoption quickly for being aware of its usefulness. They then express a positive attitude toward adopting cloud computing technology [21].

In this aspect, top management support was the most influential factor in organizations adopting cloud computing. It is believed that senior management's awareness of cloud benefits positively affects cloud adoption. Top management's role in cloud adoption is crucial, especially in developing countries, as they provide the necessary support to facilitate cloud computing adoption by approving the adoption process's financial and human resources. However, this factor may act as a double-edged sword. When top management is not aware of cloud adoption benefits, they most likely will not support it.

3.6. Environmental Factors

The majority of the adoption studies by organizations were conducted in developing countries. Developing countries are often left behind in adopting new technologies and are not among the first to deal with innovation or emerging challenges. Cloud computing is not an exception; its low adoption makes universities and researchers feel they are challenged to accelerate it, especially when its adoption becomes more complex due to other unique contextual economic or environmental obstacles. For example, a recent report by the United Nations Conference on Trade and Development showed that the percentage of people who are exposed to the internet is still really low in developing countries. In addition, governments need to enforce appropriate laws and regulations on cloud computing use to address issues like security, data protection, and cybercrimes [37].

This is not the case in developed countries, despite the fact that 85% of world cloud data centers are located in developed countries, mainly in the United States of America [37], in response to extensive cloud services adoption rate by organizations. The competition was found as an important factor that has a positive impact on cloud computing adoption, especially in both developed and developing countries. Only three studies have found this factor insignificant in cloud adoption [9,26] and [15]. In China, it was found out that organizational factors, specifically top management support and organizational inertia, play a vital role in cloud adoption by Chinese government agencies [9,26,27,32]. One of the important findings of this study is that the government's financial support was not enough of a driving force without top management support.

4. Discussion

The majority of studies in the review were survey-based empirical studies. While these empirical studies help authenticate the theoretical aspect of cloud computing adoption, they also reveal some critical concerns.

First, selecting the appropriate technology adoption theory remains a critical task for researchers in information systems adoption. Prior knowledge of the multiple levels of the organizational or social contexts of adoption enables an appropriate selection. For example, the DOI adoption model is an excellent instrument to investigate how technical factors influence users' decisions regarding adopting this technology. Meanwhile, the comprehensive nature of TOE enables researchers to investigate other environmental factors like the nature of the political system and the impacts of culture. While TOE's comprehensiveness enables such investigations, it also enables the researcher to test the theory's generalizability, enhance its model, or derive one suitable for a new context. For example, the users' fear of failing to adopt the e-government cloud was a hindering factor for its adoption among Chinese agencies [23]. The researchers proposed a TOE-based model customized for the Chinese case.

Second, although the majority of the literature neglected the investigation of the impact of culture on cloud adoption, such an impact cannot be disregarded. Several previous studies have found out that culture can impede technology adoption in general [18], and cloud adoption specifically [41]. It was interesting to see that two scholars have studied the impact of culture on cloud adoption in Saudi Arabia [2,3]. Both scholars found that Saudi Arabia's culture can inhibit cloud adoption, especially when decision-makers are clueless about the technology's relative advantages. In comparison, a study in Spain (a developed country by western context) investigated critical factors of cloud computing adoption among Spanish firms and found that cloud computing's relative advantage significantly affected firms' intention to use it [26].

Conversely, the effect of the same factor, a relative advantage, on Saudi's firms' intention to adopt cloud computing was found insignificant [2]. However, both researchers used the TOE adoption model to investigate cloud computing adoption among local corporations. These disparate findings concerning the role of relative advantages of cloud computing adoption can be explained in terms of cultural differences. For instance, the findings of using TOE to investigate cloud computing adoption in Saudi's collectivist culture are in stark contrast to similar investigations in more individualistic societies. Such findings also indicate the likelihood that applications of technology adoption theories in non-western contexts may reveal significant differences in underlying causal factors, thereby fostering our understanding of the mechanisms whereby organizations accept or reject global innovation. However, it is not immediately evident that tested adoption models would be adequate to describe an emerging cloud computing technology adoption in developing countries, for instance, Cloud-based Big Data Analytics (CBDA) in Saudi Arabia.

Culturally, organizations in Saudi Arabia are averse to uncertainty, and top management has ultimate and centralized power to make drastic change decisions accepted by all. These two characteristics of Saudi national culture have been studied previously by Hofstede [16] [28], who developed a multi-dimensional framework to understand how a national culture influences workplace values. He surveyed IBM branches located in fifty countries and reported that Saudi Arabia scored high in two dimensions, the power distance (score of 95/100) and uncertainty avoidance (score 80/100).

This emphasizes the relative advantage factor's changing role as an essential success factor for cloud computing adoption, yet unknown, especially in Saudi Arabia's higher education context. In other words, these findings lead us to believe that CBDA adoption in Saudi Universities is more likely to occur successfully when the attention of these universities' top administrations is pulled to the benefits offered by the technology, so top management support could be more influential in cloud computing adoption.

Third, cloud computing adoption in the educational sector has received little attention. There have been only three articles that discussed cloud adoption in education ([1,34]; Qasem et al., 2020), representing only 12% of the selected literature, while four articles on cloud adoption within governmental agencies and the rest of the articles on cloud adoption in commercial enterprises. This further suggested that cloud computing adoption in the educational sector is far behind its adoption in the business sector [6,8,25].

Fourth, the literature lacks studies that focus on how different factors may have different impacts on cloud adoption over time. There is indeed a potential for factors transforming themselves from being a barrier to the adoption to become a driving force that supports it; for example, organizations' tolerance of security concerns associated with adopting cloud computing. This can also be elaborated further by learning the degree to which specific factors influence an organization's decision to adopt or not adopt cloud computing technologies. Further studies on this topic are recommended as they may help future researchers determine why some organizations decide to adopt cloud computing while others do not.

Fifth, there is evidence that non-technical factors in cloud computing adoption are crucial and have started to gain more attention from researchers. This is in line with previous findings I and my supervisors published on the challenges confronting BDA use by higher education [14]. Other researchers from this SLR review also supported such findings [22]. While the technical factors (security, data migration, and storage issues) still limit cloud computing use in an organization. Yet, it is expected that the paradigm of cloud computing adoption studies will continue shifting from focusing on the technical aspects of cloud adoption to more of a focus on the organizational and environmental aspects.

5. Conclusion

This study's main objective was to identify the factors that influence the decision of organizations to adopt cloud computing within the last seven years through a systematic literature review. Furthermore, the use of TOE as a theoretical framework was investigated in this study. TOE serves as a comprehensive framework that can be used alone or integrated with other theories to study successful cloud adoption in different contexts. One of the main contributions of this study is the extraction and classification of all factors that have been found influential in adopting cloud computing technologies by organizations over the past seven years, which witnessed an increased use of cloud solutions by organizations. These factors have been extracted and classified following the TOE framework to (1) be used as a good instrument for future research on innovation adoption by organizations; and (2) enable researchers in the information management field to observe how the determinants of cloud computing adoption could change over time. Qualitative figures and summaries for the reported factors were also presented. The most critical factors and how and their differences with previous research are highlighted. The impact of cloud computing adoption factors may differ when the context changes or due to the cloud's nature as innovation improves and diffuses. The technological, organizational, and environmental factors discussed in this review reveal their potential interrelation to construct a conceptual adoption model used with other contextual factors to study other cloud computing applications in different domains. These applications include the combined use of IoT applications with cloud-based big data analytics in healthcare, agriculture, and education, where non-technological factors play a crucial role in adopting these emerging technologies.

Declaration of Competing Interest

The above authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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