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Hinders of Cloud Computing Usage in Higher Education in Iraq: A Model Development

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Article Info	ABSTRACT
	Cloud computing (CC) is a trendy technology that is being used in business and daily life. However, limited studies is found on higher education usage. The barriers and obstacles that confront the usage is not clear and in particular in developing countries. The purpose of this study is to examine the barriers and obstacle that confront the usage CC services in Barash University in Iraq. Using the technology organization environment framework and the internal external factor (IE-TOE), the study proposed the conceptual framework. The data was collected from academic, non-academic staff and students using convivence sampling technique. The data was analyzed using Smart PLS. The findings showed that organizational obstacle followed by technological, internal and external factors, and environmental factors are the most severe obstacles that confront the university in using CC services. Decision makers can benefit from the developed model to ease the implementation of CC

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1. INTRODUCTION

Cloud computing (CC) is a trendy technology that have been used in all aspects of life, business, and with less degree in education and in particular in developing countries [1] [2]. CC is critical for universities, students, academic staff and non-academic staff. The CC enable the scalability and support the learning and education at university level. It generally promises to increase privacy and security as well as the availability as well as the ease to access from anywhere at any time as defined in several studies, CC refers to data centers available to vast number of Internet user [3] and it is the data storge, sharing software, hardware, database, and enabling access and storge of large data [4], [5]. In a university environment and particularly, during the COVID19, the importance of CC has increased as students, academic and non-academic staff were able to use CC to fulfil their needs [6]–[9]. Academic staff can deliver their lectures and store it on the cloud while students can attend the lectures at any time and from anywhere [10]–[13]

The use of CC by university and in particular in developing countries such as Iraq is limited and this could be due to several reasons that are related to the infrastructure, regulations, organizational, individual as well as technological perspectives. After introducing the CC in 2009 and the aftermath period, the pace of development in developing countries has been moderately synchronized with the expansion of development in developed industrialized countries. In higher education, universities needs a frameworks such as CC to retain accurate records for a long time [2]. Students and academic staff need to have record of their works and be saved in an accessible manner. Information loss can be caused by a variety of factors, including equipment failure, human error, personal computer infections, equipment loss, programming defilement, and robbery [3] [4].

One of the most important benefit is the ability of CC to assess the students in supporting learning processes such as to support self-learning, where student can learn by themselves or peer learning as well as

classroom learning and distance learning. In addition, cloud can address social educational problem such as to provide opportunity for students with special needs [14]–[17]. The cloud also helps lecturers to create flexible learning environment such as creating virtual labs, which encourage students to participate and increase the student satisfaction as well as their academic performance [18]. One of the most important benefits of CC is the ability to support virtual and on-demand learning. This is because students in remote or rural areas either in developed or developing countries will have full access to education and be able to attend class and participate using the online channel provided by the CC and this will reduce the digital divide problem that are existed in many countries [19], [20].

Students, academic, and non-academic staff at the University of Basrah are suffering from a lack of data storage for academic purposes. As a result, research on how to implement the adoption of the cloud computing services model, in order to provide better and more secure educational services at University of Basrah is required. The study attempted to analyze the difficulties in implementing the adoption of CC services model at the university level, as well as to identify the obstacles in implementing the model of CC at Univeristy of Basrah, and to offer possible solutions to these obstacles. Accordingly, the study aims to understand what are the obstacles that faces the University of Basrah to deploy the CC effectively. The study also aims to understand the impact of these obstacles on the usage of CC in the university. Based on the findings that will be derived from this study, decision makers will be informed about the most important obstacles that hinder the usage of CC in the university. The next section discusses the literature review of this study followed by the research methodology, findings, discussion, and conclusion.

2. LITERATURE REVIEW
2.1 Overview of CC
CC supports learning, educating, and exercising, all of which are important for instructive purposes. It is a form of processing on a large scale that provides frameworks for remote access, provides estimated assets, and is scalable [5]. CC refers to both the hardware and the servers that provide those services. There are four type of deployment in CC which includes the public, private, hybrid and community clouds [6]. The layers of CC includes those designed for end users such as SaaS or software as a service, the layer designed for developers is the PaaS or the platform as a service, and lastly, the layer design for organizational use such as the IaaS which is the infrastructure as a service. In this study the three layers are relevant since the study examines the obstacles on the individual (users) organizational (university) and the beneficial of the CC (developers). Therefore, the obstacles that hinder the usage from four perspectives are included in this study.

2.2 CC In Higher Education
Universities, especially in developing countries, are facing challenges in delivering the level of Information Communication Technology (ICT) required to foster the development of learning, teaching, research, and other development activities by typical university [21]. These ICT requirements are needed by the university to follow up with the advancement in technology and to update their services to match the current technological environment [22]. In light of the rising costs of managing a university as well as a requirement to contribute more funds to support and maintain the institution's technical infrastructure, such as the need for updated software and hardware, there are increasing need to use CC [23].

CC has been proposed as a solution to reduce the operational cost of universities as it delivers customized and on demand services that make the adoption and using of technology cost effective and keeps the universities infrastructure, software, hardware and electronic services up to date [22]. This is because the CC technology promises users with enhanced IT and availability as well as reliability of these services from anywhere at any time with advantage of paying per use basis [24]. The CC technology has made the services less complicate and increased the speed as well as the quality of IT services provided to users and higher learning institution (HLI) such as universities. Nevertheless, despite the advantage that are provided by CC, the adoption of CC is not well investigated in some sector such as the educational sector and HLI still hesitant to start using the technology of CC [22].

The hesitation to use CC by HLI could be related to several factors such as mission of the university and the sensitivity of its operations [18]. However, in HLI, the most widely area of benefiting from CC is the course delivery as well as the distance learning [25]–[28]. In addition, the daily communication between students and instructors or lecturers are also considered one of the increasingly area of using CC in universities. Electronic mails (e-mail) and instant messaging are used widely inside and outside the universities to connect students with each other and with their lecturers [29].

Recently, one of the indispensable applications that is used by students and lecturers in HLI is the Gmail and its applications such as drive and questionnaire tools [18]. More application area are also used by students and lecturers are the learning management system, library management system, and document storage [30]–[32]. It is challenging for users to select and utilize appropriate CC services after considering many

variables such as scalability, licensing, curriculum, pricing and security because of the enormous number of CC services that are readily available (Ryan 2013; Smith 2013). CC provides anywhere and anytime access for students. It also lowers the cost of learning and improves the academic performance of students. In addition, all the stakeholders such as students, university, lecturer can benefit from the CC because it provides advantages that can make the process of learning easier and accessible (Nguyen et al. 2014). In this study, the obstacles that face the usage of CC are examined in the context of developing country such as Iraq and in particular in University of Basrah.
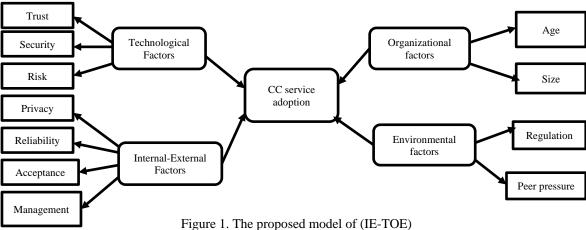
2.3   Theoretical Framework

This study examines the obstacles that hinder the usage of CC in universities. One of the importance framework that can explain the enablers or the hinders is the technology organization environment (TOE) framework. TOE was developed by [34] to determine the organizational level adoption of IT and Information System (IS) product and services. Since then, TOE has emerged as a widely used theoretical adoption framework for the acceptance and use of IT products and services [35]. TOE is different from other theoretical adoption models and frameworks because it includes the variables that are related to technology, organization, and environment [36]. The TOE includes technological related factors that are more related to the characteristics such as the security, trust, and risk of involving in technological transaction [37] [38], [39]. The organizational factors based on TOE includes factors that are related to the characteristic of the organization such as the age and the size. In addition, the environmental factors are into the characteristic of the environment such as the peer pressure and the regulation [40], [41]. Along with TOE, several research incorporated additional factors such as human related factors, system related factors, and individual factors [42]–[44]. In this study, additional variables that are related to internal-external factors are included.

2.4   Conceptual Model and Hypotheses Development

This study employs an Internal-External model, which include the TOE model [34], to develop the IE-TOE model, which is used to assess the link between hinder of CC and the usage of CC. Because it is not clear what challenges University of Basrah faced when implementing a cloud computing model prior to testing, the study chose to use IE-TOE to determine and break down the various challenges that had been considered previously in relation to cloud computing at University of Basrah, and to finally determine the specific complications faced by University of Basrah. This case offers a quantitative analysis of the resistance faced by universities in southern Iraq in implementing the strategies of cloud computing adoption. This method is thought to be particularly appropriate when there is a requirement to explore a real-life setting or source [15]. The proposed IE-TOE model for this study is shown in figure 1.

Figure 1. The proposed model of (IE-TOE)

Researchers have examined the enablers and hinders of using CC in various industries. In the study of [45] investigated the factors that affect the adoption of CC in Taiwan using the TOE framework. The findings indicated that there are many factors that affect the adoption of CC such as trading partner pressure, relative advantage, firm size, top management support, and competitive advantage. Lian et al. [42] also investigated the adoption of CC and found that technological is the most important construct followed by human construct, organizational, and environmental construct.

Senyo et al. [46] investigated the adoption of CC using TOE in developing countries. The findings indicated that variables such as security, readiness, relative advantage, top management support, competitive

pressure as well as trading partners' pressure affect the adoption of CC in developing countries. Yang et al. [47] also investigated the readiness of adopting SaaS. The findings indicated that technological readiness is the most important construct followed by environmental readiness and organizational readiness. Alkhater et al. [48] also investigated the factors that affect the organizational adoption of CC in Saudi Arabia. The findings indicated that technological, organizational, social factors and environmental factors are important predictors of the adoption of CC.

In the study of [49] found that three factors were determined to be significant in this setting (results, discussion, and conclusions). The most critical criteria are relative advantage, privacy, and complexity. Between large and small institutions, there were significant disparities in cloud computing complexity, compatibility, vendor lock-in, and peer pressure.

A literature review study conducted by [50] using CC in HLI and the finding showed that TOE variables are among the most critical factors that might lead to hinder the usage of CC. Low level of security, privacy, trust, and high level of risk are hinders of the usage of CC. [51] found that the impact of sociocultural factors and the demonstrability of results on staff's intention to use CC for teaching, research, and collaboration received strong support from the literature. In addition, there are differences in the attitude to use CC based on gender. Based on the above findings as well as based on the theory of TOE and internal and external factors, this study proposed that the variables of TOE which include technological, organizational, environmental, and internal-external factors are critical for the usage of CC in higher education. The study looks into the difficulties of implementing the cloud computing adoption paradigm at southern Iraqi universities. The study's aim was to test the following hypothesis:

H1. Technological factors have significantly affected the resistance to the adoption of cloud computing services.

H2. Organizational factors have significantly affected the resistance to the adoption of cloud computing services.

H3. Environmental factors have significantly affected the resistance to the adoption of cloud computing services.

H4. Internal-External factors have significantly affected the resistance to the adoption of cloud computing services.

3.   METHODOLOGY

The population of this study are the students, academic and non-academic staff at University of Basrah in Iraq. The convivence sampling was deployed in this study. The respondents are users of CC at University of Basrah which include students, academic, and non-academic staff. The data was collected using a questionnaire. The measurement of the variables were adopted from prior literature. Measurement of trust, security, privacy and CC service adoption were adopted from [52]. Measurement of acceptance was adopted from [53], management form [38], measurement of risk and reliability from [54]–[56]. The questionnaire was validated by two experts who are PhD holder and have experience of more than five years in technology adoption from University of Basrah. A pilot study was conducted to ensure that the measurement are reliable. The data collected was conducted by directly sending the questionnaire to respondents through message and email as well as social media applications. A total of 367 questionnaires were distributed to the respondents. A total of 163 students, academic, and non-academic staff have answered the questionnaires making the response rate accounts to 44.4%. Missing values were checked, and this has resulted in removing 11 responses. In addition, the outliers were examined and a total of 21 responses were removed. The data is normally distributed and no multicollinearity issues among the variables were observed. In total, the 130 respondents were valid for the analysis of this study.

4.   FINDINGS

In this section, the profile of the respondents as well as the analysis of Smart PLS are presented.

4.1   Profile of respondents

A total of 130 respondents have participated in this study. Males accounted for 72%, while female were 28%. A total of 52% were student, 31% academic staff, and 17% non-academic staff. In term of education, those with diploma were 16%, bachelor were 21%, master's degree were 42%, and PhD level were 21%.

4.2   Measurement model

Researchers [57]–[59] suggested that the measurement model can be assessed by check the loading, reliabilities and validities. Loading of the items should be greater than 0.70 and similarly, the Cronbach's Alpha (CA) and composite reliability (CR) should be larger than 0.70. for the average variance extracted which is used to assess the convergent validity, it should be larger than 0.50. as shown in Table 1, the values of all

loading, reliabilities and validities are acceptable. In addition, the discriminant validity is accepted because the number in bold are greater than the cross loading.

Table 1. Assessment of Measurement Model

		Loading	CA	CR	AVE					
Technological Factors	Trust	0.92								
	Security	0.89	0.89	0.93	0.82	**0.90**				
	Risk	0.91								
Internal-External Factors	Privacy	0.92								
	Reliability	0.90	0.94	0.96	0.84	0.46	**0.88**			
	Acceptance	0.92								
	Management	0.93								
Organizational Factors	Age	0.92	0.82	0.92	0.85	0.48	0.56	**0.92**		
	Size	0.92								
Environmental Factors	Regulation	0.87	0.72	0.88	0.78	0.51	0.45	0.43	**0.92**	
	Peer Pressure	0.90								
CC Service Adoption	CC Service Adoption	-	0.89	0.93	0.81	0.50	0.55	0.59	0.44	**0.91**

4.3 Structural Model

Four criteria need to be assessed using the structural model. The first is the coefficient of determination (R^2) which ranges from 0 to 1, with larger values suggesting higher degrees of forecasting accuracy; value of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively [60]. The IE-TOE model has an R^2 value of 0.635, suggesting that it is well-fit and can explain 63.5% of the variation in the CC service adoption. The blindfolding showed that the Q square is 0.41 which is greater than zero. This indicates that the variables can predict the CC service adoption. The f-square for all paths is greater than 0.02 and less than 0.35 indicating that the effect size is medium [60]. Figure 2 shows the results of the structural model which include the hypotheses of this study.
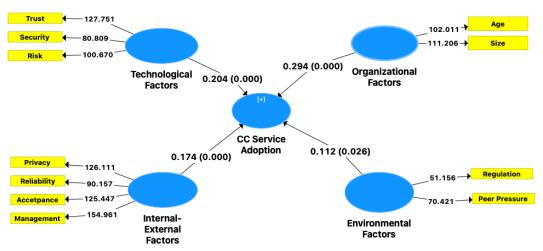

Figure 2. IE-TOE model analysis on PLS-SEM

Based on the result of structural model, Table 2 shows the results of hypotheses testing. It shows the path, coefficient (B), standard deviation (Std.), t-statistics (T), P-value (P), and a remark regarding the result.

Table 2: Results of Hypotheses

Hypothesis	Path	B	Std.	T	P	Remark
H1	Technological Factors -> CC Service Adoption	0.20	0.05	4.05	0.00	Supported
H2	Organizational Factors -> CC Service Adoption	0.29	0.05	6.25	0.00	Supported
H3	Environmental Factors -> CC Service Adoption	0.11	0.05	2.18	0.03	Supported
H4	Internal-External Factors -> CC Service Adoption	0.17	0.05	3.79	0.00	Supported

The first hypothesis is accepted because the B=0.20 and the p-value is less than 0.05. Thus, H1 is supported as shown in Table 2. For H2, the effect of organizational factors on CC service adoption is significant. The hypothesis is significant at 0.001 level, and this indicates that H2 is supported. For H3, the effect of environmental factors on CC service adoption is significant. Thus, H3 is supported as shown in Table 2. For the last hypothesis, H4 is supported because the p-value is less than 0.05.

5. DISCUSSION

The present research identifies and assesses the challenges that University of Basrah has faced in implementing a cloud computing model. According to the results in Table 2, trust, risk, security, privacy, peer pressure, management, and government regulation were major obstacles for University of Basrah. These findings achieves the study' goal by answering the study's initial research question. The technological factors such as trust, security and risk are among the concern that faces the university in using CC services. Similar conclusions discovered in a previous studies such as [18] who proposed a major chunk of the challenges faced by universities.

Peer pressure and government regulation have been discovered to resist universities' adoption of the cloud paradigm. Weak peer pressure and regulation of government are among the hinder that face the usage of CC at the university. This is in line with previous findings which suggested that the government should provide appropriate support for cloud computing implementation [13]. Privacy is a key challenge for universities in implementing cloud computing models, as seen in Table 2 because the T-Statistics value is more than 1.96 and the significant level is 0.05. Advanced education institutions put forth a lot of effort to protect sensitive data in the cloud against unwanted access [14] [19]. University management appears to be a serious challenge. This findings are in line with prior literature that suggested that cloud implementation will urge management decisions to manage the educational and learning process [14] [19]. These findings can be of utmost importance for decision makers to move to cloud computing services in the higher education. The findings helps the higher education to understand the challenges that face the universities when deciding to move to cloud-based teaching, learning and educational services.

The study contributed to the literature by extending the TOE and included other factors such as the internal and external factors. The study also contributed to the existing knowledge of cloud service usage by public and educational institutions such as the university. The study helps the students, academic staff and management of university in determining the best possible method to move and use cloud services.

6. CONCLUSION

This study examined the obstacles that faces University of Basrah to deploy CC services. The findings showed that these obstacles can be divided into four. The most important is the organizational followed by technological, internal and external factors, and the environmental factors. Organizational factors such as the size and age of the university are critical. Technological factors such as trust, security, and risk, environmental factors such as peer pressure and government regulation, and internal-external factors such as privacy and management all posed statistically significant barriers to the usage of CC models by university of Basrah. The analysis found that the IE-TOE model is the best solution for overcoming the challenges and implementing the cloud computing model for University of Basrah. This advice met the examination's second purpose, and it was obtained by answering the second research questions. The cloud should provide excellent security in order to attain the maximum capacity promised by the invention. This investigation is ongoing. Represent the cloud computing paradigm to prescribe the best solution to the problems with the IE-TOE model, and the aforementioned universities would use cloud computing to ensure security, trust, protection, system, and information assurance, as one of the Iraqi largest educational institution, for scholastic concerns.

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