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Factors That Influence The Users' Adoption Of Cloud Computing Services At Iraqi Universities: An Empirical Study

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ABSTRACT

Cloud computing was proven as a cost effective technology that attracted the attention of academicians and practitioners. In this essence, the majority of academic studies in the field are related to business organizations. Few studies investigated educational institutions. The purpose of this paper is to identify the factors that affect the users' adoption of cloud computing by educational institutions in Iraq. The study deploys the unified theory of acceptance and use of technology (UTAUT) as a theory of adoption along with security and trust. Data was collected from 312 students, academic staff, and non-academic staff at Kufa University in Iraq using stratified sampling techniques. The results indicate that performance expectancy is the most important factors that affect the behavioral intention to use cloud computing followed by effort expectancy, social influence, security, and trust. Behavioral intention and facilitating conditions have strong influence on use behavior of cloud computing services. Implications and recommendation were discussed.

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INTRODUCTION

Since its inception in 2007, cloud computing technology has received much attention from researchers and practitioners. This was driven by the advantages that come from using cloud technology. Cloud computing provides access to software and hardware without large capital investment and provides easier access to applications and services that can be realized with minimal service provider interaction (Yang *et al*., 2012). The term cloud is derived from the idea of businesses and users being able to access applications from anywhere at any time (Low *et al*., 2011; Larus, 2012; Shawish & Salama, 2014). It is defined as "a style of computing in which massively scalable IT-related capabilities are provided as a service to external customers using internet technologies" (Gartner, 2009).

Technical aspects of the cloud computing technology has attracted the interest of researchers. They have focused on the technical barriers and on the software, hardware, and essential infrastructure for business organization to use the cloud technology (Morgan & Conboy, 2013; Xing & Zhan, 2012; Hashim & Othman, 2014). However, researchers believe that the behavioral side of the adoption is more important than the technical side (Alotaibi, 2014; Gohary *et al*., 2013). In addition, researchers found that previous studies have focused on the adoption in business organizations at the organizational level (Lian *et al*., 2014; Lim *et al*., 2015; Gangwar *et al*., 2015). Recent review study by Hashim, Hassan and Hashim (2015) found that there is lack of studies related to the adoption of cloud computing by users at educational institutions and called for more studies in this field. This view is similar to other researchers who found scarcity of studies related to the users' adoption of cloud at educational institutions (Taylor & Hunsinger, 2011; Ratten, 2013; Flack & Dembla, 2014).

This paper is interested to find the factor that affect the adoption of cloud computing by users at educational institutions. Previous studies found that UTUAT need to be further validated in the cloud computing area (Héctor *et al*., 2012; Cao *et al*., 2013). They found also that unlike technology acceptance model (TAM), the UTAUT was original designed to investigate individual or user adoption of technology (Mathur & Dhulla, 2014; Gangwar *et al*., 2014; Venkatesh *et al*., 2003). Nevertheless, despite the high explanatory power, UTAUT was criticized for not including trust and security in its conceptualization. The researchers justified their criticism by the importance of the two variables in

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the adoption decision of technology (Alotaibi; 2014; Flack & Dembla, 2014; Alharbi, 2014; Singh & Chand, 2014).

Responding to the call that has been made by Hashim *et al*. (2015) for more empirical studies in cloud computing at individual level in educational area, the present paper aims to investigate the factors that affect the adoption of users at Iraqi institutions. The paper consists of seven sections. First section presented the introduction and highlighted the issues and gaps in the literature along with the objectives. The second section integrates and analyzes the literature related to the topic. Third section presents the research models and the hypotheses development. Fourth section discusses the research methodology. Fifth section presents the findings of the study. Sixth section discusses the findings. Last section concludes the study and highlights the limitations and the direction for future works.

Literature Review:

Cloud Computing:

Cloud computing is distinguished from other technologies by having three layers through which the users can utilize the technology. The first layers serves the end users and called Software as a Service (SaaS), while the second layer serves application developers and called Platform as a Service (PaaS), and the last one serves the networks architects and called Infrastructure as a Service (IaaS) (Goscinski & Brock, 2010; Low *et al*., 2011; Anuar *et al*., 2013; Lian, 2015). In term of deployment, the technology can be divided into four types that includes public, private, hybrid and community clouds (Mell & Grance, 2011; Lian, 2015). Public cloud are cheap and accessible but less secure than private. Whereas, the hybrid mixed between the affordability and the high security. Whereas, community cloud is an integration between some organization to use the cloud technology (Gustafsson & Orrgren, 2012; Zhang *et al*., 2010; Lian, 2015). Each deployment model has its benefits and drawbacks (Zhang *et al*., 2010). The decision of choosing a proper cloud computing deployment model should consider technological as well as organizational factors (Zhang *et al*., 2010).

Cloud Computing at Educational Institution:

Cloud computing can help overcome many problems in universities by having the right types of technologies, including hardware and software (Brush, Glazewski & Hew, 2008). Selection criteria of cloud computing application in education include mission criticality and sensitivity of activities (Alabbadi, 2011). The most obvious area of application is in course delivery (Jou & Wang, 2013; Vaquero, 2011). Another common application of cloud computing in education is in the area of distance learning (Jiao, Wang, An & Fang, 2011; Sun, Tsai, Finger, Chen & Yeh, 2008; Wang, Pai & Yen, 2011; Zhang & Liu, 2010). Moreover, the day-to-day communication between students and lecturers is an important application area. Emails and instant messaging have become an important part of the communication within and outside universities (Lee & Mautz, 2012).

Previous studies found that the most commonly used cloud tool in higher education is Gmail (CDW, 2011). Other application areas include learning management systems (Aljenaa, Al-Anzi & Alshayeji, 2011; Al-Zoube, 2009), library management systems (Han, 2010; Kan, Yang, Wang & Qi, 2010), and document creation/storage.

Cloud computing in universities could support the learning processes that include self-learning, online peer learning, virtual learning, distance learning, and assessment system (Aljenaa *et al*., 2011; Ding, Li, Liu & Shi, 2012; Jiao *et al*., 2011). It provides lecturers with the ability to develop online labs and enhance the students' academic performance (Sun *et al*., 2008). It supports the student learning in rural area and solve the problem of digital divide (Le Roux & Evans, 2011; Noor, Mustafa, Chowdhury, Hossain & Jaigirdar, 2010).

Cloud computing facilitating the knowledge sharing and reduce the expenditure on the software and hardware, and the maintenance of the system (Ab Aziz *et al*., 2012; Mircea & Andreescu, 2011; Noor *et al*., 2010; Stein, Ware, Laboy & Schaffer, 2013).

Previous studies showed that there is lack of studies pertaining to cloud computing in developing countries. In Iraq, few studies were conducted in cloud computing. These studies are related to technical aspects such as the study of Al-Ani and Ibrahim (2012) that attempted to identify the technical aspect of the implementation of virtual universities in Iraq. Another study was conducted by Hashim and Othman (2014) attempted to develop a technical framework for the adoption of cloud computing by universities in Iraq. Mohan *et al*. (2014) proposed a prototype to be implemented in the Iraqi universities.

Utaut:

Venkatesh *et al*. (2003) developed the UTAUT model to consolidate previous related models such as TAM, theory of reasoned action (TRA); motivational model (MM); theory of planned behavior (TPB); combined TAM and TPB (C-TAM-TPB); model of PC utilization (MPCU); diffusion of innovation theory (DOI); and social cognitive theory (SCT). UTAUT consist of six core variables that are performance expectancy, effort expectancy, social influence, facilitating conditions, behavioral intention, and use behavior. It also includes four moderators namely, gender, age, experience and voluntariness. Variables of UTAUT were derived from other variables in previous models and theories. Table 1 shows the factors of UTAUT and their

sources.

Table 1: Core Variables of UTAUT (Venketch *et al*., 2003)

Variables	Sources
Performance expectancy	Perceived usefulness (TAM/TAM2/ C-TAM-TPV) extrinsic motivation (MM); job-fit (MPCU), relative advantage (DOI)
Effort expectancy	Perceived easy to use (TAM/TAM2); Complexity (MPCU/DOI)
Social influence	Subjective norm (TRA, TAM2, TPD/DTPB, C-TAM-TPD); social factors (MPCU); Image (DOI)
Facilitating Conditions	Perceived behavioral control (TPB/DTPE, C-TAM-TPB) Facilitating conditions (MPCU); Compatibility (DOI)

Previous studies described UTAUT as a newer theoretical model and able to strengthen inadequacies of previous models (Min *et al*., 2008; Marchewka *et al*., 2007; Chang *et al*., 2015). UTAUT has exploratory power (R^2) up to 70% that is higher than all the previous models (Alharbi, 2014; Cao *et al*., 2013; Mathur & Dhulla, 2014).

However, the use of the model in cloud computing studies still limited (Héctor *et al*., 2012; Cao *et al*., 2013). Most of the previous studies have used TAM or DOI to identify the factors that affect the adoption of cloud (Opitz *et al*., 2012; Gupta *et al*., 2013; Burda & Teuteberg, 2014; Shin, 2015). The literature focuses less on the use of UTAUT model in investigating the factors that influence the adoption of cloud computing. UTAUT was developed to assess the acceptance of individual to a new technology. For this purpose, a study conducted by Cao *et al*. (2013) incorporated the factors of UTAUT namely: performance expectancy, effort expectancy, social influence, facilitating condition, and adoption intention along with risk, cost, and innovativeness. The findings indicated that all the variables have significant influence on the adoption of cloud services. In similar approach, Lian (2015) investigated the adoption of cloud computing by adding to UTAUT's factors, trust in e-government, perceived risk, and security. The findings showed that effort expectation, social influence, trust in e-government, and perceived risk have significant effects on the intention to adopt cloud computing. The present study deploys UTAUT model along with trust and security.

Research Model and Hypotheses:

Research Model:

This study uses the UTAUT model as a theoretical adoption theory because it was designed to investigate the users' adoption of technology. The study also incorporates the variable trust and security. Trust in cloud provider as well as security issues, are crucial for ensuring the successful adoption of an appropriate cloud. In addition, researchers criticized UTAUT and TAM because they did not include the two variables (trust and security) in their models (Alotaibi; 2014; Flack & Dembla, 2014; Alharbi, 2014; Singh & Chand, 2014). Figure 1 presents the conceptual model of this study.

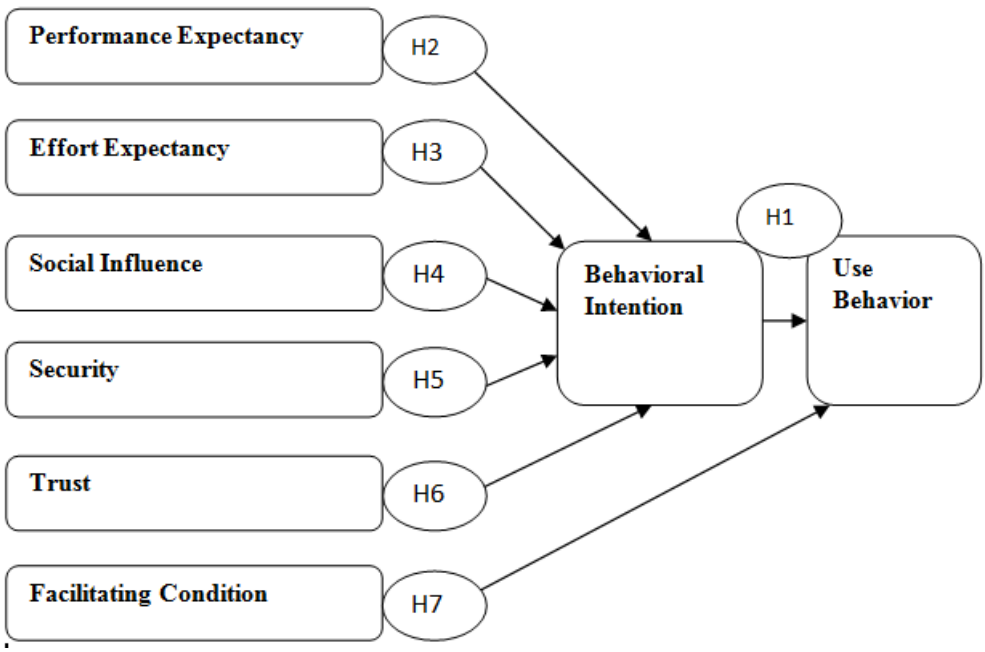


Fig. 1: Conceptual Model for User Adoption.

Hypotheses Development:

Following the conceptualization of UTAUT, the dependent variables of this study are the behavioral intention and the use behavior. UTAUT proposed a direct link between behavioral intention and usage behavior (Venkatesh *et al*., 2003). Optiz *et al*. (2012) found that behavioral intention strongly influence the actual use of cloud computing services. Taylor and Hunsinger (2011) investigated the influence of intention on the use of Google.Doc by university students and found significant relationship. In this study, it is expected that behavioral intention will affect the use behavior of cloud computing. Thus, the following can by hypothesized:

H1: behavioral intention has positive effect on use behavior of cloud computing services:

Performance expectancy is the first variable of UTAUT and it serves as one of the critical factors for user adoption. It is similar to perceived usefulness in TAM (Min *et al*., 2008; Venkatesh *et al*., 2003). Many studies in the cloud computing field have demonstrated empirically that the performance expectancy affect the behavioral intention of users to adopt the technology. Wu (2010, 2011) found that perceived usefulness influence the adoption of SaaS services. Similarly, Shin (2013, 2015) found empirically that cloud computing adoption is affected by the perceived usefulness. The findings of Park and Kim (2014) showed that perceived usefulness is a key factors for the adoption of cloud computing. UTAUT studies on adoption of cloud computing showed that the expected benefits of the cloud computing might increase the users' intention to adopt the technology (Park & Ryoo, 2013; Cao *et al*., 2013). In this study, it is expected that the user intention to adopt the cloud computing would increase if they perceive that there are many benefits that can be obtained from adopting the technology. Thus, the following can be hypothesized:

H2: Performance expectancy has positive effect on users' behavioral intention to use cloud computing services:

Effort expectancy is similar to perceived ease of use in TAM (Min *et al*., 2008; Venatesh *et al*., 2003). Many studies have used TAM model and found strong influence of perceived ease of use on the behavioral intention to adopt cloud computing services. Gupta *et al*. (2013) found empirically that the strongest predictor of cloud computing adoption is the perceived ease of use. Similar results were derived from the findings of Shin (2013, 2015; Wu, 2011; Pauqet, 2013; Burda & Teuteberg, 2014). Lian (2015) has employed the UTAUT model to investigate the adoption of E-invoice using the cloud computing. The findings showed that effort expectancy influences the adoption of cloud computing services. Thus, based on the previous studies, the following can be hypothesized:

H3: Effort expectancy has positive effect on users' behavioral intention to use cloud computing services:

The social influence refers to the normative influence of key referent groups, such as peers or coworkers, on ones' behavioral choice. It has also been treated as similar to the subjective norm incorporate in the TRA (Ajzen & Fishbein, 1980) and the TPB (Ajzen, 1991). Subjective norms are also considered antecedents to an individual's intention to perform certain behavior (Park & Ryoo, 2013).The UTATU model emphasized that social influence plays important role in IT adoption (Venkatesh *et al*., 2003). Social influence will also affect user adoption of cloud computing (Lian, 2015). Cao *et al*. (2013) employed the UTAUT model to investigate the cloud computing adoption. The findings showed that social influence could predict the users' adoption of cloud computing storage services in China. Thus, based on above, the following can be hypothesized:

H4: Social influence has a positive effect on users' behavioral intention to use cloud computing services:

UTAUT was criticized for failing to include factor such as trust in its conceptualization (Wu, 2010, Wu, 2011; Alharbi *et al*., 2014). Wu (2011) found that trustfulness of cloud service providers is essential for the adoption of a cloud solution. Stieninger and Nedbal (2014) pointed out that trust represents the ability of the significantly involved actors to convey the perception of reliability and trustfulness and the role of trust is especially important in the context of a public cloud scenario. Therefore, trust in cloud computing systems is the most important factor for the successful deployment of cloud computing (Chu *et al*., 2013). Lian (2015) found that trust in e-government on cloud computing significantly influence the adoption of e-invoice on cloud computing. Following Voutinioti (2013), Alaiad and Zhou (2014), and Lian (2015), this study proposed direct link between trust and behavioral intention. Thus, the following can be hypothesized:

H5: High trust has positive effect on users' behavioral intention to use cloud computing services:

Previous studies in cloud computing have found that the major concern of users when adopting cloud computing is security (Jansen and Grance, 2011; Subashini & Kavitha, 2011; Zissis & Lekkas, 2011). The UTAUT model was criticized also for not including security (Wu, 2010, Wu, 2011; Alharbi *et al*., 2014). Security has always been an important factor in information systems and cloud services are no exception (Phaphoom *et al*., 2015). Many other studies have found similar results and pointing out the importance of security for the adoption of cloud

computing (Wu, 2010; Lian *et al*., 2014; Shin, 2013; Lim *et al*., 2015). Previous studies linked security directly to behavioral intention (Alkhater *et al*., 2014; Lian, 2015). Therefore, based on above discussion, the present study assumes that there is direct significant effect of security on the behavioral intention to adopt cloud computing. Thus, the following can be hypothesized:

H6: High security has positive effect on users' behavioral intention to use cloud computing services:

Venkatesh *et al*. (2003) linked facilitating condition directly to the use of behavior. Stieninger and Nedbal (2014) described facilitating condition as the organizational factors and pointed out that the availability of technical and organizational requirements including internet bandwidth and reliability of the infrastructure affected the user adoption of the cloud. Mathur and Dhulla (2014) described facilitating conditions as the conditions in which technology can be adapted by users. Cao *et al*. (2013) found that facilitating condition affect the final use adoption of the cloud computing. Chang *et al*. (2015) investigated the adoption of library services on cloud and found that facilitating condition could strongly predict the use behavior of cloud computing. Following the conceptualization of UTAUT, facilitating conditions is linked directly to the use behavior. Thus, based on above, the following can be hypothesized:

H7: Facilitating condition has positive effect on use behavior of cloud computing services:

Research methodology:

Population and Sampling:

This study was conducted in Iraq. Among the Iraqis universities, Kufa University is the only university that deploys the cloud computing technology. Thus, the university was taken as a case study. The university has 21 colleges and offer programs from diploma to Ph.D. It was established in 1987 and has started deploying the cloud computing via public provider in 2011. According to the university website, there are 26066 students, 1876 academic staffs, and 2525 non-academic staff (Kufa Univeristy Website, 2015). Since these three groups are different and have different characteristics, it was decided to use stratified sampling. Thus, the groups of the population are considered in this study as a stratum. In each group a randomly selected sampling technique is used. According to Krejcie and Morgan (1970), the sample size of this study is 379 respondents divided as 324 students, 23 academic staff, and 32 non-academic staff.

Research Instrument:

This study is using a questionnaire as a tool for data collection. The questionnaire is divided into two parts. Part A asks questions about the background information of the respondents such as their age, gender, occupation, educational level, and basic knowledge about cloud computing. Part B asks questions about the variables of the study. Five point likret scales was used where (1) is strongly disagree and (5) strongly agree. Table 2 shows the measurement and their sources.

Table 2: Source of Measurement.

Variables	No. of Items	Sources
Performance expectancy	5	Davis, (1989), Venkatesh*et al*. (2003), Walczuch, Lemmink & Streukens, (2007), Lian (2015)
Effort expectancy	5	Davis, (1989), Venkatesh*et al*. (2003), Walczuch *et al*. (2007), Lian (2015)
Social Influence	8	Venkatesh *et al*. (2003), Lian (2015), Wu (2011), Marchewka and Kostiwa, (2007)
Facilitating conditions	6	Venkatesh *et al*. (2003), Lian (2015); Venkatesh, et.al. (2012).
Security	4	Yenisey *et al*. (2005), Shin and Shin, (2011); Park and Kim (2014), Wu, (2011)
Trust	6	Gefen, (2000), Jarvenpaa *et al*. (2000), Burda and Teuteberg (2014), Pavlou & Gefen, (2004), Lian (2015)
Behavioral intention	5	Bhattacherjee, (2001), Park and Ryoo (2013); Opitz *et al*. (2012), Hung *et al*. (2006, 2013) ; Lian (2015)
Use Behavior (Adoption of cloud computing)	5	Gupta *et al*. (2013), Davis *et al*. (1989), Venkatesh and Davis (2000), Alotaibi, (2014)

Validity and Reliability:

The validity of the questionnaire was checked by asking three experts to evaluate and pretest the content of the questions. Their feedbacks and comments were considered for correcting and adjusting the instrument. Reliability of the measurements were examined by asking 38 students to answer the questionnaire. The Cronbach's alpha for the reliability study and for final data collection was acceptable. Table 3 shows the reliability for pilot and field study.

Table 3: Reliability of Pilot and field Study

Variable	Number of items	Cronbach's Alpha of Pilot study (38)	Cronbach's Alpha of Field study (312)
Performance Expectancy	5	0.86	0.76
Effort expectancy	5	0.91	0.76
Social Influence	8	0.84	0.75
Facilitating conditions	6	0.80	0.77
Security	4	0.86	0.73
Trust	6	0.92	0.78
Behavioral Intention	5	0.81	0.75
Use Behavior	5	0.79	0.73

Data Collection:

Data of this study was collected from student, academic, and non-academic staff at Kufa University, Iraq. The contact details of the respondents were obtained from the university. A total of 379 questionnaires was emailed to users. The respondents were given three weeks to answer the questionnaires. A reminder was sent in second and third week to remind the respondents to fill in the questionnaires. A total of 312 questionnaires were received complete and usable.

Findings:

Demographics of respondents:

A total of 312 respondents has participated voluntarily in this study. They are mainly in the age between 21 and 30 years (159 or 51%). The respondents included 188 (60.3%) males and 124 (39.7%) females. Mainly the respondents are students (264 or 84.6%) and they have bachelor degree (212 or 67.9%). A total of 226 (72.5%) have accessed the cloud of the university at least once a week. Table 4 shows the demographic information of the respondents.

Table 4: Demographic Information of Respondents

N= 312	Label	Frequency	Percent
Age	Less than 20 years	50	16.0
	21-30 years	159	51.0
	31-40 years	61	19.6
	41-50 years	40	12.8
	More than 50 years	2	0.6
Gender	Male	188	60.3
	Female	124	39.7
Occupation	Student	264	84.6
	Academic staff	19	6.1
	Non-academic staff	29	9.3
Education	Diploma	6	1.9
	Bachelor	212	67.9
	Master	66	21.2
	Ph.D	28	9.0
Usage	Never	39	12.5
	Once a week	130	41.7
	2-3 times a week	96	30.8
	4-5 times a week	26	8.3
	Everyday	21	6.7

Hypotheses Testing:

Statistical Package for the Social Sciences (SPSS) version 22.0 was used for data analysis. As an assumption for conducting regression analysis, the correlation between variables must be examined. This is because the correlation can tell whether the Multicollinearity is existed or not (Pallant, 2010). Table 5 shows the Pearson correlation coefficient. It shows that the coefficients between variables were less than 0.90 as recommended by Pallant (2010) which indicated that the Multicollinearity did not occur.

Table 5: Pearson Correlation

N=312	PE	EE	SI	FC	SEC	Trust	BI	Use Behavior
PE	1	0.48	0.65	0.14	0.33	0.34	0.48	0.28
EE	0.48	1	0.56	0.00	0.30	0.44	0.46	0.18
SI	0.65	0.56	1	0.02	0.25	0.37	0.49	0.24
FC	0.14	0.00	0.02	1	0.48	-0.06	0.10	0.81
SEC	0.33	0.30	0.25	0.48	1	0.22	0.42	0.61
Trust	0.34	0.44	0.37	-0.06	0.22	1	0.38	0.11
BI	0.48	0.46	0.49	0.10	0.42	0.38	1	0.22
Use Behavior	0.28	0.18	0.24	0.81	0.61	0.11	0.22	1

Note: PE: performance expectancy, EE: effort expectancy, SI: social influence, FC: facilitating condition, SEC: security, BI: Behavioral Intention.

The result of hypotheses testing is presented in Table 6. The table shows that the highest predictors of the behavioral intention are performance expectancy followed by effort expectancy, social influence, security, and trust respectively. In addition, the use behavior is influenced by facilitating condition and behavioral intention. The regression analysis showed that the five variables (performance expectancy, effort expectancy, social influence, security, and trust) that are linked to behavioral intention are able to explain 38.9% of the variation in the behavioral intention toward the use of cloud computing services. While the behavioral intention and facilitating conditions are able to explain 67.3% of the variation in the use behavior.

Table 6: Coefficient of Regression Analysis

Model		Unstandardized Coefficients		T	Sig.
		B	Std. Error		
Behavioral Intention	(Constant)	0.51	0.34	1.51	0.13
	PE	0.24	0.09	2.64	0.01
	EE	0.19	0.08	2.25	0.03
	SI	0.18	0.06	3.01	0.00
	SEC	0.15	0.03	5.11	0.00
	Trust	0.14	0.03	2.92	0.00
Use behavior	(Constant)	-0.23	0.22	-1.03	0.30
	FC	0.89	0.04	24.30	0.00
	BI	0.21	0.05	4.38	0.00

N=312, P-value <0.05

The result of hypotheses testing showed that the effect of behavioral intention on use behavior is significant (B=0.21, P-value<0.05). Thus, H1 is supported. The second hypotheses pertaining to the effect of performance expectancy on the behavioral intention was found significant (B=0.24, P-value <0.05). Thus, H2 is supported. Other factors of UTAUT such as effort expectancy (B=0.19, P-value<.5) and social influence (B=0.18, P-value<0.05) were found significant. Thus, H3 and H4 are supported.

The findings of regression analysis showed also that the effect of high trust on suppliers on the behavioral intention to use cloud computing is significant (B=0.14, P-value <0.05). Thus, H5 is supported. Similarly, the effect of high security was predicted to have significant effect on the behavioral intention to use cloud computing. The findings showed that security of the cloud computing affected significantly the behavioral intention to use cloud computing services (B= 0.15, P-value <0.05). Thus, H6 is supported.

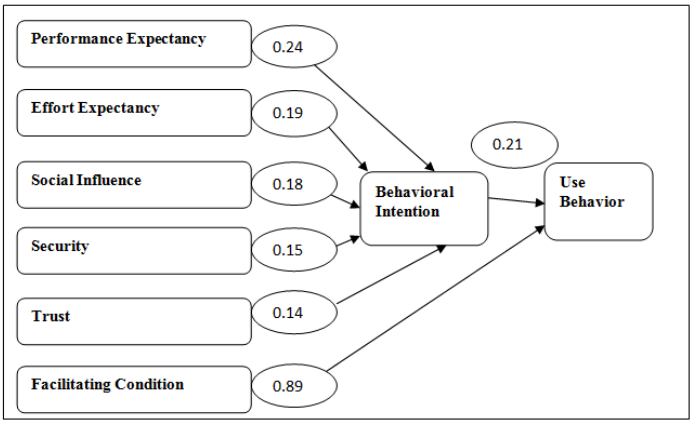
Facilitating condition was proposed as a direct determinant of the use behavior of cloud computing services. The findings showed that facilitating condition is a strong factor that affects the use behavior of cloud computing services (B= 0.89, P-value<0.05). Thus, H7 is supported.

Table 7 shows a summary of the hypotheses testing. The table shows the beta value which indicates the size of effect along with the P-value of the relationship. It shows also the status of the hypothesis based on the P-value which supposed to be less than 0.05 for the hypothesis to be accepted.

Table 7: Summary of Hypotheses Testing.

Hypotheses	Beta	P-value	Status
H1:Behavioral intention affects positively the use behavior of cloud computing services	0.21	0.00	Accepted
H2: Performance expectancy affects positively the users' behavioral intention to use cloud computing services	0.24	0.01	Accepted
H3: Effort expectancy influences positively the users' behavioral intention to use cloud computing	0.19	0.03	Accepted
H4: Social influence has a positive effect on users' behavioral intention to use cloud computing services	0.18	0.00	Accepted
H5: High trust affects positively the users' behavioral intention to use cloud computing	0.14	0.00	Accepted
H6: High security has positive effect on the behavioral intention to adopt cloud computing	0.15	0.00	Accepted
H7: Facilitating condition affects positively the use behavior of cloud computing services	0.89	0.00	Accepted

Thus, as a result of the hypotheses testing, Figure 2 shows the model of cloud computing adoption for Iraqi higher educational institution. It shows that the four factors of UTAUT along with security and trust are significant factors of the adoption of cloud computing in Iraqi higher education. The most important factor in the model is the facilitating condition with coefficient of 0.89. This could be attributed to the weak IT infrastructure in Iraq and the need for Internet connection and electricity in the country.



P-value <0.05

Fig. 7: Cloud Computing Adoption Model for Iraqi Higher Education

Discussion:

The study has tested seven hypotheses using regression analysis. The behavioral intention was found an effective factor that influence the use behavior of cloud computing services. This could be explained as the increase in the behavioral intention of the users at Kufa University will lead to the increase in the use of cloud computing services. Cloud is useful and beneficial for all users at Kufa University. In agreement with the present study, previous empirical studies have found that behavioral intention have significant influence on use behavior. Optiz *et al*. (2012) tested the relationship between behavioral intention and use behavior and found significant association. Similarly, Taylor and Hunsinger (2011) found that the relationship between both variables is significant.

Performance expectancy is the strongest predictor of behavioral intention. The finding of the literature suggested that the performance expectancy is a key indicator of the behavioral intention to use the cloud computing services. Performance expectancy describes the benefits that users can obtain from using the cloud computing services. Having the benefits of cloud could urge users to be more involved with the technology. Users at Kufa University compare between doing the work conventionally and electronically and they perceive the benefits of doing it using the cloud computing services. Previous studies have found similar result. Park and Ryoo (2013) found significant influence between performance expectancy and the behavioral intention to adopt cloud computing storage services. Similar result related to the cloud computing usefulness were found by Wu (2010, 2011) and Shin (2013, 2015)

Effort expectancy also found to affect the behavioral intention. The users at Kufa University believe that learning the theoretical part about how to use the cloud is easy. It is believed that the easier the work on the cloud, the more likely that the users in Kufa University will adopt and use the cloud computing services. In agreement with the finding of the current study, Gupta *et al*. (2013) examine the influence of ease of use on the behavioral intention and found significant relationship between the two variables. Shin (2013, 2015) found that ease of use is a significant predictor of behavioral intention. Similar findings were found in other studies such as Wu (2011), Pauqet (2013), and Burda and Teuteberg (2014).

Social influence was found effective factor that affect the behavioral intention to use cloud computing services by users at Kufa University. The friends, family, and lecturers influence at Kufa University have strong effect at users. For example, if a lecturer at Kufa University created a portal and asked student to download assignment, instruction, slides etc. the student will have to use the cloud to reach the portal and download the material. If lecturer assigned group to work with Google apps and cooperate with each other online, he will influence them to use the cloud. The findings of this study are in agreement with the findings of the literature. Those who examine the effect of social influence on the behavioral intention found similar results (Wu, 2011; Park & Ryoo, 2013; Lian, 2015).

Trust has been found as an effective factor on behavioral intention. Trust is one of the factors that influence the behavioral intention to use cloud computing services at Kufa University. Trust is essential for any transactions. The lack of it is problematic and might lead to abandon of the cloud services. Kufa University is using public cloud. The university must make sure that the servers are in the right hand and they cannot be accessed by third party. For example, if the university uses the public cloud for public services and develop a private cloud inside the university, the trust of the users will increase because they know that their data are stored and accessible only by the university. This finding is in agreement with the literature. Previous studies found significant effect of trust on the adoption of cloud computing (Wu, 2010, 2011; Chu *et al*., 2013).

It was predicted that high security can affect positively the behavioral intention to use cloud

computing services at Kufa University. The findings showed that the user at Kufa University do not trust the cloud to be safe and secure. This supported by countless cases of fraud, cybercrime, phishing, hacking and so on. Respondent are concerned about the safety of their data. This concern might slow or reduce the adoption process of technology. Thus, they will be hesitant to utilize effectively the cloud computing services. The findings of the present study is in agreement with the previous studies. Lian (2015) found significant effect between trust and behavioral intention. Similar findings were found by other researchers such as Gupta *et al*. (2013) and Lim *et al*. (2015).

Facilitating condition affects positively the use behavior of cloud computing services. The factor was highly significant. This could be due to the fact that Iraq has weak infrastructure and weak supply of electricity. The need for facilitating condition could be high in Iraq comparatively with any other country. The finding of the present study is in agreement with the findings of the literature. Cao *et al*. (2013) concluded that the factor is significant for the adoption of the cloud. Similar findings were found by Muthur and Dhulla (2014) and for Chang *et al*. (2015).

Implications:

This study has deployed the UTAUT model. The findings showed that the UTAUT could be used and explain the adoption of cloud computing services. The explanatory power of the developed model were 67.3% which almost similar to the explanatory power of UTAUT at 70%. The developed model included security and trust which enhanced the explanatory power of the developed model.

Practical implication for the decision makers could be utilized to improve the cloud computing adoption and utilization. The Iraqi decision makers are advised to increase awareness about productivity and performance of cloud computing especially for university students. More workshops and seminar should be conducted. In addition practical course must be provided to users to know how cloud computing works. Lecturers must supports the cloud computing and encourage its use by students. The internet must be provided on campus where users can access the technology consistently at the campus. The university could utilize hybrid cloud to increase the trust and security of the services.

Conclusion and Future Work:

The purpose of this study was to identify the factors that affect the adoption of cloud computing at Iraqi universities. A total of 312 respondents participated in this study. The respondents were students, academic staff, and non-academic staff. Data was analyzed using SPSS version 22.0. The findings showed that performance expectancy was the most important factors for the behavioral intention to adopt cloud computing services. This was followed by effort expectancy, social influence, security, and trust. Facilitating condition was more effective than behavioral intention as drivers for use behavior.

The findings of the study are generalized for the universities in Iraq, which share with Kufa University similar characteristic. The findings of the study are related to individual users. Thus, the organizational aspects was not part of this study. In addition, the findings is related to educational institutions, therefore, business organizations are not included. It is worthwhile to mention that the study did not use any moderators proposed in the original model of UTAUT. Moderators will be included in future works.

The literature revealed that the studies of cloud computing using UTAUT are few. Similarly, the studies related to the benefits and barriers of using cloud in developing countries are rare. Thus, recommendation for future work should include more studies related to the adoption of cloud computing using UTAUT model or other theoretical adoption model. Researchers could also mix between models to come up with the factors that affect the adoption of cloud computing. It is also recommended for future researchers to survey the benefits and challenges of using cloud computing adoption in developing countries in general and in Iraq in particular.

Previous studies focused on the use of quantitative approach, thus, there is need for qualitative approach that uses different data collection method such as interview to establish the basis of this field. Other recommendation could include the respondents of the study. Future work is recommended to conduct a study specifically on either students, academic staff or non-academic staff. They are also advised to group colleges based on their orientation such as social science colleges, or literature colleges. Lastly, other variables could be included in future work to increase the ability of explaining the variation in behavioral intention to use cloud computing services. These variables could be related to culture, incentives of using cloud computing, and IT knowledge of respondents.

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